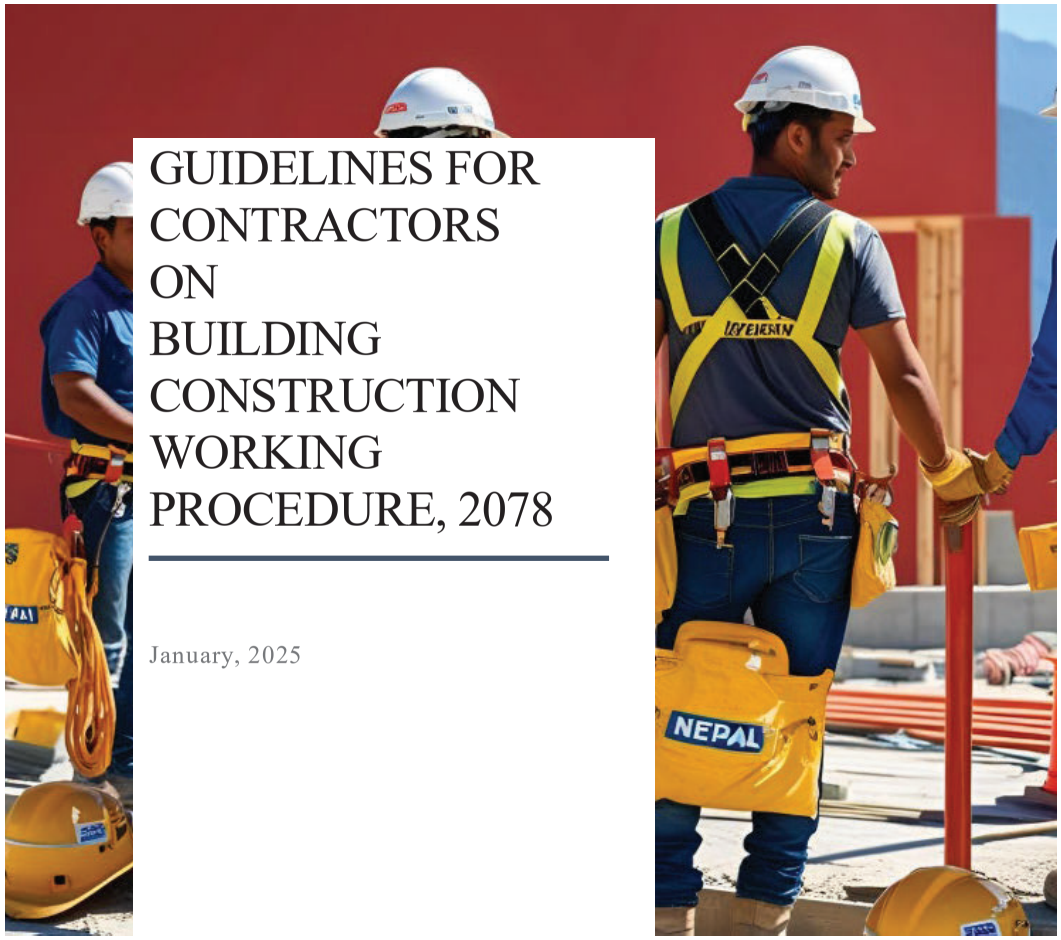
3-3. For Contractors



GUIDELINES FOR CONTRACTORS ON BUILDING CONSTRUCTION WORKING PROCEDURE, 2078

January, 2025

A3-3-1

Under the project "The Project for Promotion of Nepal National Building Code Compliance for Safer Building Construction"

Department of Urban Development and Building Construction, Babarmahal, Kathmandu

Technically Supported by Japan International Cooperation Agency (JICA) Nepal



Attention to Municipality

The Municipality is responsible for issuing the building permit for building construction works at the design phase while it is responsible for issuing the inspection certificates and completion certificates as well during and after the construction respectively. The Municipality shall be responsible for the strict enforcement of the building By-Laws & the building code in the municipality during the design phase as well as during construction.

Building Owner

The Building Owner is the main body for Building Application who shall makes the final decision of the building design and its construction. The Building Owner is responsible for employing the Designer, the Supervision Consultant and the Contractor as well as application to Municipality.

Designer

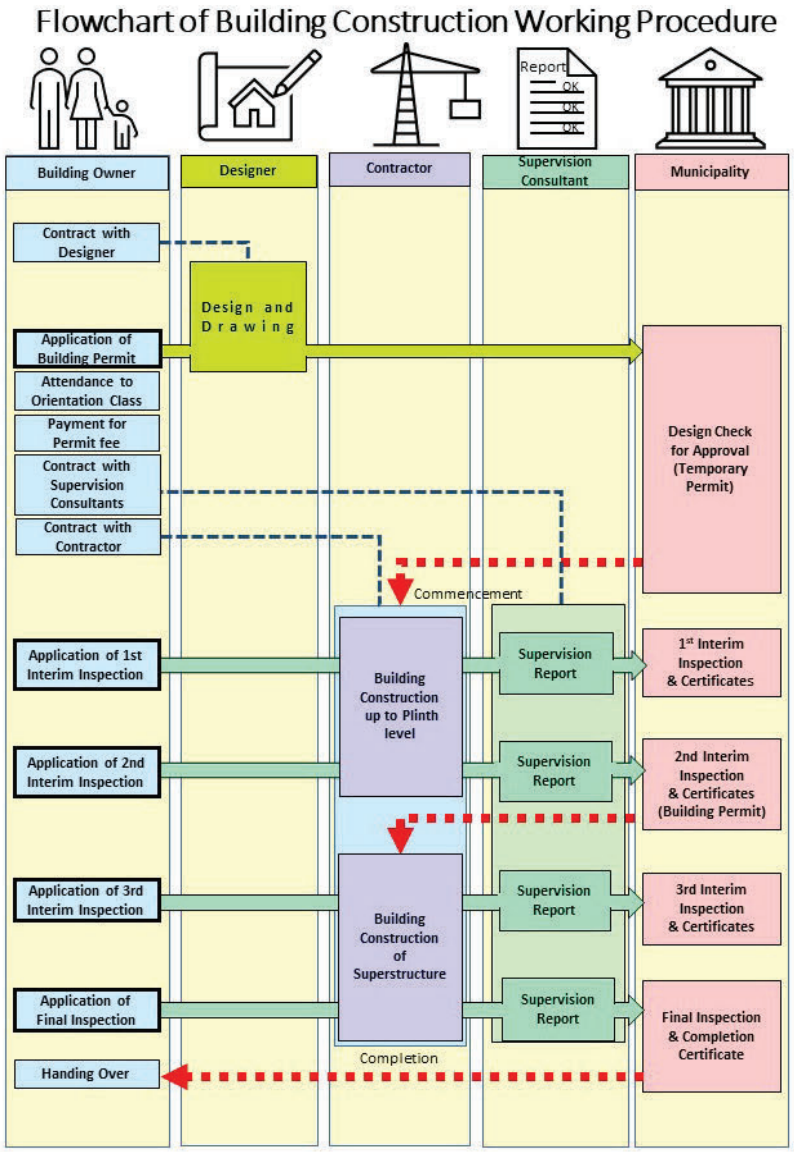
The Designer is responsible for preparing design documents for building construction. The Designer must be qualified for defined category of Building and registered to the Municipality. Construction and Supervision are implemented based on the design documents prepared by the Designer.

Contractor

Contractor is responsible for carrying out the construction work according to the design & drawing documents within the construction period specified in the contract as well as safety control on site. The Contractor/Contractor must be qualified for defined category of Building and registered to the Municipality

Supervision Consultant

The supervision consultant is responsible for confirming that the construction work is being carried out according to the design documents and for reporting to the Municipality. The supervision consultant must be qualified for defined category of Building and registered to the Municipality.



A3-3-2

Abbreviations

GON	Government of Nepal
NRA	National Reconstruction Authority
MoUD	Ministry of Urban Development
MoFAGA	Ministry of Federal Affairs and General Administration
DUDBC	Department of Urban Development and Building Construction
KVDA	Kathmandu Valley Town Development Committee
JICA	Japan International Cooperation Agency
UNDP	United Nations Development Progarmme
UNCHS	United Nations Human Settlement Programmes (UN-Habitat)
NEC	Nepal Engineering Council
NS	Nepal Standard
IS	Indian Standard
BCWP	Building Construction Working Procedures
e-BPS	Electronic Building Permit System
RCC	Reinforced Cement Concrete
RC	Reinforced Concrete
PCC	Plain Cement Concrete
NBC	National Building Code
NNBC	Nepal National Building Code
DPC	Damp Proof Course
Re-bars	Reinforcement Bars
CAO	Chief Administrative Officer
ROW	Right of Way
FAR	Floor Area Ratio
OPC	Ordinary Portland Cement
PPC	Portland Pozzolana Cement
M15	Design Mix Concrete with characteristic strength of 15 MPa
M20	Design Mix Concrete with characteristic strength of 20 MPa

M25	Design Mix Concrete with characteristic strength of 25 MPa
TMT Bars	Thermo-mechanically treated Bars
BoQ	Bill of Quantity
CGI	Corrugated Galvanized Iron
d_b	Diameter of Rebar
l_{dh}	Horizontal Development Length
N/A	Not Applicable

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Preamble

The guideline for contractors on building construction working procedures has been prepared to facilitate contractors working in building construction sectors on overall stages of building permit process of municipality specially focusing on making compliancy of buildings with building By-Laws and building code. The guideline provides detail descriptions about improving quality of construction and detailing works to ease building owner for receiving certifications from municipality at each inspection stages. The guideline has tried to clarify the contractors on procedures of material/ workmanship testing and construction safety to be adopted for maintaining quality construction. The stages of building constructions and detailing to be followed are elaborated with simplified illustrations and sketches to avoid discrepancies with regards to BCWP endorsed by the municipalities. The objective of the guideline is to make contractors more responsible on real implementation of building code in the municipalities.

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Section 1. Preliminary

1.1. Short title, Commencement & Application

1. These guidelines shall be called "The Guidelines for Contractors on Building Construction Working Procedure, 2079 (2023 AD)".
2. This guideline shall extend to the whole territory of Nepal.
3. This guideline shall come into operation immediately.
4. This guideline shall be applicable for the issue of building permit from the municipality to all kind of the Building Construction including repair, retrofitting, renovation, expansion, addition of storeys and changing of occupancy type, compound wall.

1.2. Definition

In this guideline, unless the context otherwise requires, the expressions given below shall have the meaning indicated against each of them.

a) "Building" means any closed structure constructed using various construction materials for the purpose of human habitation.
b) "Building Construction" means construction of new building, reconstruction after demolition of the old building, expansion of building, addition of storeys, change of façade of the existing building, additions or alterations of windows, doors, parapets, balconies, height, porticos, etc. and other related works.
c) "e-BPS" means the Electronic Building Permit System through which building permit is issued online by the municipality.
d) "Drawing" means all drawings and relevant documents pertaining to the construction of building.
e) "Designer" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council(NEC) for the purpose of the preparation of drawings & designs and/or construction.
f) "Supervision Consultant" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council(NEC) for the purpose of carrying of construction supervision of the building as prescribed by the municipality.
g) "Deed of Public Inquiry (*SarjaminMuchulka*)" means the document prepared after the public inquiry on the land plot, access road, neighboring plots with regard to the construction of building conducted by the ward chairman or his representative in presence of the land owners of the adjoining plots including the signatures of the presentees.
h) "Storey" means the portion of building between two floors or between the floor and the ceiling.
i) "Plinth" means the portion of a structure between the surface of the surrounding ground and surface of the floor immediately above the ground.
j) "Plinth Level" means the level of the floor of a building immediately above the surrounding ground.
k) "Plinth Area' means the built-up covered area of the building / buildings immediately at plinth level.
l) "Superstructure" means the portion of the building above the Plinth Level.
m) "Occupancy Type" means the "use to which the building is put, such as residential, commercial, cold storage, warehouse, apartment, hospital, hostels, institutional, etc.
n) "Occupancy Change" means change of occupancy type of the building from the approved occupancy type at the time of building permit issuance.
o) "Building Code" means National Building Code of Nepal enacted by the Government of Nepal.
p) "Building By-Laws" means the building By-Laws of the respective municipality
q) "Municipality" means the municipalities in Nepal established as per the Constitution of Nepal and also denotes Metropolitan City & Sub-metropolitan City in the country.
r) "Mayor" means the mayor of the respective municipality.
s) "Chief Administrative Officer" means the Chief Administrative Officer of the respective municipality.
t) "Act" means Local Government Operations Act, 2074 (2017 AD).
u) "Municipal Assembly" means the municipal assembly of the respective municipality.
v) "Financial Act" means the approved financial act approved each year by the municipal council of the respective municipality.
w) "Building Owner" means every person, company or institution, who intends to construct or re-construct a building or make material alterations or cause the same to be done.
x) "Contractor" means Contractors engaged in the building construction activities.
y) "Contractor" means contractor engaged by the building owner for the building construction activities.
z) Application form: means the documents prepared for getting building permit from the municipality for Category A, Class B, Class C and Class D buildings separately

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Section 2. General information of BCWP

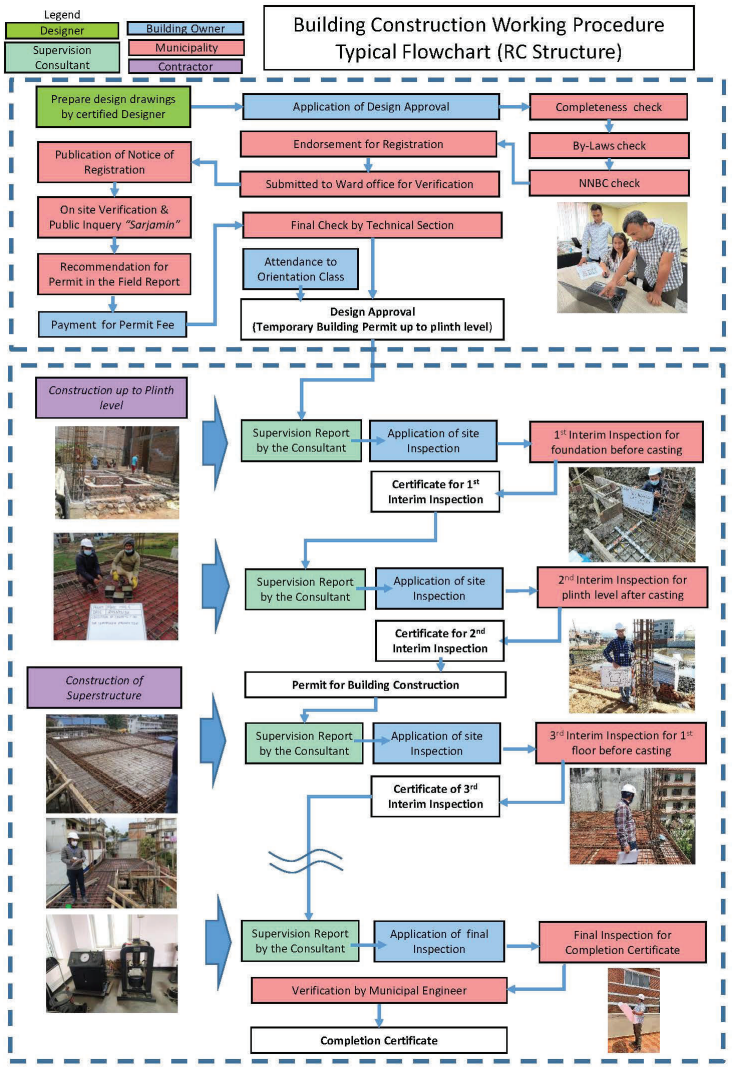
2.1. Background and Purpose of BCWP

The building construction practices in Nepal is improving drastically in recent decades. New construction materials, equipment, technologies are being introduced in the construction sector for carrying out the sophisticated construction works smoothly, properly and timely. That is in the case of the bigger and large-scale building construction projects such as high-rise apartments, group housing, commercial complexes, corporate office buildings and so on. The qualified technical team and professional contractors are involved in such large-scale building projects. Quality tests and technical supervision and monitoring are carried out in a professional way. However, for most of residential buildings which are comparatively small scale in terms of cost and volume of works, the professional qualified technicians are rarely involved and quality works mostly depends on the informal contractors and semi-skilled Contractors. Construction details are not followed and the new technologies and testing methodologies are rarely used to assure the quality constructions. Building act, 1999 and Building Regulation, 2009 of Nepal has made mandatory provision of technical supervision of building construction works with qualified technicians. However, these are not being enforced by most of the municipalities. There is lack of standard working procedures and guidelines to carry out inspection works as per prevailing building By-Laws and building code. The role and responsibilities of the major stakeholders of building constructions are not clearly defined. There are no cross checking and monitoring mechanism to regulate the building constructions in the urban and rural municipalities. Moreover, the informal stakeholders of building sectors are not trained, capacitated and sensitized on building norms, criteria, quality control and detailing to safeguard the building stocks from possible natural disasters mainly the earthquakes. Realizing these adverse situations on building sector, DUDBC has taken initiation to develop Building Construction Working Procedures (BCWP) based on Building Act 1999 to support municipalities to enforce building regulations following building By-Laws and building code of Nepal. The main purpose of the BCWP is to make uniformity in the building permit process in the municipalities all over the country with introduction of interim inspections of building constructions by municipal technicians. The other purposes of developing and enforcing new BCWP are as follows:

- To make the municipal technicians, designers, supervision consultants, contractors and Contractors and Building owner more responsible on overall building permit system of municipalities.
- To make the technical supervision mandatory for all new building constructions in municipalities
- To improve the quality of construction works with introduction of compulsory lab testing of construction materials and concrete works
- To improve compliancy of building By-Laws and building code in design and construction

- To safeguard the building stocks in urban and rural areas of the country from probable earthquake disasters

2.2. Flowchart of BCWP



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2.3. General Information of Building By-Laws and Building Code in Nepal

2.3.1. Earthquake Risk in Nepal

- Nepal is ravaged by multiple natural hazards annually resulting in significant number of loss of lives and properties. Epidemics, floods and landslides are among the most frequent natural hazards with high magnitudes and intensities occurring throughout the country. Earthquake, cyclonic wind, thunderstorm, drought, famine, cloudburst, fire, avalanche is often recurring natural disasters in the country. In terms of vulnerability to natural disasters, UNDP/BPCR has ranked Nepal as the eleventh in terms of risk from earthquakes and thirtieth in terms of risk from flood (UNDP/BCPR 2004).
- Nepal's location in a highly active tectonic region of the Himalayan belt has increased the risk of earthquake disaster in the region. The subduction of Indian plate under the Tibetan plate is considered as the major source of seismicity in the region. Over the last century, great earthquakes in the Himalayan region occurred in 1803, 1833, 1897, 1905, 1934 and 1950 (Bilham ,Gaur, and Molnar 2001). Seismic records showed the 1833 earthquake in Nepal, 1879 earthquake in Shilong, 1905 earthquake in Kangra, 1934 earthquake in Bihar-Nepal and 1950 earthquake in Assam also caused deaths of thousands of people.

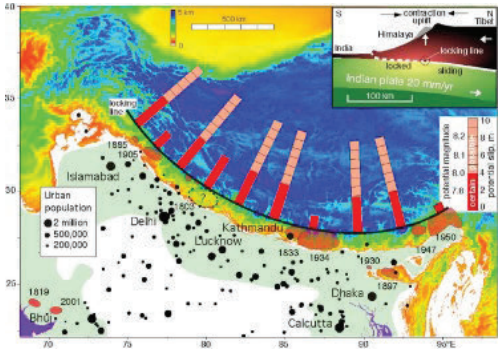


Figure 1 Estimated slip potential along the Himalaya and urban populations south of the Himalaya (Bilham, Gaur, and Molnar 2001)

- Seismic records for Nepal date back to 1255 and since that time several destructive earthquakes have occurred in 1408, 1681, 1810, 1833, 1866, 1934 and 2015. The 1934 Bihar-Nepal earthquake with magnitude of 8.4 took a toll of 4,300 people, destroying about 20 percent of all structures and damaging another 40 percent of buildings in Kathmandu Valley. This earthquake was believed to rupture a 200-300 km long segment to the east of Kathmandu(Pandey and Molnar 1988). In recent decade, Nepal experienced four major earthquakes: a 6.5 magnitude quake in Bajhang district on 29 July 1980 that killed 178 people and destroyed about 40,000 buildings and a 6.6 magnitude quake in Udayapur district that killed 721 people and destroyed 65,000 buildings.

- Similarly, an earthquake of 6.9 Richter Scale hit at eastern border of Nepal between Taplejung and Sikkim on 18 September 2011. The earthquake had affected eight districts of eastern region caused 5000 building totally collapsed and 6500 buildings partially damaged including many school buildings.
- On 25 April 2015, a huge 7.8 magnitude earthquake (Gorkha earthquake) struck Barpak in the historic district of Gorkha, about 76 km northwest of Kathmandu. Nepal had not faced a natural shock of comparable magnitude for over 80 years since the Bihar earthquake. And numerous aftershocks have occurred since the Gorkha earthquake, the largest aftershock is a magnitude 7.3 on May12, 2015. The Gorkha earthquake and aftershocks caused massive damages and losses, a lot of collapse of the buildings of high vulnerability which were increased the number of deaths. Remarkable and regrettable damages extended many historical buildings including world heritage sites. A damage and loss assessment showed that over 8,831 people lost their lives and 22,309 were injured. An over 602,000 private houses and 2,600 public buildings were completely collapsed. 285,000 private houses and 3,700 public buildings were damaged partially. 19,000 classrooms were completely damaged and more than 11,000 classrooms were damaged partially.
- In 2005, the Western Himalaya was hit by an earthquake with magnitude 7.4 killing more than 74,000 people in Pakistan and India. The location of ruptured areas shows a gap along the mountain range between the location of the 1905 Kangra and 1934 Bihar-Nepal earthquakes. It is believed that this region has not experienced such an earthquake since the last large earthquake. This portion of the arc is thus referring to as a 'seismic gap' (Figure 2), a potential location for the next large earthquake. This earthquake scenario evidently indicates that the entire Himalayan belt is one of the most vulnerable zones in terms of seismic hazard. The works on fault modelling (Chamlagain and Hayashi 2007)of Nepal Himalaya has shown continuous accumulation of elastic strain to reactivate older geological faults to generate earthquake of different magnitude. Moreover, several other lines of evidence (e.g. neotectonics, geomorphological, geophysical, geological, and seismological) also show that one or more mega-earthquakes may be overdue in a large fraction of the Himalaya (probably area between Kathmandu and Dehradun), threatening millions of people in the region.

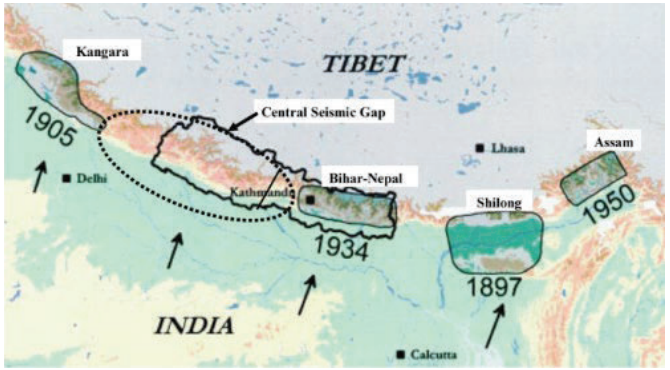


Figure 2 Distribution of probable rapture zones of 1879, 1905, 1934 and 1950 earthquakes along the Himalayan arc. Modified from (Yeats and Lillie 1991; Yeats et al. 1992)

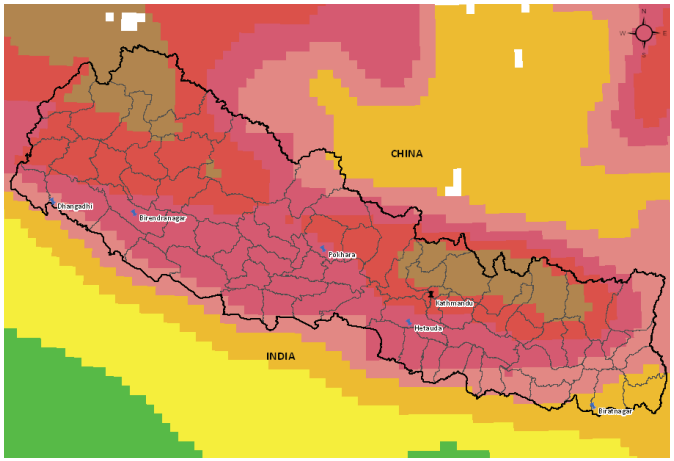


Figure 3 GSHAP seismic hazard map of Nepal [Adopted from (Giardini et al. 1999)]

- The GSHAP seismic hazard map shows that the entire country falls in a high earthquake intensity region of seismic risk scale corresponding to MMI, IX and X. The far western and eastern mountainous regions are the most hazardous regions with rest of entire hilly and the Terai regions lying in a high earthquake hazard zone. The hilly regions and the southern Terai region are the most densely populated areas of the country with a probability of very high population loss in an event of a major earthquake in the region.
- The level of risk has been increased further in our cities due to high urban growth rates and consequent high physical exposure and lack of preparedness. There are number of factors that contribute to the configuration of risk in cities. Firstly, the location of the

city in terms of geology and seismological hazard; secondly the urbanization process which leads to the concentration of populations in risk-prone cities, and risk–prone locations within cities.



Figure 4 Some pictures of Building Damages in Kathmandu during Earthquake of April 2015 (Source: Internet

2.3.2. Background of NBC

That earthquake of 6.7 Richter scale that struck in eastern Nepal in 1988 drew attention of the Ministry of Urban Development (Former Ministry of Physical Planning and works), need for changes and improvement in current building construction practices in Nepal. It was recognized and request of Government of Nepal, technical assistance from UNDP and UNCHS (Habitat) had set up a three-year program "Policy and Technical Support to the Urban Sector" within the ministry. Then the sub-project "National Building Code Development Project" (UNDP/UNCHS/(Habitat)NEP/88/054) was formulated in 1992-93 within the Department of Urban Development and Building Construction (DUDBC) (former Department of Buildings) including with the government counterpart from the department. The Project developed Nepal National Building Code of Nepal which included 20 volumes of the different kinds of the Codes.

Building code is a set of standard practice adopted by engineering community for designing and constructing buildings and backed by legislation. It is an engineering tool for ensuring structural safety of buildings and convenience of occupants. In other words, in context of Nepal, building code is an official document which comprises of earthquake resistant design and construction technology considering suitability of Nepal's geology, environment using locally available construction materials and technology as far as possible. The main purpose

of the building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law of a particular jurisdiction when formally enacted by the appropriate authority. Thus in context of Nepal implementation of National Building Code is mandatory in all Urban and Rural Municipalities of Nepal according to Building Act 1999 (First Amendment 2007). Building code is not changeable according to the location or topography of municipalities. The code is unique for all over Nepal as it covers all categories of buildings especially structural design part which are constructed in the country.

Although too late, initiations have been taken to implement the National Building Code in municipalities of Nepal. Many municipalities have been implementing Nepal National Building code in building permit process. And DUDBC is strictly applying NBC in government buildings. Other municipalities and rural municipalities are trying to apply NBC gradually.

Department of Urban Development and Building Construction (DUDBC) had added three additional codes in 2003 besides the existing 20 volumes of the codes. They are Architectural (NBC 206), Sanitary (NBC 207) and Electrical code (NBC 208). After the Earthquake of 2015 NBC 202, 203, 204 and 206 have been updated. NBC 205: Mandatory Rules of Thumb for RC Buildings without Contractorry infill has been updated in 2012 as NBC 205: Ready to use detailing for RC Buildings without Contractorry infill. The present 23 volumes of codes have been formerly approved by the Government in the year 2003. The name list of Nepal National Building Codes is as follows:

- NBC 000: Requirement of State-of-the-Art Design and Introduction:
- NBC 101: Materials Specifications
- NBC 102: Unit Weight of Material
- NBC 103: Occupancy Load (Imposed Load)
- NBC 104: Wind Load
- NBC 105: Seismic Design of Buildings in Nepal
- NBC 106: Snow Load
- NBC 107: Provisional Recommendation on Fire Safety
- NBC 108: Site Consideration for Seismic Hazards.
- NBC 109: Contractorry: Unreinforced
- NBC 110: Plain & Reinforced Concrete
- NBC 111: Steel
- NBC 112: Timber
- NBC 113: Aluminum
- NBC 114: Construction Safety
- NBC 206: Architectural Design Requirement.

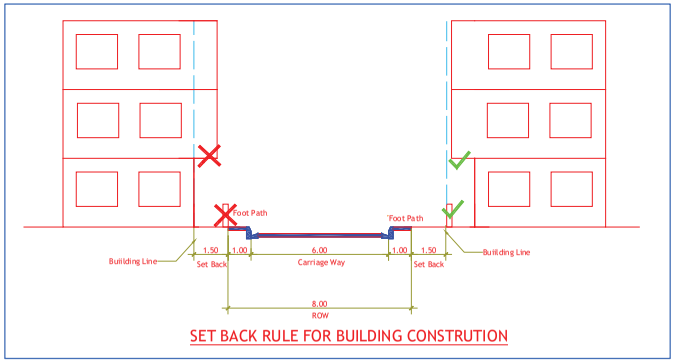
- NBC 207: Electrical Design Requirements for (Public Buildings)
- NBC 208: Sanitary and Plumbing Design Requirements)
- NBC 201: Mandatory Rules of Thumb: Reinforced Concrete Building with Contractorry Infill NBC 202: Mandatory Rules of Thumb: Load Bearing Contractorry
- NBC 205: Mandatory Rules of Thumb: Reinforced Concrete Building without Contractorry Infill
- NBC 203: Guidelines for Earthquake Resistance Building Construction: Low Strength Contractorry
- NBC 204: Guidelines for Earthquake Resistance Building Construction: Earthen Buildings (Eb)

2.3.3. Background of Building By-Laws

- Building By-Laws refer to the set rules and regulations for building planning architectural designing enforced by municipalities which are mandatory to be obliged by building owners during building application and building construction.
- Ministry of Urban Development (MoUD) had developed and circulated "Model building By-Laws (2014)" as a reference document for new municipalities to formulate building By-Laws.
- The Ministry of Federal Affairs and Local Development (MoFALD), immediately after the major earthquake of April 2015, had circulated basic directives (2015) for housing development, urban planning, and building construction for all municipalities to upgrade and formulate building By-Laws considering resilience of the cities from earthquake and other natural disasters.
- Similarly, Ministry of Urban Development (MoUD) had published and circulated the Basic Standards on Settlement Development, Urban Planning & Building Construction (2015) (BSSDUPBC 2015) as a guiding document for the new municipalities to formulate complete building By-Laws as per their geo-physical circumstances and conditions. This standard was approved by Government of Nepal on 30 September 2015 was published in Nepal Gazette on 8th April 2016. The first amendment on this standard was prepared and published in Nepal Gazette on 10 April 2017.
- Building By-Laws may vary in different municipalities according to the local context, geography, topography such as provision of floor area ratio as per the land use zones, right of ways for local roads etc. However, municipalities cannot make weaker By-Laws than BSSDUPBC 2015 of MoUD.
- If any municipality has already applied stronger By-Laws than the BSSDUPBC 2015, the municipality one will prevail.
- Building By-Laws for the Construction in Kathmandu Valley, 2064 was approved by Government of Nepal on 1st May 2007 which was effective from 15 may 2007. This By-Laws was amended by the Government of Nepal on 16th November 2008 and 28 June 2010.

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- The basic criteria of building By-Laws are Right of ways (ROW), front Setbacks, side setbacks, setbacks from river, lake, pond, forest, high tension electric lines, ground coverage, floor area ratio (FAR), light planes, rules for open spaces and so on. The detail description of the basic criteria of building By-Laws has been provided in Annex-2.
- Deviations from the building By-Laws may lead not only to the rejection of the building permit during application process but also to the rejection of certifications for the construction of superstructure and issuance of building completion certificates if the construction is found to violate the provisions of the building By-Laws.
- Apart from the building By-Laws, provisions of the building code should be followed during construction of buildings.
- Contractors should understand that violation/ignorance of building code is violation/ignorance of the law of the country and negligence in structural safety of buildings.
- Undermining building code means compromising safety of its inhabitants from earthquake disasters which is inevitable in earthquake prone country like Nepal.
- Thus, Contractors should strictly follow Building Construction Working Procedures (BCWP) for getting compliance of both building code and building By-Laws in design/ drawing and in actual construction.



Source: Own

2.3.4. Category of buildings

Building Act, 1998 categorizes design and construction of buildings into four types according to their level of sophistication.

Category A: International state-of-the-art

- Under the first category International State-of-the-Art, if consultants ensure that their designs meet the corresponding international standard, the designs are considered to be in conformity with NBC.

Category B: Professionally engineered structures

- The second level refers to Professionally engineered structures and covers all usual structures such as hospitals, meetings halls, factories, warehouses, multi-storey buildings and residential buildings.

Category C: Buildings of restricted size designed to simple Rules-of-Thumb

- The third category refers to buildings of restricted size designed with simple Rules-of-Thumb, and mostly applies to remote areas where simpler buildings are prominent. The explanatory documents are such that an experienced Sub-Engineer will be able to understand them and present sufficient details at the time of permit application to prove to a skilled appraiser at the Local Authority that the requirements have been met. The requirements are in terms of limits on spans and heights, minimum reinforcing and member sizes, positioning of earthquake-resisting elements and other such rules.

Category D: Remote rural buildings where control is impractical

- The fourth category is guidelines for remote rural buildings. These guidelines address about a dozen typical building styles that have been condensed from an inventory of approximately fifty-five building types surveyed in 1993.
- These structures are normally of earthen construction (e.g. unburned Contractorry, mud-mortar, rubble, dry stone, wattle and daub). Whereas these recommendations are described as guidelines, it is intended to be mandatory for such structures built in areas controlled by a building permit-issuing local authority.

Classification of National Building Code according to their use

Category	Type of Building Code	Purpose
A	**International State-of-Art** **Applicable codes: NBC 000**	**Applicable to large building structures. The structures must comply with existing international state-of-the-art building codes.**  **For Example: Constitutional Assembly Building at Baneshwor, Kathmandu (Source: Internet)**

<table>
<tr><th>Category</th><th>Type of Building Code</th><th>Purpose</th></tr>
<tr><td>B</td><td>Professionally Engineered Buildings
Applicable codes:<table><tr><td>NBC 101</td><td>NBC 107</td><td>NBC 113</td></tr><tr><td>NBC 102</td><td>NBC 108</td><td>NBC 114</td></tr><tr><td>NBC 103</td><td>NBC 109</td><td>NBC 206</td></tr><tr><td>NBC 104</td><td>NBC 110</td><td>NBC 207</td></tr><tr><td>NBC 105</td><td>NBC 111</td><td>NBC 208</td></tr><tr><td>NBC 106</td><td>NBC 112</td><td></td></tr></table></td><td>Buildings designed and constructed under supervision of engineers, buildings with plinth area more than 1,000 sq. ft., buildings having more than 3 stories, buildings with span more than 4.5 m and buildings with irregular shapes.
 
For Example: Multi-Storied Commercial Buildings (Source: Own)</td></tr>
<tr><td>C</td><td>Mandatory Rules of Thumb
Applicable codes: NBC 110, 201, NBC 202, NBC 205</td><td>Buildings of plinth area less than 1,000 sq. ft., less than 3 stories, buildings having span less than 4.5 m and regular buildings designed and constructed by technicians in the areas where professional engineers' service is not available
For Example: Three Storied RCC framed Structured Residential Buildings
(Source: Own)
  </td></tr>
</table>

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<table>
<tr><th>Category</th><th>Type of Building Code</th><th>Purpose</th></tr>
<tr><td>D</td><td>Guidelines of Remote Rural Buildings (Low Strength Contractorry/ Earthen Buildings
Applicable codes: NBC 203, NBC 204</td><td>Buildings constructed by local Contractors in remote areas and not more than 2 stories
 
For Example, Brick or Stone in mud mortar Rural Building with slate/CGI Sheet roofing (Source: Own)</td></tr>
</table>

Classification of Building according to the Occupancy Type described in building By-Laws:

For the purpose of implementation of building By-Laws, buildings are classified into the following categories:

a) **Conference/ Community Hall:** buildings where people gather for the purpose of getting entertainment, recreation, social functions, political programs, physical fitness, etc. such as dance theatre, cinema halls, city centers, museums, exhibition hall, fitness centres, gymnasiums, auditoriums, pray areas, restaurants, bus terminal, airport terminals, railway terminals, discotheque centers, etc.

b) **Commercial Buildings:** buildings used for the display and selling of retail or wholesale goods including their storage, such as shops, malls, departmental stores, etc.

c) **Academic Buildings:** buildings used for the academic teachings to students under the authority of education boards and universities, such as schools, colleges, coaching centers, research centers, hostel facilities of the educational institutions, etc.

d) **Industrial Buildings:** buildings used for the processing, assembly and manufacture of various goods, generation of electricity, etc. such as assembly plants, refineries, dairies, factories, power plants, etc.

e) **Institutional Buildings:** buildings used for the management, care and treatment of people such as hospital buildings, jail buildings, center for taking care of senior citizens, facilities housing single women, children or differently-abled persons, etc.

f) **Business Buildings:** buildings used for business activities such as business firm offices, auditing offices, professional firms, banks, etc.

g) **Warehouse:** buildings where storage of various goods and materials is done, such as goddamn house, store house, warehouse, garage, hanger, cold store building, etc.

h) **Residential Buildings:** buildings used for common residential purpose including facilities for cooking, living and sleeping, such as common residences, apartment buildings, group housing buildings, etc.

i) **Mixed Use Buildings:** buildings used for more than one use, such as those buildings in which lower stories are used for commercial purposes and upper ones are used for residential purposes.

2.4. Steps of Building Permit Process

The steps of Building Permit Process in municipalities as per new BCWP are as follows:

Step 1: Selection of Designer, Supervision Consultant and Contractor & Contractors from the list published in the municipality's website

Step 2:Preparation and submission an Application Documents, Designs and Drawings at Registration Desk

- Preparation of designs, drawings & details through the registered designers in the municipality
- Checking and verification of the application form, designs and drawings by the building owner
- Signatories of the building owner or his/her authorized representative and the designer in application form and design/drawings along with the names, addresses and contact numbers
- Submission of Building application to registration desk of the Municipality

Step 3: Approval of Submitted Designs, Drawings & Details

- Completeness check of design drawings and required documents by registration desk
- Checking of design drawings as per prevailing building By-Laws by Building By-Laws Section/Unit of Municipality
- Checking of design drawings as per building code by Building Code Section/Unit of Municipality
- Suggestion to building owner/designer for corrections of design drawings, if any
- Endorsement building application for Registration

Step 4: Field Verification and Public Inquiry:

- Sending the submitted application form with designs & drawing from the Registration Desk to the ward office
- 15 days' notice to neighbours for registering complaints, if any

- Complaint Processing by technical/legal section of municipality, if any
- On-Site verification and Public Inquiry by Ward Office
- Field Report Submission by Ward Office Technician and Admin staff
- File Submission to Technical Desk/Section by the Ward Office

Step 5: Payment of Building Permit Fee

- Recommendation by technical desk/section for payment of building permit fee to the Revenue Desk
- Payment of Building Permit Fee by Building Owner
- Final verification of design drawings and copies of required documents with original one by the Technical Desk/Section

Step 6: Attendance to the Orientation Class on NBC &Earthquake Resistant Building Construction by the Building Owner:

- Attend by building owner in the orientation class on National Building Code & Earthquake Resistant Building Construction along with the hired Contractors/contractors
- Forward the name list of the building owners who have attended orientation classes to the Technical Desk/Section

Step 7: Temporary Building Permit for the Construction up to Plinth Level1

- Design final check & recommendation for issuing Temporary Building Permit to Chief Administration Officer (CAO) by technical desk/Section
- Verification building application and approval by CAO
- Issuance of temporary building permit along with a set of approved drawings by Technical Desk/Section

Step 8: Selection of supervision consultant and contractor/Contractors from the list published in the municipalities' website

- The building owner will hire registered supervision consultant from the roster published in the municipal website for technical supervision of building construction
- Likewise, the building owner will hire registered contractor or Contractors from roster published in the municipal website for carrying out the construction work

Step 9: Construction up to the Plinth level

- Commencement of the Building Construction Works
- Layout and preparation of foundation works
- Supervision report about the preparation of foundation works by the Supervision Consultant

Step 9(a): First Interim Site Inspection by municipality

- Construction up to foundation and column re-bars

- Application for first interim site inspection with Supervision Report by the Registered Supervision Consultant
- The first interim site inspection is carried out by the municipal technician for the construction arrangement of foundation before casting.
- Verify that the actual layout of the foundations and columns along with their rebar arrangements has been done as per the approved designs & drawings.
- In the case of Contractorry structures, layout of Contractorry foundations and walls shall be checked.

Step 9(b): First Interim Inspection Certification

- If the construction below plinth level is confirmed with approved designs and drawings, then first Inspection Certificate is issued
- Notice to proceed will be issued to Building Owner for construction works up to plinth level

Step 9(c): Second Interim Inspection

- Construction up to plinth level casting
- Application for second interim site inspection with Supervision Report by the Registered Supervision Consultant
- The second interim site inspection is carried out to verify the actual construction up to the plinth level including the plinth beam as per the approved designs & drawings after casting.

Step 9(d): Second Interim Inspection Certification:

- The municipal technician shall recommend for the issuance of second Inspection Certificate along with recommendation for the issuance of Permanent Building Permit if the actual construction has been done up to the plinth level as per the approved design drawings.

Step 9(e): Permanent Building Permit for Construction of Superstructure

- Chief Administrative Officer (CAO) issues the Permanent Building Permit for the construction of superstructure of the building upon receiving the recommendation from the Technical Desk

Step 10: Construction of Superstructure of the Building

- Commencement of the Superstructure Construction
- Supervision Report by Registered Supervision Consultant

Step 10(a): Third Interim Inspection by Municipality

- Construction up to first floor beam and slab re-bars.
- Application for third interim site inspection with Supervision Report by the Registered Supervision Consultant

- The 3rd interim site inspection is carried out at first floor level to verify that the actual construction has been done as per the approved designs and drawings before casting.
- The Technical Section issues the 3rd Inspection Certificate
- Interim inspections for upper storeys may be carried out by the municipality to verify that the construction is being undertaken in full compliance with the approved designs & drawings.

Step 10(b): Third Interim Inspection Certification:

- The municipal technician shall recommend for the issuance of Third Interim Inspection Certificate if the actual construction has been done up to the first-floor level as per the approved design drawings.

Step 11: Building Completion Certificate

Step 11(a): Final Inspection for Completion Certificate by Municipality

- Completion of Construction
- Application for Building Completion Certificate with Supervision Report by the Registered Supervision Consultant
- Municipal technician carries out final inspection of the building, review technical supervision report and verify that the actual construction has been done as per the approved designs and drawings and maintenance of public infrastructure road, drain etc. have been completed.
- Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon recommendation from technical section

Step 11(b): Issuance of building construction completion Certification:

- If the inspection report indicates that the building has been completed as indicated in the Supervision Report and the building has been painted at least one coat on the inside and outside surfaces and maintenance of public infrastructure road, drain etc have been completed, then the building construction completion certificate shall be issued to the Building Owner by the Municipality.
- Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon receiving recommendation from technical desk/section

2.5. Critical Points of BCWP for Contractors

Contractors should consider following critical points of BCWP for facilitating building owner for compliancy of building By-Laws/ building code in the constructions:

- Contractors need to be registered in the concerned municipality to work for building constructions on behalf of the owner
- The technical supervision is mandatory for all buildings and building owners need to hire supervision consultant for carrying the supervision works
- Contractors need to carry construction works under direct monitoring of supervision consultant

- Contractor should assist supervision consultant to provide photographic evidences and record of construction detailing and quality works
- Tested and certified construction materials should be used for maintaining quality of building constructions
- Compressive strength test of concrete is compulsory for every story to assure the quality of reinforced cement concrete works
- Municipality will carry out three interim inspections and one final inspection of building constructions for assurance of compliancy of building By-Laws and building code
- Interim inspection certificates are required for getting permanent building permit and final completion certificates from the municipality
- Contractors need to fulfill the instructions provided by the municipal technicians during interim inspections regarding quality construction and detailing works
- Contractors need to address of site safety along with cleanliness and management of construction materials in site

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Section 3. General Role and Responsibility of Contractors in Building Permit Process

3.1. Legal Position of Contractors

1) Responsibility as per BCWP

The Contractors who are registered in the municipalities and are working on behalf of building owner will be legally bound to follow the provisions of BCWP, endorsed by the municipality. The legal responsibilities for contractors for making building compliances in construction are as follows: (Please put the Clause no. of BCWP on Each description)

- The Contractor shall, with due care and diligence, execute and complete the works and remedy any defect therein in accordance with the approved designs and drawings.
- Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and method of construction.
- The Contractor shall give prompt notice to the Supervision Consultants, with a copy to the building owner, of any error, omission, fault or other defect in the design, which he discovers.
- The contractor shall provide the essential quality record of the works to the Supervision Consultant to prove that the building is constructed according to approved drawings

2) Responsibility as per Labor Act

The contractor as an employer should carry the construction works considering the occupational safety and health of labors as per the Labor Act 2017.

Clause 69: Duties of employer towards Labour:

The duties of the contractor as employer towards the Labour in respect of occupational safety and health shall be as follows:

a) To make safe environment for work by making appropriate safety and health arrangements at the workplace.
b) To make provision for the use, operation, storing and transportation of chemical, physical or biological materials or equipment so that it would not adversely affect the safety and health.
c) To provide necessary information, notice and training relating to the safety and health to the labour, as required.
d) To provide necessary training and information in an appropriate language to the labour in relation to the use and operation of the equipment or chemical, physical or biological materials related to the work.
e) To make proper arrangement for the safe entry and exit from the workplace.
f) To provide personal safety means to the labour as required.

Clause 70. Duties of employer towards non-labour:

a) The contractor as an employer shall make such provision as may be necessary to avoid any adverse effect on the safety and health of any non-labour who walks in and out of, or passes through, the workplace.
b) Where any operating system of the workplace is likely to cause any harmful effect or risk on the safety or health of any person, the contractor as an employer shall make arrangement for giving, putting a signal or providing information in that respect.

3.2. Classification and Registration

- Formal contractors are classified as class A, B, C and D, based on the financial capacity, work experiences, human resources and equipment who are registered with the Department of Industry.
- Formal contractors generally work for Constructions Projects implemented by Government or Government registered Institutions and Companies.
- Informal contractors, who are not formally registered in the Ministry of Industry are mostly involved in construction business as sub-contractors. They are also involved in informal sector of construction works such as private and public buildings.
- Such informal contract may be classified as labour contractor and contractor with material and labour.
- The contractors need to be registered in the municipality for involving in building constructions on behalf the building owner and as per BCWP there will be no class differences among the registered contractors.
- The building owner should hire only municipal registered contractors for constructing building.
- However, the building designers and supervision consultants are classified as Class A for qualified engineers or architects and class B for qualified Sub-Engineers or diploma engineers/architects.
- Qualified Engineers, Architects, Sub-Engineers and diploma engineers/architects need to be formerly registered in the concerned municipalities for working as building designer or supervision consultant on behalf of building owner.
- Building owners need to hire registered class A designer or supervision consultant for design/construction of category A and B buildings
- Likewise, building owners need to hire registered class B designer or supervision consultant for design/construction of category C and D buildings

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The table of classification of contractors, designers and supervision consultants are elaborated in following tables.

Classification of Contractors registered with the Department of Industries as per Construction Business Rules, 1999

Class of Contractors	Financial Capacity	Work Experiences	Human Resources	Machine and Equipment
Class A	Minimum 10 million running capital	Four different public construction works valued at a minimum of Ten million Five thousand rupees	Civil Engineer-2 Sub-Engineer-4	Thodolite-2 nos. Level-4 nos. Dump truck or truck-2 nos. Water Pump-3 nos. Concrete Mixers-3 Vibrators-5 Lab equipment-1 set ……
Class B	Minimum 5 million running capital	Four different public construction works valued at a minimum of Ten million Five thousand rupees	Civil Engineer-1 Sub-Engineer-2	Thodolite-1 no. Level-2 nos. Dump truck or truck-2 no. Water Pump-2 nos. Concrete Mixers-2 nos. Vibrators-4 nos. Lab equipment-1 set
Class C	Minimum 1 million running capital	Four different public construction works valued at a minimum of One million rupees each	Civil Engineer-1 Sub-Engineer-2	Level-2 nos. Water Pump-2 nos. Concrete Mixer-1 no. Vibrators-3 nos. ……
Class D	Minimum 0.5 million running capital	—	Sub-Engineer-1	Level-1 no. Water Pump-1 no. Vibrators-1 no.

Classification of Registered Designers and Supervision Consultants for Municipality

Class of Designers and Supervision Consultants	Minimum Qualifications	Category of Buildings as per NNBC for providing consulting services for Preparation of Design/Drawing and Technical Supervision)			
		A	B	C	D
Class A	Bachelor in Civil or Architecture (Civil Engineer or Architect)	○	○	○	○
➢ Class B	Diploma (Proficiency Certificate) in Civil	×	×	○	○

	or Architecture (Sub-Engineer)				

3.3. Responsibility of Contractor at different stages of building permit process

3.3.1. General Responsibility of Contractor for Building Application Stage

1) Registration of contractors in municipality for construction of buildings

- As per BCWP, municipalities will make mandatory provision of registering contractors with free- of- cost to get permission to construct buildings in the vicinity of municipality.
- The building owner needs to hire only registered contractors to carry building constructions.
- The contractors should have enough knowledge and experiences on building code and structural detailing works.
- The contractors should have basic idea about the building By-Laws of the municipalities.
- The contractors themselves should be well aware of building code and earthquake resistant construction of building and should have team of trained Contractors, plumbers and electricians to become eligible for registering in the municipality.
- The contractors should carry building construction works in close inspection and monitoring of the supervision consultant.
- The contractors should motivate and facilitate building owner for carrying quality constructions with complete compliancy of building By-Laws and building code. Sample form of registration of contractor in the municipality is attached in Annex 3.

2) Contract with Building Owner

- In case of formal contract with Government's registered contractor for Government buildings or large-scale corporate offices or business complexes, there must be contract document with detail specification of works for carrying out the construction works. The contractor shall mobilize the resources to commence the work as per the formal contract.
- In case of the small-scale private building's projects carried by informal contractor, it is recommended to have formal agreement between Building owner and Contractor in the witness of municipality technical section or ward office before commencing building construction works
- The agreement paper should include minimum clauses, term and conditions including brief specification of works to carry out the building constructions.
- The contractor should confirm working with the building owner and should sign the agreement paper with negotiated quotation/rates for the civil and finishing works.

- The contractor also should sign commitment paper for complying the building construction with building By-Laws, building code and other rules, regulations circulated by municipality.
- The sample contract paper between building owner and the contractor for construction of Earthquake Resistant Construction of Buildings is attached as Annex 4.
- Sample Commitment letter for Contractor for compliance of building Code and Building By-Laws in Construction is attached as Annex 5.

3.3.2. General Responsibility of Contractors for building Construction stage

1) Confirmation of Building permit:

The Contractors shall check and confirm the temporary building permission issued by the municipality before the commencing the construction works. Without such permission, the contractor shall not commence the building works.

2) Confirmation of Design documents

The Contractor shall check and confirm the design documents approved by the Municipality. The Contractor also should go through the technical details and specification of the works. In case any defects or unclear indication is found, the Contractor shall notice to the Building Owner and Supervision Consultants.

3) Confirmation of Compliance under the Design documents regarding by-laws

- **Building position and its layout**

The Contractors shall check and confirm that position and layout of the proposed building meet criteria of prevailing building bylaws of the municipality. The Contractors shall consult with municipal technicians or supervision consultant regarding the criteria to be followed for layout and positioning of the building foundations, columns and wall. The Contractors shall ensure that the Right of Way (ROW) /Set back rules of access roads are strictly followed and any permanent structures such as ramps, steps and boundary walls will not fall within the ROW/Set Back line. The Contractors also shall check that room projections and balconies are also within the setback area.

- **Building size and height**

The Contractors shall check and confirm that the building size and the height defined in the approved design/drawing, meet the criteria of building bylaws of the municipality. If there is any confusion regarding limitations of the size and height defined by the municipality, the Contractor shall consult with municipal technician or the supervision consultant for clarification. Generally, limitations of size and height of the buildings depends on land use plan and zones defined by the municipality. The Contractors should go through the building bylaws of the municipality before construction of buildings to get basic concept of the criteria to be followed.

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4) Confirmation of Compliance under the Design Document regarding NNBC

- **Quality of the construction material**

The Contractors shall obtain the approval from the supervision consultants in advance for using the construction materials such as cement, sand, aggregates, re-bars, bricks, stone, timber etc. The Contractors shall cooperate to show sufficient ground that the proposed construction materials are of good quality and will produce sufficient strength required for building. The Contractors shall assume that tests shall be required on all materials to be used in the works and on all finished works or part of works. For that the Contractors shall cooperate to carry visual observations, manual and lab testing if necessary. The Contractors shall coordinate with Supervision Consultant to ensure that all the materials as per the specifications attached with the contract paper and meet the criteria of Nepal Standard.

- **Construction methodology**

The Contractors shall consult with the supervision consultant and get consent regarding the construction methodology to be followed for major items of the works. The building constructions should be carried out using latest equipment, machines and technology available in the market to get the best quality of the works. The Contractors shall ensure that the construction methodologies to be applied are in line with specification of works.

- **Quality of Workmanship of construction**

All materials incorporated and all workmanship performed shall be strictly in conformity with the requirements of the specifications and the Contractors shall be responsible for the quality of the works in the entire construction within the contract. The Contractors shall cooperate with Building Owner to provide, use and maintain on the site, throughout the period of execution of the contract, laboratory equipment for carrying out on-site tests required for the selection and control of the quality of materials

5) In case of defects

The Contractors shall follow the instructions of the supervision consultant during execution of the construction works. Each finished works should be perfect in line and level without any defect. The finished works should be also satisfactory to the building owner and supervision consultant. The Contractors shall rectify the defect according to the instruction form the Supervision Consultant during the field monitoring.

6) Record and report to the Supervision Consultant for Four Level Interim Inspection

The Contractors shall cooperate to record and report his works with certain evidences utilizing the photos according to the instruction from the supervision consultant. The photographic records should reflect the progress of the works to be included in the technical reports that will be submitted with application for the four level of interim inspections. The Contractors shall cooperate supervision consultant to record photographs of major items of the works and critical details to ensure that the structural works are carried in complete compliance of design drawing and building code.

7) Attendance of Interim Inspection by the Municipality

The Contractors shall be present during the interim inspections carried by the municipal technicians. The Contractors shall cooperate to record the instructions (both verbal and written) provided by the municipal technician. The Contractors will be liable to carry correction measures recommended by the municipal technician during interim inspections.

8) Confirmation of Building permit from Municipality

The Contractors shall confirm the permanent building permission issued by the municipality before the construction of superstructure. Without such permission, the Contractors shall not commence the building works. The Contractors will be responsible for encouraging building owner to follow earthquake resistant technologies and detailing as per approved municipal structural design/drawings during construction works. The Contractors should coordinate with supervision consultant to follow provisions of building code for building construction works. The Tips for Earthquake Resistant Construction of Buildings is attached as Annex 2.

3.3.3. General Responsibility of Contractors for building Completion stage

1) Conduct final check for completion

Contractors shall notice to owner on completion of construction works as per design drawing and specifications. Receiving the work completion notice from Contractors, Building Owner, Supervision Consultant and the Contractors shall verify jointly the building construction works. The Contractors need to rectify the defects any item of works in his own cost and finalize other additional works as per the punch lists.

2) Record and report the works to the Supervision Consultant for final inspection

The Contractors shall cooperate with Supervision Consultant to keep record of all completed items and elements of buildings, photographic evidences of major items, compressive test reports of concrete, field test and manufacturer test reports of approved construction materials and finishing items. These records and reports are required for the final inspection of the building. Based on these records, reports the supervision consultant confirms the compliancy of building with building bylaws/building code and prepare final completion report for municipality.

3) Attendance of Final Inspection by the Municipality

The Contractors shall be present during the final inspection carried out by the municipal technicians. The Contractors shall cooperate with building owner to repair or maintain any public infrastructures such as road, footpath, water supply line, sewer line, storm water, drainage or side drains of the road if these are damaged during construction. The Contractors should cooperate with building owner to remove and clean off the left-over construction materials and debris from the building premises. The Contractors shall cooperate to record the instructions (both verbal and written) provided by the municipal technician. The

Contractors will be liable to carry correction measures recommended by the municipal technician during final inspection

4) Confirmation of Completion Certificate from the Municipality

The Contractors shall also confirm with the building owner about the issuance of completion certificate by the municipality after final inspection of completed building by the municipal technician. After receiving the completion certificate from the municipality, the building owner may provide work completion letter to the Contractors.

3.4. Punishments to defaulters

The contractor should perform the construction works to the best of his/her knowledge to support building owner to construct the building as per municipal the requirements in complete compliance of building By-Law and building code. Any intentional discrepancies and unethical activities during the work performances shall be penalized by the building owner (client) as per the contract/agreement paper and by the municipality as per the municipality rules/ regulations and Government's law.

1) Warning Letter at the First Occurrence of Unethical Activity:

At the first instance of notice of occurrence of unethical activity by the Contractors such as field constructions not complying with approved building design and drawing or if the Contractors work is not satisfactory or some serious discrepancies were made in construction, municipality shall issue a written warning letter to the Contractors notifying not to repeat such activity and that at the second occurrence, the Contractor shall be debarred from the work.

2) Debarring the Contractor from work at the Second Occurrence of Unethical Activity:

When the Contractors is found to have done unethical activity for the second time even after the issue of warning letter at the first occurrence, municipality shall black-list the Contractors temporarily for a period of six months debarring the Contractors from working within the municipality.

3) Black-listing at the Third Occurrence of Unethical Activity:

Municipality shall black list the Contractors completely and debarred him/her from working in the municipality as a registered Contractors if such activity is found to have repeated for the third time. Names and addresses of such Contractors who have been debarred shall be published on the website of the municipality. At the same time, municipality shall cancel the registration of the Contractors and remove his/her name from the municipal roster.

4) Recommendation to Public Procurement and Monitoring Office (PPMO) for Black-listing the contractor for Unethical Activity:

For Government Registered (formal) contractors (class 'A', class 'B', class 'C' and class 'D'), if contractor's performance is unsatisfactory or work progress is very slow or the

contractor could not complete work within agreed time period or extended time period or if there are issues of unethical activities in construction works, issuing warning letters, breach of contract, termination of contract and recommendation for black listing to Public Procurement and Monitoring Office (PPMO) by the building owner (Client) will be done as per prevailing government's laws and as per the contact document

Section 4. Technical details of the task for Contractors General

4.1. Why buildings fail during earthquake

Buildings are generally failed during earthquake due to lack of strength and ductility, that is introduced by following causes:

- Design deficiency i.e. failure to understand failure mechanism, deficient code provisions and calculation
- Construction deficiency i.e. lacks of quality assurance: material, construction details

1) Failure of Reinforced Cement Concrete (RCC) framed Buildings during earthquake

Reinforced Cement Concrete (RCC) framed building are failed due to following reasons:

- Inadequate size of foundations, columns Beams
- Deficiency in Detailing (Beam/Column joints, Lapping, spacing of lateral ties/stirrups, sill/lintel bands for infill walls
- Soft story
- Short columns

- Deficiency in quality of concrete works

Undefined Load path **Both the pictures show the damages caused by an earthquake at the junction of column and beam.** **In first building, the beam is resting on the next beam and there is no column at the joint. This causes heavy torsion on that section.** **In the second building, a portion of the joint is shown where a beam is joined with a next beam and which again joins with the third beam and at both the joint there is no column at each joint.**	  **Source: Training Manual for Urban Contractors, DUDBC**
Soft Storey Effect in RC Frame **Soft storey effect happens when any storey is weaker/less stiff than other stories.** **Examples could be open bottom storey such as shops, parking space and more compact upper stories (constructed** **for residential or office space).** **More walls in upper storeys make it stiffer than lower storey.**	  **Source: Training Manual for Urban Contractors, DUDBC**

Eccentric Beam Column Joint **The first picture of this slide shows eccentric beam column joint.** **In the second picture, damage was** **due to eccentric beam column joint.**	  **Source: Training Manual for Urban Contractors, DUDBC**
Pancake Damage **This picture shows pancake damage of a RC framed hotel building.** **This building collapsed in Kathmandu at Dallu, during earthquake of April 2015.** **It shows RC framed construction are not immune to earthquake damage unless designed and constructed properly.**	 **Source: Training Manual for Urban Contractors, DUDBC**

Failure due to lack of Lateral ties **These pictures show column failure because of lack of stirrups.** **Because of very little stirrups, the column bursts** **The third picture in shows too much cover on one side where as almost no cover on other side.** **Though there are a lot of steel bars in both the columns, the column failed because of lack of stirrups.** **It shows that vertical bars are not only enough for strength of column. Furthermore, in third picture, all the bars are lapped in one location and at the bottom of the column.**	   **Source: Training Manual for Urban Contractors, DUDBC**
Failure due to short column effects **Upper part of the column suffered very little structural damage compared to middle part.** **Though the longitudinal bars are same, the difference in quantity of transverse stirrups have made total difference.**	  **Source: Training Manual for Urban Contractors, DUDBC**
Anchorage Failure of Columns **These pictures show column failure because of insufficient anchorage between lower and upper column bars and lack of sufficient stirrups in the anchorage region.** **Because of insufficient lapping length and very few stirrups, the column slipped easily.** **The picture also shows improper position of splicing the vertical bars and all the vertical bars are lapped at the same location.**	  **Source: Training Manual for Urban Contractors, DUDBC**

Failure of Staircase **Staircase is a sensitive element of a building.** **Specially for buildings with more than one storey, it is a staircase from where people escape and if staircase collapses then there may be a serious problem.** **So, staircase should also be given due attention while constructing a building.**	 **Source: Training Manual for Urban Contractors, DUDBC**

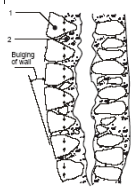
2) Failure of Load Bearing Masonry Buildings during earthquake

Load bearing Masonry Buildings are failed due to following reasons:

- Inadequate integrity Between walls, between floor/ roof components, between floor/ roof and walls
- Inadequate out-of-plane flexural capacity
- Inadequate in-plane strength of diaphragm
- Deficient configuration: unbalanced stiffness
- Large openings
- Weak mortar
- Poor workmanship

Diagonal Cracks from corner door/window opening **This photograph shows a Masonry building in which cracks are initiated from the corner of the window during the earthquake.** **A Masonry wall subjected to in-plane shaking may get sliding, rocking or diagonal tension cracking depending upon many factors.**	 **Source: Training Manual for Urban Masons, DUDBC**

Failure of Gable Wall **The problem with duo-pitched (two slopes) sloped roof buildings is failure of gable walls.** **Gable wall in a building is at the highest level and the displacement of wall at the top is more than that at the bottom.** **Usually, these gable walls are untied at the top.** **Also, the height becomes more in gable walls so this wall can fall more easily.**	 **Source: Training Manual for Urban Mason, DUDBC**
Failure of wall at one direction **The flexural strength of Contractorry wall is very less. Therefore, during earthquake shaking, Contractorry wall may be damaged due to out of plane toppling.** **This picture shows a Contractorry building suffered by out of plane collapse during earthquake.**	 **Source: Training Manual for Urban Masons, DUDBC**
Failure of long unsupported wall **Long unsupported walls can easily fall down in an earthquake.** **They may fall even in normal condition if not properly constructed.** **In an earthquake lateral force hits the wall horizontally throughout the wall and most at the top of the wall.** **The more the length to thickness or height to thickness ratio of walls the easier to fall down.**	 **Source: Training Manual for Urban Masons, DUDBC**
Failure of Roofing **The roofing failed due to weak connection between floor to roof and also within roof members**	 **Source: Training Manual for Urban Masons, DUDBC**

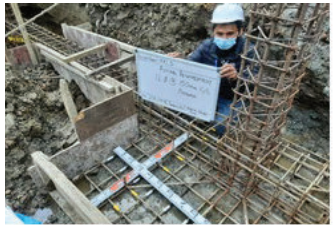
Corner Cracks due to Toothed Joints **The junctions are inherently weak locations and constructing the junction with tooth joint caused maximum damage during the earthquake.**	  **Source: Training Manual for Urban Contractors, DUDBC**
Failure wall due to opening very near to corner **The photograph presents overturning of wall because of lack of support. As the door is placed at the corner the wall does not have any support.**	 **Source: Training Manual for Urban Masons, DUDBC**
Damages at joints **In the picture, the smooth vertical surface shows that there was no connection between inner and outer walls. As a consequence, during earthquake, the outer wall overturned.** **It is also visible window openings are large and are placed closer to the wall junctions which made that part weaker.** **Maximum stresses develop at the corners and joints during earthquake and walls start separating from the joints or corners and finally the building leads to collapse.**	 **Source: Training Manual for Urban Masons**
Delamination of walls **One of two layer of the wall get collapsed due to weak bonding between two layers i.e. lack of through stones**	  **Source:** **Training Manual for Urban Masons, DUDBC**

4.2. Critical Control Points under BCWP:

To avoid the building damages and failure described in aforementioned Clause 3.1, BCWP aims the at fundamental quality of structural works especially of rebar arrangement and concrete strength. To control such quality, following three inspections and testing methods are highlighted under BCWP:

4.2.1. Inspection of the rebar arrangement before the casting at Interim Inspections by the Municipality

The Contractors shall demonstrate the rebar arrangement to the Municipal Engineer for Interim Inspections. In case that the Contractors is not able to demonstrate all the rebar arrangement in one-time, alternative evidences such as photo report can be acceptable. The Contractors shall consult with Supervision Consultant in advance if necessary.




Rebars layout for Foundation and Strap Beam (Source: JICA Project for promotion of NNBC)

4.2.2. Compressive strength test of concrete for every story

In case of RC structure which shall conform to NBC 110, 105, 201, 205, the Contractors shall provide the Supervision Consultant required number of testing cube sampled at every casting depending on its concrete volume. In case the strength is not confirmed, the Contractors may be instructed to demolish the casted structure. Therefore, the Contractors is strongly recommended to ensure the strength of the concrete in advance of casting on site in order to avoid the incompliance of required concrete strength.




Photos of sampling and comp. test (Source: JICA Project for promotion of NNBC)

4.2.3. Record and report the work

To ensure the quality of the building, physical inspection by the Supervision Consultant is the best way. However, in case the supervision consultant is not available fulltime on site, alternative evidence such as photo report will be acceptable on the condition that the photos can clearly demonstrate the details of the works. Followings are the example of photo report to the Supervision Consultants.





Re-bars Layout for columns, beams, and slabs (Source: JICA Project for promotion of NNBC



Photo of Concrete Mixing

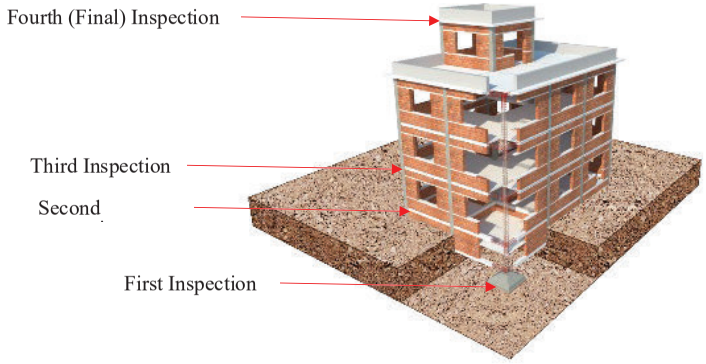


Photo of Test Sampling for Compressive strength test

4.3. Details of Four Level Interim Inspections:

4.3.1. Description about for Four Level of Inspections by Municipality

As per BCWP, municipality technicians will inspect the building construction at four stages namely at foundation before casting of footing, at plinth level after casting of plinth tie beams, at first floor level before casting of floor slab and finally at complete finishing of the building. The contractor has to make preparation of sites as instructed by the supervision consultant.



Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

- For first site inspection, the contractor has to prepare all foundations with laying of re-bar mesh, erection of vertical bars of column and reinforcement of footing ties for the case RCC framed structure buildings. In case of Load Bearing Wall Structure Buildings, the strip footing with foundation need to make ready with vertical bars at all corners and junctions.




Source: Own

- For 2nd inspection the contractor has to complete RCC work of plinth tie beam for RCC framed structured building and in case of Load Bearing Wall Building plinth band has to be completed. The main bars, vertical stirrups, beam column joint detailing, lap positions for tie beam and other details should be as per design drawing and compliant with building code.




Source: Own





Photo of Concrete Mixing

Photo of concrete casting for substructure

Photo of Substructure before back filling

Required evidence in Supervision Report

- For the third interim inspection, the contractor has to complete all rebar works for beam and slab at first floor with necessary centering and shuttering. The main bars, shear reinforcements, beam column joint detailing, beam rebar lap positions and other detailing should be as per design drawing compliant with building code.




Source: Own



Photo of rebar arrangement of 1st floor Column



Photo of casting of the Columns

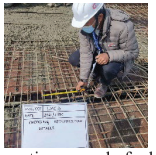
Required evidence in Supervision Report

- For the final inspection, the contractor has to complete all structural and finishing works of the building including door/windows fitting, cement plaster and at least one coat of painting. The whole building should be compliant with building By-Laws and building code.





Source: Own



Inspection record of rebar



Sampling of Test cubes



Test record

Required evidence in Supervision Report

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4.3.2. Main Check point of Inspections by Municipality

- The contractor should facilitate supervision consultant and building owner for collecting all necessary documents including quality testing reports and photographic evidences of structural detailing works.

S. No.	Inspection	Timing	Main Check Points but not limited to
1	1st Interim Inspection	Before casting of Foundation	• Setting out of column and Building size • Excavation depth and bearing soil condition • Piling works record (if any) • Rebar arrangement of foundation and Column • Technical report by Supervision Consultant
2	2nd Interim Inspection	After concreting of plinth beam	• Setting out of column and Building size • Back filled soil condition • Rebar arrangement of Column • Technical report by Supervision Consultant
3	3rd Interim Inspection	Before the casting of first floor beam & slab	• Rebar arrangement of beam and slab • Technical report by Supervision Consultant
4	Final Inspection	After completion of building	• Final figure of the building (Building Height) • Technical report by Supervision Consultant

4.4. Fundamental Quality Assurance under BCWP (RCC Structure)

Construction Works under BCWP shall include, but not limited to following sequence:

S,No.	Description of Work	Recommendations
1	Preparation for building Supervision	
1.1	Confirmation of designs drawings and temporary permit by municipality	Document Check
1.2	Contract with Building Owner	Document Check
2	Site Clearance Work/Ground Work	
2.1	Setting Work	Visual check and measurement
2.2	Excavation Work	Visual check, measurement and soil sampling
2.3	Bearing Soil (or Piling works)	Visual Check and soil sampling
2.4	Soil Treatment	Visual Check and soil sampling
2.5	Back-filling	Visual Check
3	Materials	
3.1	Rebar	Document Check, measurement and Visual check
3.2	Concrete	Document Check, Visual check and In-situ test
4	Rebar Arrangement	
4.1	Foundation	Visual check and record keeping

4.2	Column (Every floor)	Visual check and record keeping
4.3	Beam (Every floor)	Visual check and record keeping
4.4	Beam and Column Joint (Every floor)	Visual check and record keeping
4.5	Slab (Every floor)	Visual check and record keeping
4.6	Splicing of bars (Every floor)	Visual check and record keeping
5	Concrete Works	
5.1	Concrete mix proportion	Document Check, Visual check, In-situ test and Test data
5.2	Concrete Casting (Every floor)	Visual check and In-situ test
5.3	Curing (Every floor)	Visual check
5.4	Concrete Strength Test (Every floor)	Document Check, Visual check, In-situ test and Test data
6	Formwork (Every floor)	Visual check
7	Safety Check	Visual check

4.5. Check point of Each Works:

The check points (but not limited to) for contractor on major items of the works are as follows:

4.5.1. Preparation for Building Supervision:

The Contractor shall check the all the required documents in advance of his building contract and notify to the building owner and supervision consultant if there is unclear information, error, wrong indication or discrepancies in the documents. Following are the point to be confirmed before the commencement of construction.

1. Design Document

The contractor shall check the drawings in advance of construction and notify to the Building Owner and supervision consultant if there is unclear information, error, wrong indication or discrepancies in the drawings. Followings are the points to be confirmed before the commencement of the construction.

1) Structural System of Building
2) List of the drawings
3) Architectural drawings / working drawings as per Building By-Laws
4) Structural design and details as per NBC

2. Building Contract

The contractor shall check and agree on the contract condition with the Building Owner in advance of the construction works and notify to the Building Owner if there is unclear information, error, wrong indication or discrepancies in the contract. Followings are the points to be confirmed before the commencement of the construction.

1) List of the contract document:
2) Construction period
3) Negotiated Rates for each item
4) Total Negotiated Contract Amount
5) Specification of materials and works
6) Insurance of Labours, Equipment and Third-Party Insurance
7) Material supply (Building owner shall be responsible to comply with NS standards in case Building Owner supplies the materials)
8) Measures for surrounding site conditions

4.5.2. Site Clearance/Groundwork:

The Contractor shall check the site clearance and preparation work performed from the initial phase of the commencement of work at field and confirm if the works are in accordance with the approved designs and drawings and consequently notify building owner if there is any discrepancy. Following are the points to be confirmed before the commencement of construction

1. Setting out

The contractor shall check the setting out of the building in advance of commencement of the works and notify to the Building Owner and supervision consultant if there is unclear information, error, wrong indication or discrepancies in the contract. Followings are the points to be confirmed before the commencement of the construction.

1) Orientation of the building
2) Right of Way (ROW) of access road and side roads if any
3) Minimum Setback form the main road and side road if any
4) Side Setbacks/open space from neighboring property lines
5) Centre to Centre Dimension of the Gridlines in X and Y directions
6) Diagonal cross checking to assure right angles of grid lines in X and Y directions
7) Working Bench Marks tied with reference stations for building levels
8) The existing profile and cross-sections

2. Excavation works

Check Points

1) Layout of foundation for soil excavation works
2) Size of foundation
3) Depth of foundations
4) Method of excavations (Manual or by machine)
5) Compaction of foundation beds

3. Bearing soil (or Piling works)

Check Points

1) Confirmation of bearing of footing soil
2) Geo-technical investigation of the site
3) Determine type of foundation based on soil test report
4) Assumed bearing capacity if soil test is not done
5) Confirm considered bearing capacity of footing base by the structural designer for foundation design and basis of the assumption.
6) Confirm type of soil (hard, medium, soft soils or weak soils)
7) If soil of site is found suspicious then consult with design engineer)
8) Piling works:
   - Type of piles
   - Layout of piles
   - Methodology for installation of piles
   - Equipment and tools for piling works
   - Pre-construction survey of the nearby properties before commencing the piling works
   - Additional measures to preventing damage to nearby property

4. Soil Treatment for foundation

Check Points

1) Methodology for soil treatment
2) Type of Grouting chemicals for soil stabilization

3) Tools and equipment for soil treatment
4) Technically skilled human resources for carrying soil treatment

5. Back Filling

Check Points

1) Type Materials for back filling
2) Source of materials for back filling
3) Allowable Thickness of backfill layers
4) Compaction method for backfilled materials (Manual, use of Monkey Jumper)

4.5.3. Material Check:

Contractor shall check all the construction materials and tools to be used in construction work and keep essential record to prove that material complies with design, drawing documents and specification document. Following are the points to be confirmed at working site.

1. Rebar material

Check Points

1) Rebar Grades
2) Sizes of Re-bars to be used for RCC works
3) Test certificates from manufacturer
4) Required ductility and elongation
5) Satisfactory result in Tensile and Bend test
6) Re-bars quality (no crack, scale or rust)
7) Rebar storage
8) Re-bars conditions (free from pitting due to corrosion, loose rust, mill scale, paint,oil, grease, adhering earth, ice or other materials)

2) Concrete material

Check Points

1) Type/grade of Cement
2) Type/source of Sand
3) Manual test for silt content in Sand
4) Allowable silt content for sand
5) Type/source of Aggregates
6) Grading of aggregates for structural elements
7) Delivery and storage of cement, sand and aggregates
8) Quality of Water for concrete
9) Type of Admixtures if any

4.5.4. Rebar Arrangement:

Contractor shall check workman ship of all the rebar arrangement during the construction and give prompt notice to the supervision consultant and owner if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

2) Foundation

Check points

1) Depth and size of foundations
2) Dimension and spacing of re-bars for different structural members
3) Structural details for foundation and footing beams
4) Tools and equipment for re-bar cutting and bending
5) Trained bar benders for re-bar works

(1) Column

Check points

1) Size of columns
2) Height of columns
3) Layout of columns

4) Rebar section of columns
5) Size and spacing of lateral ties
6) Concrete cover for the column
7) Method for erections column re-bars

3) Beam

Check points

1) Size of beams
2) Rebar details for beams
3) Size and spacing of vertical stirrups
4) Concrete cover for beams
5) Line and level of beams

4) Beam and Column Joint

Check points

1) Requirement of detailing of joints at middle and end
2) Confining reinforcement for joints
3) Anchorage of beam longitudinal bars in column

5) Slab

Check points

1) Thickness of slabs
2) Finishing level of slabs
3) Concrete cover for slab
4) Provision of chairs
5) Size and spacing of re-bars for slab

6) Splicing of Re-Bars

Check points

1) Maximum number of bars that can be splice in a location.
2) Proper Locations for splicing of main re-bars
3) Spacing of Closed links/stirrups/hoops over the entire length over which the longitudinal bars are spliced.
4) Required lap length for reinforcement bars in tension and compression.
5) Bending of re-bars for lapping

4.5.5. Concrete Works:

Contractor shall check workman ship of concrete works during the construction and give prompt notice to the building owner and supervision consultant if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

1) Concrete Mixing proportion

Check Points

1) Cube boxes for batching sand and aggregates
2) Mechanical Concrete mixers or batching plants for concrete mixing
3) Mix ratio (Nominal or design mix)
4) Water cement ratio
5) Allowable slump of concrete for workability
6) Nominal Temperature for mixing

2) Concrete Casting

Check Points

1) Thickness and size of structural members
2) Reference level for the structural members
3) Finishing line levels of structural members
4) Equipment for compaction of concrete (Needle and plate vibrators)
5) Method of pouring of concrete mix

3) Curing of concrete

Check Points

1) Methodology of curing
2) Duration of curing for different structural member
3) Tools and materials for curing

4) Concrete Strength Test

Check Points

1) Type and quantity of cube molds
2) Compaction tools for concrete cubes
3) Compaction methodology
4) Number of samples for the cube tests for different structural elements
5) Sampling methods
6) Requirement of minimum compressive strength of concrete for 28 days
7) Curing method of concrete cubes
8) Transportation of concrete cubes1

4.5.6. Formwork

Contractor shall check workman ship of formworks during the construction and give prompt notice to the building owner and supervision consultant if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

Check points

1) Type of formwork for different structural members
2) Type of props/supports
3) Removal time of the formworks
4) Line and level of formworks

Safety Check:

Contractor shall be responsible for checking safety for all the workers, supervisor and third party involved in the construction. The contract document shall include all necessary terms for ensuring the safety at site or follow the safety criteria as per NNBC 114. Following are the points to be confirmed at working site.

- Site Barricading *(safety for manpower and construction material)*
- PPE *(hard Helmet, Hand gloves, Face mask, boot/closed shoes)*
- First Aid Kit at site

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Section 5. Technical details for Contractor

5.1. Site Clearance Work/ Setting Out

5.1.1. Confirmation of Building Position (Setting out)

- The building layout is first and crucial step of building construction. Proper marking of the grid lines should be done.
- The center lines of grids at x and y direction should be at accurate right angle. The grid lines should be cross checked for right angle with diagonal dimensioning.
- End points of grid lines should be fixed permanently using wooden pegs/posts enclosed by brick/stone masonry at certain distance from the foundations as the reference points for construction of substructure and superstructures.
- The columns and walls should be in grid at both orthogonal directions.
- During the period of Commencement of works the Contractor shall survey the construction area and confirm the levels. The Contractor shall immediately notify the Supervision Consultant of any discrepancies and shall agree with the Supervision Consultant any amended values to be used during the contract, including replacements for any stations missing from the original stations.
- The Contractor shall check, replace and supplement as necessary the station points and agree any revised or additional station details with the Supervision Consultant.
- All stations and reference points shall be clearly marked and protected to the satisfaction of the Supervision Consultant. The Contractor shall establish working Bench Marks tied with reference stations soon after taking possession of the site. The coordinates and the elevations of the reference stations shall be obtained from the Supervision Consultant. The working Bench Marks shall be near all major/medium structure sites. Regular checking of these Bench Marks shall be made and adjustments, if any, got agreed with the Supervision Consultant and recorded.
- The Contractor shall be responsible for the accurate establishment of the center lines based on the Drawing and data supplied. The centerlines shall be accurately referenced in a manner satisfactory to the Supervision Consultant. A schedule of reference dimensions shall be prepared and supplied by the Contractor to the Supervision Consultant.
- The existing profile and cross-sections shall be taken jointly by the Supervision Consultant and the Contractor. These shall form the basis for the measurements and payments.



Source: Training Manual for Urban Masons, DUDBC

5.2. Groundworks

The contractor shall coordinate with supervision consultant for ensuring that the bearing method specified in the design drawing adequately shows the bearing capacity. In case there is any inadequate situation, the contractor shall inform the supervision consultant and follow the instruction by the supervision consultant.

5.2.1. Excavation works

To lay the foundation below the existing ground level, trenches and pits of adequate dimension should be dug up to required depth. The depth shall be conformed on reference to benchmark. Trenches and pits are excavated to a width greater than that for the foundation and should be sufficient to provide workspace during laying of foundation.

Timbering shuttering and shoring shall be provided in excavated area considering type of excavation soil and boundary condition of site. For hard soils where the sides of trenches can stand themselves, there is no need of lateral support. But in case of loose and soft soil, the sides of pits and trenches should be held in position by adequate lateral support.

Excavated soil should be laid at least 1.5 m apart from excavation line.

5.2.2. Confirmation of bearing method and its capacity

- Confirmation of bearing of footing soil is most important stage of construction. Because defective work at this stage of construction is the most critical and the most difficult to repair.
- Basically, geo-technical investigation confirms the bearing capacity of the site and it determine type of foundation selection.
- However, for the buildings of low budget, geo-technical investigation may not be conducted, and the structure design of foundation may had been done with assumed bearing capacity.
- In the situation, Supervision Consultant should confirm considered bearing capacity of footing base by the structural designer for foundation design and basis of the assumption.

- The information should be available in design report/Structure design of foundation. Considered bearing capacity may be confirmed at the site can be done as follow:
  - Dig at least 2 pits of size 1mx1mx up to 0.5m below footing bottom level and inspect type of soil.
  - Observe ground water level.
  - The observed soil in the pit shall be classified as per the table of NBC 205.
- Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils.
- Type of the soil should verify with soil assumption of design report.
- If soil of site is found suspicious then recommend asking owner to conforming with design engineer.
- A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.
  - Dig a pit of 1mx1mx1m
  - Fill the pit with the same soil with simple compaction.
  - If pit is not filled with the soil, then soil is weak
  - If pit is just filled with the soil, then soil is medium type
  - If soil remains after filling the same pit, then soil is hard.

S.N.	Type of Foundation Material	Soil Classification
1	**Rocks in different state of weathering, boulder bed, gravel, sandy gravel and sand-gravel mixture, dense or loose coarse to medium sand offering high resistance to penetration when excavated by tools, stiff to medium clay which is readily indented with a thumb nail.**	**Hard**
2	**Fine sand and silt (dry lumps easily pulverized by the finger), moist clay and sand-clay mixture which can be indented with strong thumb pressure**	**Medium**
3	**Fine sand, loose and dry; soft clay indented with moderate thumb pressure**	**Soft**
4	**Very soft clay which can be penetrated several centimeters with the thumb, wet clays**	**Weak**

5.2.3. Piling works

Based on method of construction piles may be

a) Driven piles and
b) Bored/Drilled and cast-in-situ piles.

Driven piles are more mechanical and shall be done as per standard specification.

The description of installation of Bored/Drilled and Cast-In-Situ Piles are as follows:

- Before starting of drilling, filling materials i.e., reinforcement cage, dry mixed concrete in mixture in ready condition and vibrators should be in ready position.
- Topsoil needs to be cut-off and levelled off to same plane so that the depth of the drilling remains constant throughout all area.
- Drilling may be mechanical or manual. The works shall be performed under recognized and approved methods, using materials and equipment meeting specifications. Casing pipe shall remove after completion of drilling work.
- Any disturbance that occurred due to the condition of the soil, i.e., hard strata found, shall be reviewed and decided to compliance of design. Provisions to be made for other disturbance such as dewatering, erosions etc. which might occur during drilling of hole.
- The contractor should consult with supervision consultant to conduct a pre-construction survey of the nearby properties before commencing the piling work so that all pre-existing conditions are recorded.
- The owners of neighboring property should be given a copy of the survey report, which can be used as a reference for any future disputes or damage claims by any neighbors.
- The Supervision Consultant shall conduct close monitoring of the work and any unwanted effect should be proceeding with temporary halting of the work.
- In the case, shall review and consider other systems or additional measures to prevent further damage.
- Filling in the bored columns perform simultaneously as the drill works progress. Once the pile installation is completed, the site must be cleared and rendered level ready for the structure layout and the next phase to begin, as well as verification of proper placement of all piles in relation to the structural needs and drawings.

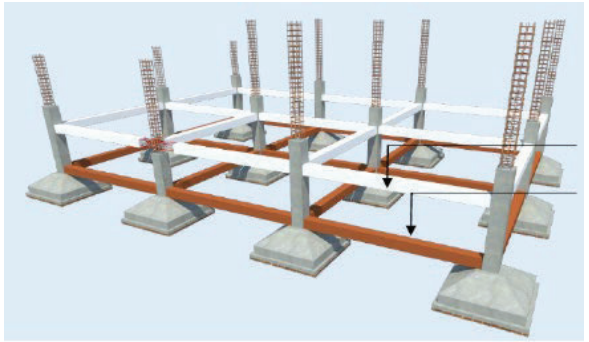
5.2.4. Laying of foundations

- Foundations should not be laid on the loose or fill up ground and should go up to firm ground.
- All foundations should be laid in a level
- If the soil is very weak, it is recommended to provide 300 mm thick gravel packing before laying the foundation.
- Foundation should not be laid on water-logged soil. Water needs to be pumped out and gravel packing can be provided if the soil is swampy.

5.2.5. Improving bearing capacity of Soil

If the foundations are left open for one rainy season it will enable the soil to settle down, and it will also be known whether the natural movements of the soil below due to increment of moisture are likely to cause any damage. Foundations in bad soil can be improved by:

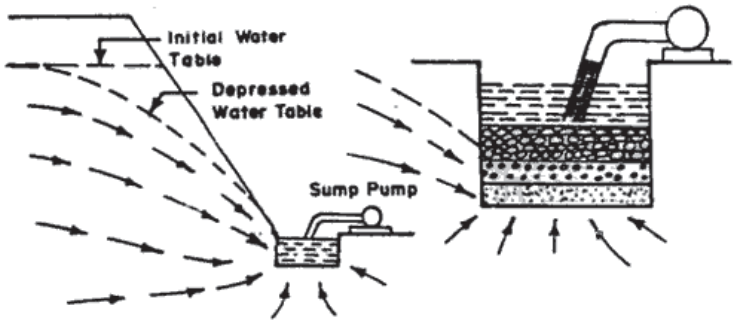
- Increasing the depth of the foundation except when the material grows wetter as the depth increases.
- Compacting the soil by ramming
- Ramming in sand, gravel, moorum, broken stone or brick bats in situ be. tween the foundation concrete and soil. This is useful for silt or black cotton, soils and also clayey soils.
- Removing the poor soil and filling the gap with sand, rubble stone, gravel or other hard material. This increases the bearing power to about twice its original value. This method is especially useful for black cotton soils. Cement grouting in rammed materials will make the foundations much harder.
- Draining out water from wet foundations.
- Driving piles, either of wood or concrete, or driving and withdrawing piles and filling the holes with sand or concrete. This will increase the density of the soil.
- Artificial stabilization can be used to seal off permeable strata for deep excavations or to give soft soils additional strength if they are likely to flow. Cement grouting: water bearing gravel and coarse sand can be made very much permeable by pumping cement grout into them.



Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

5.2.6. Dewatering

Excavation of foundation trenches in ground having high water table, or in waterlogged area pose great problems because of water seeping in the trench from sides. The timbering, if provided, would become loose and collapse. It is desirable to maintain water table at least 0.5 m below the bottom of the excavation to undertake any excavation work under dry condition. The surficial subsoil water can be removed by perimeter trench and sump method or well point system. For complicated problems, may require applying deep well, vacuum or electro-osmosis methods.



Sheet piles need to be provided before starting of excavation as per provided design for deep excavation and excavation below the footing of adjoining structure shall execute.

5.2.7. Observe ground water level.

The observed soil in the pit shall be classified as per the table of NBC 205. Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils. Type of the soil should verify with soil assumption of design report. If soil of site is found suspicious then recommend asking owner to conforming with design engineer.

A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.

- Dig a pit of 1mx1mx1m
- Fill the pit with the same soil with simple compaction.
- If pit is not filled with the soil, then soil is weak
- If pit is just filled with the soil, then soil is medium type
- If soil remains after filling the same pit, then soil is hard.

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5.3. Materials

5.3.1. Rebar

Quality mark awarded re-bars should only be used in construction. Re-bars should be free from oil, rust, coats of paints, grease or other coatings, which may impair or reduce bond.

Physical characteristics of re-bars should be as follows:

S. No.	Property	MS	Fe415	Fe500
1	Ultimate	410	490	560
2	Yield (ϕ 6 - 40 mm)	250	415	500
3	Yield (ϕ> 40mm)	230	415	450
4	Elongation (ϕ< 10mm)	20%	14.5	7.5
5	Elongation (ϕ> 10mm)	23%	14.5	7.5
6	Weight ($\phi \leq$ 8mm)	± 4%		
7	Weight (ϕ> 8mm)	± 2.5%		
8	Diameter (ϕ up to 25mm)	± 0.5%		

Rebars delivered in site should be in bundle with production tag with quality standard mark. Rebar for reinforcement should be stored in such a way as to prevent distortion and corrosion. Care should be taken to protect the reinforcement from exposure to adverse atmosphere during storage, fabrication and use.



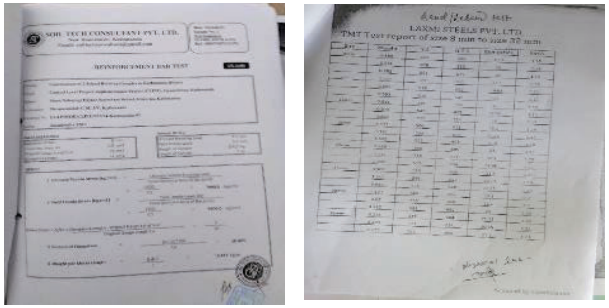


- Reinforcement shall be free from pitting due to corrosion, loose rust, mill scale, paint, oil, grease, adhering earth, ice or other materials that may impair the bond between the concrete and the reinforcement or that may in the opinion of the Engineer cause corrosion of the reinforcement.
- This requires not only purchase of good quality steel reinforcement and proper storage of it, but also sequencing the construction process to minimize the exposure of the reinforcement Strength and ductility of the reinforcement to be used shall confirm to relevant NS standard.
- Bars shall comply with the dimensions described in the drawings and shall not break in single bending.

- The steel used for reinforcement shall be Thermo-mechanically treated (TMT) Bars with 0.2 Per cent Proof stress/ yield stress, Min, N/mm^2.
- The minimum tensile strength shall be 10 Per cent more than the actual 0.2 per cent proof stress/yield stress but not less than 565.0 N/mm^2.
- It shall have no crack, scale or rust. Binding wire used to bind reinforcements shall be annealed galvanized binding wire of 20 gauge.



The contractor shall submit to Supervision Consultant, sample of reinforcement bar brand intended to be used for independent testing of Tensile Strength. And, in case the test result is acceptable, and material is approved by Supervision Consultant. The contractor may procure the approved material provided manufacturer's **test certificate** conforming to the specification for the lot is submitted to the Supervision Consultant who reserve the authority to test each lot in case of suspect quality. U.T.M. tensile strength test should be conducted for reinforcing bars of sizes of8mm Ø, 10mm Ø, 12mm Ø, 16mm Ø, 20mm Ø, and 25mm Ø. It shall have 16.0 elongation, per cent, min. on gauge length 5.65 A, where A is the cross-sectional area of the test piece.



Sample Rebar Test Certificate (Source: Own)

A3-3-34

5.3.2. Concrete

(1) Cement

The cement used should be fine, uniform in color and should not contain any lump. Cement with production date should be supplied to site. Cement within 2 months from production date should be used in construction.

It is advised to use cement with quality standard mark- as NS mark. For project size 1000 Sq.m. and above, an independent test as per NS:049-2041 should be performed. Minimum requirements of test standard provided below:

Required physical characteristics of ordinary Portland cement.			
S.N.	**physical Characteristics**	**OPC grade 43**	**OPC grade 55**
1	**Fineness, m2/kg (By Blaine's Air Permeability method)**	**225**	**225**
2	**Setting Time:** **Minimum initial setting time (minutes)** **Maximum final setting time (minutes)**	**45** **600**	**45** **600**
3	**Soundness by Lechatlelier method, mm, maximum**	**10**	**10**
4	**Compressive strength:** **Minimum average compressive strength of three mortar cubes (n/mm^2)** **3 days** **7 days** **28 days**	**23** **33** **43**	**27** **37** **53**
5	**Normal consistency**	**26 to 33 %**	

53-grade cement should be used only where concrete of higher strength (in general practice M30 and above concrete) required and where proper precautions considerable to reduce higher heat of hydration through a proper curing process.



Source: Own

(2) Sand

Sand particles should be crystal in shape. Sand should not contain organic and decomposable particles. Constraints of clay, silt and foreign materials should not exceed five percent by

volume. Supervision Consultant should check delivered sand from each source at site and approved sample of sand should maintain in display rack with source name.



Source: Own

Simple test can be carried out in field to determine the proportion of foreign particles in the site:

- Fill a jar or cylindrical shape glass up to 60 mm height.
- Fill water 25 mm above the sand.
- Add one spoon salt
- Shake until mixing is uniform and let the glass in still position for three hours.
- Pure sand will sedimented in lower level and foreign materials will sedimented above. Sedimented foreign material should not exceed five percent of sand.



Alternative method of testing sand in-situ condition:

- Take some volume of sand in clean hands.
- Rub both palms

If palms stay clean, accept sand is of good quality.

(3) Aggregate

Flake and elongate aggregate should not be used. It should be angular in shape. Aggregate of variable well graded. Specific gravity of aggregate should be within 2.6 to 2.7. Size of aggregate depends upon thickness of product item. For cement concrete with thickness of 100 mm or more, size should be limited to 20 mm and for the thickness up to 100 mm, grade

from 12 mm aggregate to be used. Hardness, strength, grading of coarse aggregate should conform to the requirements of IS 383-1970 and IS:515-1959.

- Coarse aggregate shall be clean hard and durable crushed rock, crushed gravel or natural gravel
- All aggregates shall not contain any deleterious materials.
- The aggregate should be completely free from lumps of cray or organic and vegetable matter, fine dust etc.
- National occurring stone aggregates and gravel, and brick aggregate are commonly used as coarse aggregates.



Source: Own

(4) Water

Water shall not produce any objectionable stain or unsightly deposit on the surface.

- Water to be used in mixing concrete shall be free from injurious amounts of oils, acids alkalis, organic material or other deleterious substances.
- It should be as clean as drinking water.
- Water shall not produce any objectionable stain or unsightly deposit on the surface. It should be clean, does not smell, no oil, acid, alkali, salt, organic materials that can affect the Re-bars



Source: Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

5.3.3. Bricks

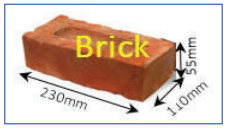
The bricks shall be of a standard rectangular shape, burnt red. The colour of a good brick should be copper red. A yellowish tint and dark blackish blue colour on brick indicates that it is under burnt and over burnt respectively. Crushing strength of bricks for load bearing wall should be 7.5 N/mm2 and for other cases-should not be less than 3.5 N/mm2. Standard brick size is 230x115x57 in mountain area and 250x120x65 in southern part of the country. Dimensional Tolerances of up to 5% shall be acceptable from standard size of the batch. For

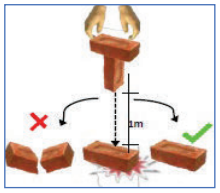
medium and small size construction works, in situ test procedure will be acceptable to check quality of bricks. Water absorption ratio of brick should not be exceed 20 % . Other requirements of brick should be as per NS 1-2035.

- Place two bricks in T shaped and drop it on the hard ground from the height of 1m. A high quality of brick doesn't break. Bad quality brick will break into pieces.
- The brick should be uniform in color and size. It should produce metallic sound while two bricks are hit.
- It should have uniform texture on broken surface.
- The bricks shall be free from cracks, flaws, grit and other impurities such as lime, iron and deleterious salts.
- All bricks shall be well burnt, sound and hard with sharp edges giving a ringing sound when struck with a mallet.
- Bricks shall not absorb water more than one sixth of their weight after one hour of soaking by immersion in water.



Source: Own





Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

5.3.4. Stone

Stone should be tough, hard and strong. If boulder type stone to be used, then at-least 2 adjoining faces (excluding exposable face) should be brake in orthogonal shape.





5.3.5. Scaffolding

- Scaffolding shall consist of timber and necessary battens and planks.
- All scaffolding members before installation shall be checked for their strength and stiffness and tied up properly.
- Steel scaffolding if available is preferred and be used where necessary. It shall be erected on double supports.
- Holes shall not be made in wall for supports.
- Planks shall be fitted and tied together. In case of finishing work such as plastering, painting and distempering, no part of the scaffolding should touch the structure.
- Where ladders are used, gunny bags shall be tied up at the ends to prevent any damage to work by sliding or tipping.







Source: Own

5.3.6. Timber/wood

Structure timber shall be matured Sal Wood unless otherwise stated. At least 6 rings should be visible in 25x25 mm sectional area of timber to be used in structural member. Timber for structure shall be straight and free from twist, large knots, concentrated knots, sapwood, dead and loose knots, signs of decay and other defects. It should comply with the



requirements of IS 883-1994. The minimum compressive strength of the timber shall be 7 N/mm2 parallel to grain. Recommended maximum moisture content for structure element is 20 % and for door and windows is 16%.

Source: Own

5.3.7. Formwork

Formwork shall be off plywood, steel or any other material capable of resisting damage to the concrete faces under normal conditions of erecting, fixing and placing concrete. However, the material should be as specified in BOQ. Timber and batten wood used for formwork should be easily workable and stable. It should be Hard, durable, enough

thickness and of required size. It should not be liable to warp when exposed to sun and rain or wetted during concrete. Plywood used for formwork should complying with is 4990 and make approved by Supervision Consultant. Steel formwork should have minimum 2 mm thickness or more as required. Plate should be stiffened with MS angel 40mm x 6 mm at distance 300 mm c/c in short direction. Erecting of Watertight, regular shape and size, smooth surface. Formwork should have Sufficient strength to withstand the concrete and worker's load

5.3.8. Material storage

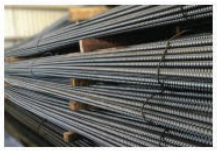
(1) Storage of Cement



Cement should be stored in a dry place, stacked in regular piles not exceeding ten bags and should be effectively protected from moisture and contamination so that there are no losses, formation of lumps and to ensure that proper quality is maintained. Pile of cement in storage should be at least 450 mm apart from walls.

Cement piles should maintain in the sequence of entry date and first in first out from store should be maintained.

(2) Storage of Rebar



Rebar for reinforcement should be stored in such a way as to prevent distortion and corrosion. Care should be taken to protect the reinforcement from exposure to adverse atmosphere during storage, fabrication and use.

(3) Storage of Timber with seasoning provision

Fresh timber has water in the form of sap and moisture inside it. Hence, timber needs to be dried before being used. The process of drying of timber is known as the seasoning of timber and the moisture should be removed during seasoning under controlled conditions as nearly possible at a uniform rate from all parts of the timber.

(4) Stacking of Timber



- Timber should be arranged in stacks with minimum height of 150mm above the ground level.
- The height of stacks should be 1.5 – 2.0 meter.
- Place heavy weights on the top of the stack to prevent warping

Source: Own

5.4. Rebar arrangement

Reinforcement layout shall be erected as per following order of priority:

1. Detail drawing provided in contract document
2. NBC 105:2020, Annex A: Design and detailing of reinforcement concrete structures for earthquake loads
3. IS 13920:2016: Ductile detailing of Reinforced Concrete Structures Subjected to Seismic Forces
4. SP: 34 (S&T)-1987 Handbook on Concrete Reinforcement and Detailing

This guideline summarize reinforcement detailing requirements including cover to reinforcement, minimum requirements of quantity and sizes and spacing, extension and curtailment positions for anchoring. The procedure for detailing of reinforcement for each structural member is described in brief.

5.4.1. General requirements

- Reinforcement Grade and Type should be as per specification, structure drawings and design report
- Reinforcement should be cut and bent and erected as per design specification and detail drawing.
- All main bars shall be truly straight and in line
- Lapping shall be only at the specified location.
- Stirrups shall comply all the requirements and tied to all main reinforcement.
- Top and bottom bars shall be spaced with the help of chairs.
- Clear cover shall be truly maintained.
- Cover blocks of specified size shall be used.

- Development length $L_d/\varnothing$ of deformed bars in tension should not be less than

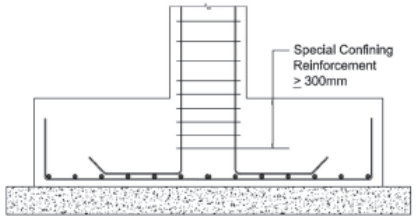
Grade of Steel	Grade of Concrete				
	M 20	M 25	M 30	M 35	M40 and above
Fe 250	45	39	36	32	29
Fe 415	47	40	38	33	30
Fe 500	57	49	45	40	36

5.4.2. Foundation

- Minimum cover to main reinforcement shall not be less than 50 mm for surface in contact with earth face. However, it may extend up to 75 mm when bottom of the footing is in direct contact with the soil.
- Minimum diameter of main bar is 12 mm.
- Minimum area of reinforcement in footing slab is 0.12% of concrete area.
- The reinforcement bars of columns should be extended into the footing to a distance not less than development length of the bar. However, the development length can be modified in ratio by providing more reinforcement than required.

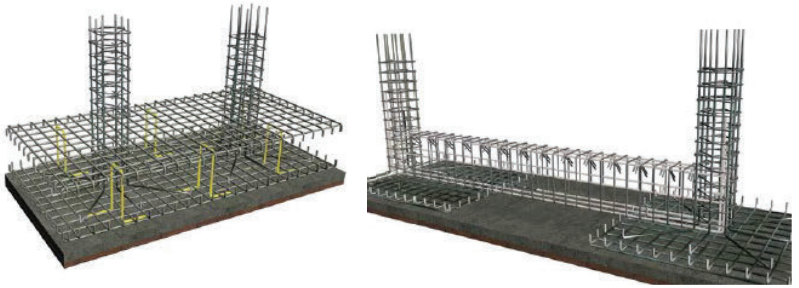
(Sketch showing development length and minimum dimensions of legs for cubical isolated footing and other detailing)

- Special confining lateral ties provided to the column shall extend at least 300 mm into the footing and should not more than 100 mm c/c.
- If footing pads of two columns overlap each other, combine footing will be provided. In the case, foundation will be one of following two types:
- Combine Footing pad with reinforcement mesh in bottom plus strip beam
- Combine footing pad with Two layers of mesh in top and bottom of the footing pad



- In case, column locate in boundary of property land, strap or cantilever footing will be provided combining the footing with footing of adjacent column via strap beam.

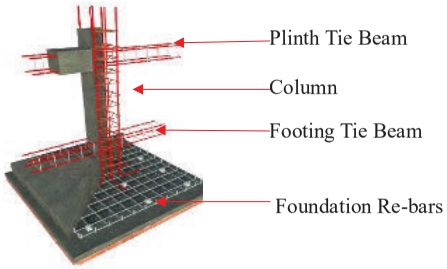
- For combine footing with strip beam, detailing of longitudinal and transverse bars is similar to that of beams.
- All footing of a building should be kept as same horizontal level as far as possible unless designed and prescribed by the structural designer.



5.4.3. Column

- Minimum dimension of a column shall not be less than $20xd_b$, where db is diameter of the largest diameter of longitudinal reinforcement bar in the beam passing through or anchoring at the joint. However, minimum dimension of column shall be 300 mm.
- Rectangular columns shall have a minimum of 8 numbers of bars.
- Minimum diameter of the longitudinal bar shall be 12 mm
- Transverse reinforcement shall have 135° hook ends with as extension of 6 times its diameter (but not less than 65 mm) at each end, which are embedded in the confined core of the column. Minimum diameter of hoop shall be 8 mm.
- Maximum spacing of parallel legs of the links/hoops shall be minimum of 300 mm c/c and half the least lateral dimension of the column.
- Spacing of the confining reinforcement shall be minimum of $B_c/4$; $6d_b$ and 100 mm, B_c is smallest cross-sectional dimension of column, d_b=diameter of smallest longitudinal bar of column
- Special confining reinforcement shall be provided over a length (lo) minimum of D_c (Largest cross section dimension of the column); Clear length of the column $l_{cl}/6$; 450 mm from the face of the joint towards mid height of the column on either side of the joint.

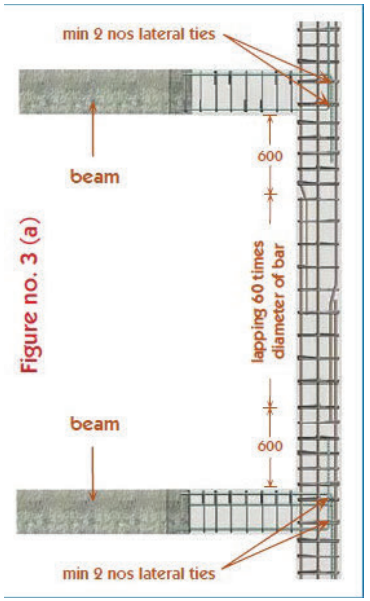
- Actually, length of column re-bars need to calculated properly to avoid the lap positions near or at the joint.



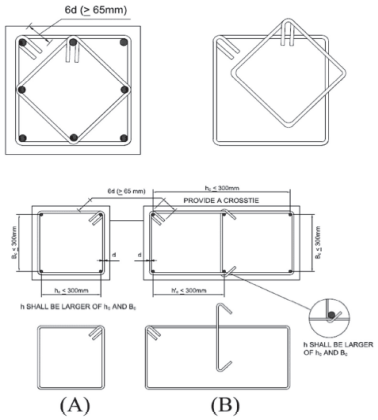
Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

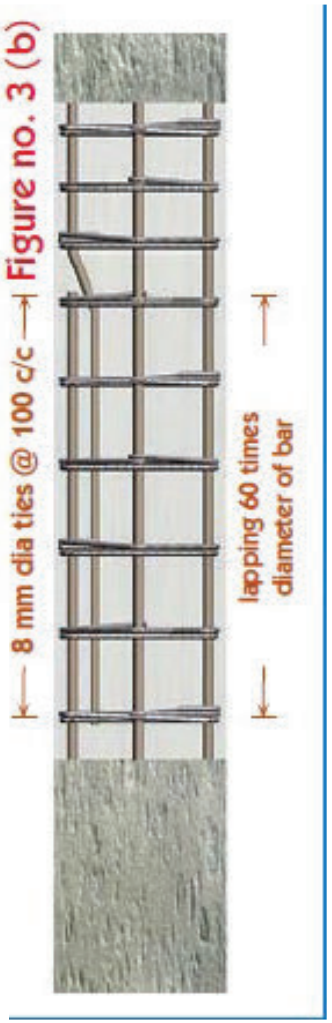
- The lapping in columns should be at the mid height of column starting from 600 mm from top of beam or ending up to 600 mm from bottom of beam.
- The reinforcement bars should not be lapped at one level i.e. should be lapped in staggered position aligned in a vertical line.
- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of lateral ties should be 100 mm c/c throughout the length of lapping.
- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
- Within a joint
- Within a distance of 2d from face of the column/beam
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced.
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.
- The spacing of these links shall not exceed 150 mm.

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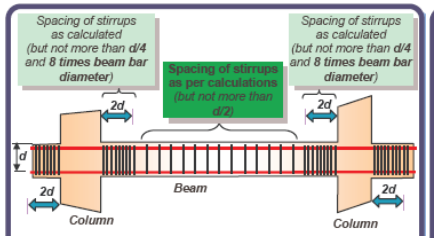
Source: Technical Poster, DUDBC



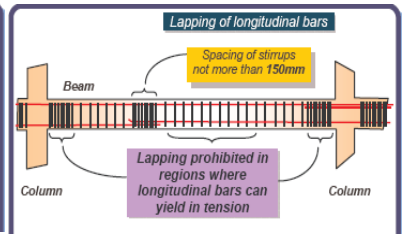


5.4.4. Beam

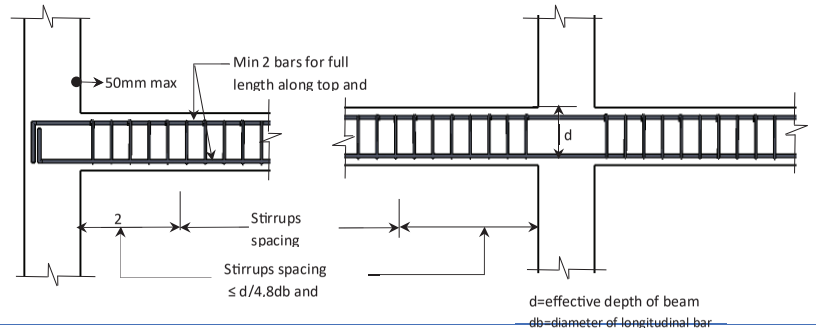
- Longitudinal steel on bottom face of a beam framing into a column shall be at least half the steel on its top face at the same section.
- Longitudinal steel in beams at any section shall be at least 1/4th of maximum longitudinal steel provided at the beam.
- Vertical stirrups shall be used in beam as transverse reinforcement.
- Stirrups are permitted to be made of two pieces of bars also namely U-link with a 135° hook with an extension of 6 times diameter, but not less than 65 mm, imbedded in the core concrete and across-tie.
- The hooks of the stirrups and cross-ties shall engage around peripheral longitudinal bars. Consecutive cross ties engaging the same longitudinal bars shall have their 90° hooks at opposite sides of the beam.
- The minimum diameter of a transverse reinforcement shall be 8 mm.
- Closely spaced links shall be provided over a length equal to 2d from column face on either side. Spacing of links over the 2d length shall not exceed the minimum of (d/4; 8db; 100 mm). The first link shall be at a distance not exceeding 50 mm from the joint face.

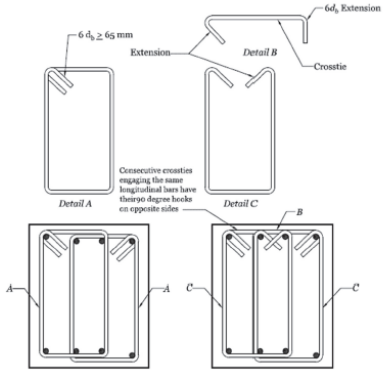


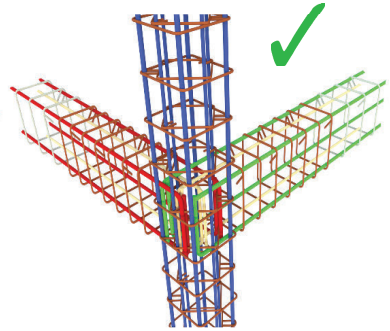
Source: IITK, BMTPC/Earthquake Tip

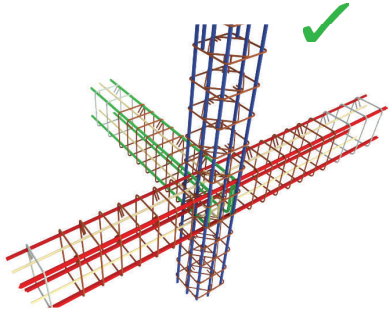


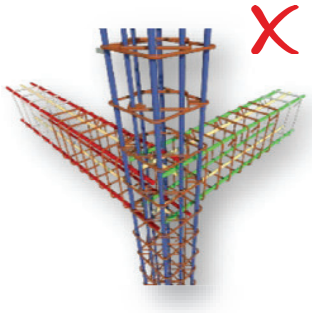
Source: Technical Poster, DUDBC





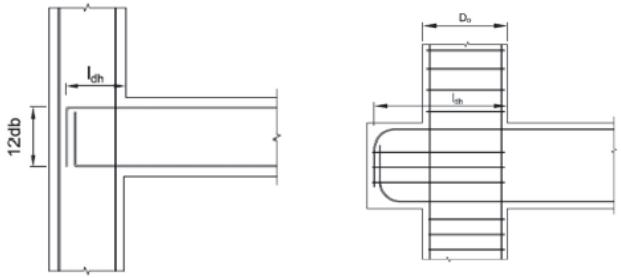




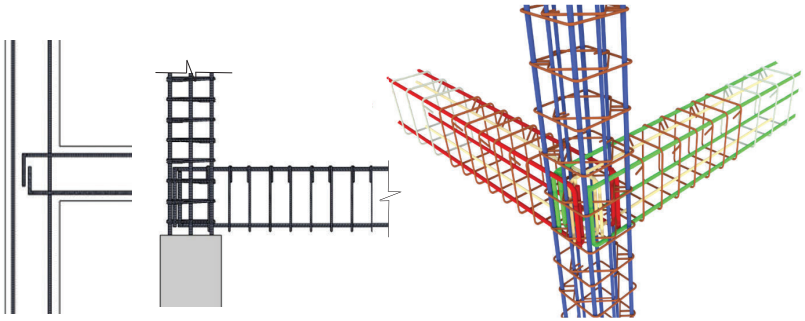


5.4.5. Beam and Column Joint

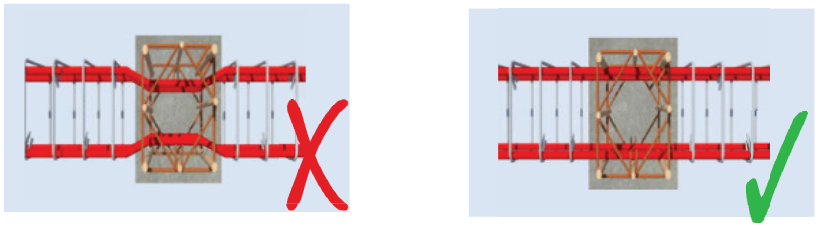
- At an exterior joint, top and bottom longitudinal bars of beams shall be provided with horizontal length beyond the inner face of the column, equal to horizontal development length (l_{dh}) terminating in a standard hook of length $12d_b$.The hook shall be located within the confined core of a column or of a boundary element with hook bent into the joint.
- If the requirements for l_{dh} cannot be satisfied in the exterior beam-column joint, the beam can be extended horizontally in the form of exterior stubs.
- Shear reinforcement should be provided at the interval of 4 inch within joints



Source: NBC 105:2020, MOUD/DUDBC

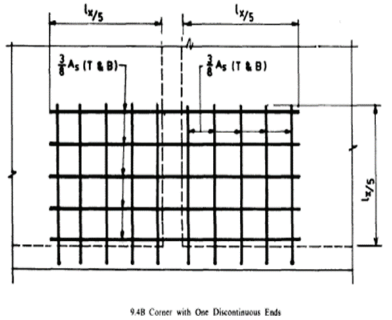


Anchorage of beam longitudinal bars in column

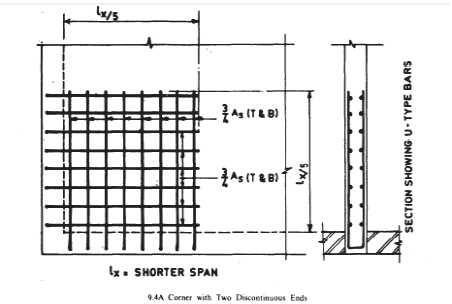


5.4.6. Slab

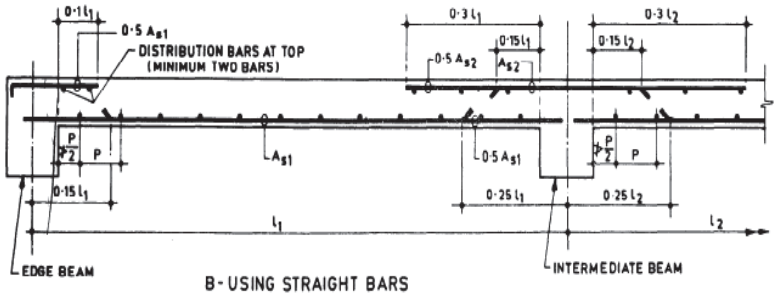
- Minimum cover to reinforcement shall be not less than 15 mm.
- The bottom bars in the shorter direction are placed in the bottom layer.
- At least 50 % of main bars provided at mid span should extend to the support.
- Torsional reinforcement shall be provided at any corner where the slab is simply supported along the direction. It shall consist of top and bottom reinforcement. The bars shall be extended from the edges a minimum distance of $1/5^{th}$ of shorter span. Torsional reinforcement need not be provided at any corner contained by edges over both of which the slab is continuous.
- Adequate chairs shall be provided to maintain top bars in positions.
- Curtailment distance shall me maintain as in figure …



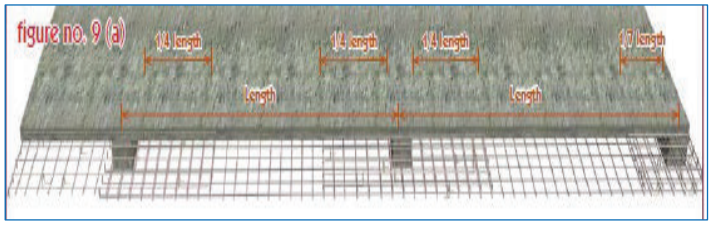
9.4B Corner with One Discontinuous Ends

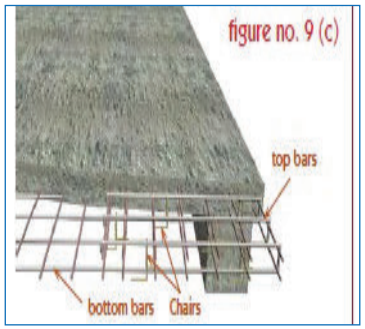


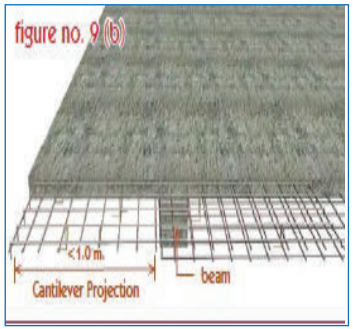
9.4A Corner with Two Discontinuous Ends



B - USING STRAIGHT BARS







5.4.7. Splicing of bars

- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
  - Within a joint
  - Within a distance of 2d from face of the column/beam
  - Within a quarter length of the beam adjoining the location where flexural yielding may occur under earthquake effects
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced. The spacing of these links shall not exceed 150 mm.
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.

5.5. Concrete works

5.5.1. Concrete Mixing

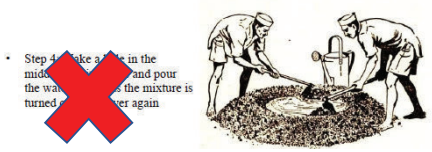
- The cement and aggregates shall be thoroughly mixed together in the specified proportions, **in a batch type mechanical mixer**.
- All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than one minute.
- If the drum rotates at lower speeds, the minimum period shall be increased inversely proportional to speed.
- The period of mixing shall be measured from time when all the materials including water are put in the drum.
- The entire contents of the drum shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
- No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.





Source: Own

- Manual Concrete mixing is no longer allowed for RC structures following NBC 110. The Contractors shall carry mixing of concrete only with the mechanical mixer.



Source: Manual for Mason Training on Earthquake Resistant Construction of Buildings, DUDBC

- However, for remote and hilly areas of Rural Municipalities where the mechanical mixer machines are hardly available or very difficult to transport, the manual mixing may be allowed only on the following condition.

1) The mixing condition, equipment and mixed proportion including extra cement shall be confirmed by the Supervision Consultants in advance.
2) The cement, sand, aggregates and water shall be thoroughly mixed together in the specified proportions in **an enclosed waterproofed box suitable for the batch size.**

3) All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than two minutes by two persons.
4) If the manpower is short, the minimum period shall be increased inversely proportional to manpower.
5) The period of mixing shall be measured from time when all the materials including water are put in the drum.
6) The entire contents of the enclosed box shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
7) No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.
8) Compressive strength test shall be conducted as well as Mechanical mixing concrete.

- The steps of manual mixing are illustrated as below.



1. Prepare an "Enclosed Waterproofed Box" suitable for the batch size



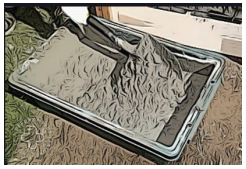
2. Mix cement and measured sand in dry condition



3. Mix measured aggregated and shovel from the bottom to surface



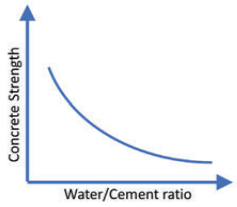
4. Pour the measured water slowly



5. Mixture is turned over again until certain workability comes up

5.5.2. Water/Cement Ratio

Water/ cement Ratio is the most critical factor for concrete strength. The more water concrete contains, the less strength concrete results. It was frequently observed on site that the too much water for concrete workability result in the shortage of concrete strength. So, the Contractor shall strictly pay attention to measure the water according to the specifications.



- Water–cement ratios of 0.40 to 0.60 are more typically used.
- Density of water is 1 kg per liter. The quantity of water required is a product of water cement ratio and the weight of cement.
- For example, if a water/cement ratio of 0.55 is specified, the quantity if mixing water required per bag of cement is 0.55x50 = 27.6 litters.
- For volume batching, cement is measured by bag, and water in liter. A 50 kg bag of cement is taken as 35 liters.

- Standard batching box shall be use for measuring the exact quantity of materials. Batching by weight preferred. Size of standard cube box shall be 300x300x375 mm.
- Mix the concrete until it is uniform but not less than 2 minutes
- The quantity of water for nominal mix of concrete is tabulated in the table below. The nominal mix concrete may be used for concrete of M20 or lower.
- However, for design mix the quantity of water depends on kind of sand, aggregates, cement and type mixes. So, the Contractor is strongly recommended to conduct Trial Mix for the confirmation of concrete strength in advance of actual casting.

	Cement x 1bag =50kg=35liter	Sand	Aggregates	Water (litter)	Remarks
M15	1	2	4	32	The quantity of water is given for reference only. The exact quantity of water shall depend on the trial mix to get the required strength
M20	1	1.5	3	30	
M25	1	1	2	28	

Example of Typical Mix proportion for reinforced concrete

Source: IS 456:2000

5.5.3. Placing & Compaction of concrete

- Concrete shall not be allowed to fall freely through a height of more than 1.5m. Fresh concrete shall not be placed against concrete that has been in position for more than 30 minutes unless a construction joint is formed.
- The placing and compaction of concrete shall at all times be under the direct supervision of supervision consultant.
- Regular Slump test should be carried out to control the addition of water and to maintain required consistency.
- Slump testing of concrete should be carried out minimum one test at the commencement of each casting and one each time a to prepare a strength test specimen. Slump of the concrete mix should range between 100±25 mm for ordinary concrete without mechanical vibrator and 75±25mm with mechanical vibrator. Standard size of slump test cone is 300 mm height with 100 mm top diameter and 200 mm bottom diameter.



Source: Own

- Concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against the formwork and around any reinforcement and other embedded item, without displacing them. Care shall be taken at arises or other confined spaces. Successive layers of the same pour shall be thoroughly worked together. Concrete shall be compacted with the assistance of mechanical immersion vibrators.

5.5.4. Curing of Concrete

- Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperatures differentials within the concrete sufficient to cause cracking.
- Curing shall be continued for as long as may be necessary to achieve the above objectives but not less than seven days
- The curing process shall commence as soon as the concrete is hard enough to resist damage from the process.
- Exposed concrete surfaces shall be closely covered with impermeable sheeting, properly secured to prevent its removal by wind and the development of air spaces beneath it.
- If it is not possible to use impermeable sheeting, the Contractor shall keep the exposed surfaces continuously wet by means of water spray or by covering with a water absorbent material which shall be kept wet.



Source: Own

5.5.5. Remedial Treatment of Concrete Surfaces

- Any remedial treatment to concrete surfaces shall be inspected immediately after the stripping of formwork and shall be carried out within 2 hours.
- Surface defects such as small areas of **honey-combing** cavities, large isolated blow holes, broken corner edges, etc., shall be repaired with mortar consisting of a cement and sand ratio equal to that of the concrete being repaired.
- Under no circumstances will surface repairs be allowed where **reinforcing steel is exposed**. In this case the Contractor shall put extensive remedial works, such as demolition of concrete, forward.



5.5.6. Cover of Concrete

- Cover is defined as the distance between the outer surface of the concrete to the inserted reinforcement.
- Cover to concrete is provided to protect the steel reinforcement bars (re-bars) from environmental effects to prevent their corrosion; to provide thermal insulation, which protects the reinforcement bars from fire, and; to give reinforcing bars sufficient embedding to enable them to be stressed without slipping.

Unless otherwise described, the clear cover of concrete to the reinforcement shall be as follows:

- Horizontal, vertical or inclined slabs: 15 mm or the size of the main bars whichever is greater.
- Lintels: 20 mm or the size of the main bars whichever is greater.
- Beams: 25 mm or the size of the main bars whichever is greater, 15 mm
- minimum for binders.
- Columns: For all columns having any diameter of reinforcement, the clear
- cover shall be 40 mm or the size of the main bars whichever greater
- Foundation: 50 mm for normal soil



Cement Cover Blocks (Source: Own)

5.5.7. Concrete strength test

IS 516 Clause 2.1 specifying the procedure for making and compression test specimens of concrete. For samples to be used for strength test, a minimum quantity of 0.02 m^3 will be essential.

(1) Testing frequencies

Normal and Accelerated Strength Tests should be conducted for concrete.

Testing of 28-day crushing strength of concrete shall be controlled not less than the following frequencies:

Quantity of concrete in the Work, m^3	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional 50 m3 or part thereof

Source: IS 456:2000

A test shall be the average test value for three cubes prepared from the same batch of concrete, the samples being consolidated in the moulds by Roding as per BSI 1881.

(2) Compressive Strength of Concrete

- Compressive strength of Concrete can be defined as the ability of material or structure to carry the loads on it without any crack or deflection**.**
- A material under **compressive load** tends to reduce the **size**, while in **tension,** size elongates.
- The **compressive strength of concrete** can be calculated by dividing the load applied on the concrete cube at the point of failure by the **cross-section ar**ea of the cube **(15x15x15 cm)** on which **load was applied.**
- The **concrete compressive strength** for normal **construction wor**k varies from **15 MPa** to **30 MPa** and more in **commercial** and industrial **structures.**
- The **strength of concrete** depends on factors such as **water-cement ratio,** the strength of cement use, **quality of concrete** materials, **quality control** during production of **concrete,** etc.
- A **compressive strength test of concrete** is performed to check the **compressive strength of concrete**.

- There are various **standard codes** that recommend **concrete cylinder** or concrete cube as the standard **specimen for the test.**



Concrete Cube Mould
Source: Own



Standard compression Testing Machine
Source: Civil concepts

- For cube test cubical moulds of size, **15cm x 15cm x 15cm** are commonly used. This concrete is filled in the Mould and tempered properly so as to minimize any air voids available in concrete.
- After 24 hours these moulds are opened and test specimens are soaked in water for curing. The upper surface of these specimen should be made even and smooth. This is done by spreading cement paste on the whole area of the specimen.
- These cubes are tested by a compression testing machine after 7 days curing or 28 days curing.
- The Load on the cube should be applied gradually at the rate of 140 kg/cm2 per minute till the specimen fails.
- Load at the failure of a cube1 divided by area of specimen gives the compressive strength of concrete.

Percentage of Strength Gain by Cubes in Days

The following table shows the percentage gain of compressive strength of concrete at 7 days, 14 days and 28 days

Days	% Gain Strength
1 Day	16 %
3 Day	30 %
7 Day	65 %
14 Day	90 %
28 Day	99 %

- While placing concrete, make six (6) 150 mm test cubes from particular batches of concrete as desired by the Supervision Consultant.
- The cubes must be prepared, cured and tested according to IS516.Out of the six(6) test cubes,test3 cubes for compressive strength at 7**days** after casting and the remaining 3 at 28days after casting. Maintain are gister at site with the following details and sign by both the Contractor and the Engineer.
  a. Reference to the specific structural member
  b. Mark on cubes
  c. The grade of concrete
  d. The mix of concrete
  e. Date and time
  f. Crushing strength at 7days
  g. Crushing strength at 28days

5.6. Form works

Formwork shall be erected in such a way that concrete cab be properly placed and compacted in a manner that the hardened concrete conforms to the required shape, position and level subject to the specified tolerances and standards of finish.

- Formwork should be in line, level and plumb considering the tolerance as per IS 14687.
- The tolerance on the shapes, lines and dimensions shown in the drawings shall be within the limits given below:
  - Deviation from specified dimensions of cross-section of columns and beams: +12 to -6 mm;
  - Deviation from dimensions of footing in plan: 50 to -12 mm,
  - Eccentricity: 0.02 times the width of the footing in the direction of deviation but not more than 50 mm;
  - Thickness ±0.05 times the specified thickness.
- Adequate number and size of struts, braces, ties and props must be provided as per design. For a height exceeding 3.5 m, signed drawing of formwork should be provided.
- Soil should be compact enough where props rest on natural or filled-up ground to avoid any settlement. Post should be supported over continuous sole over filled-up ground.
- Formworks at top shall be provided where the slope of the formed surface exceeds one in four.
- All joints in the formwork shall be watertight.

- Where reinforcement projects through formwork, the form shall fit closely round the bars. Formwork shall be so designed that it may be easily removed from the work without damage to faces of the concrete.
- Formwork shall not be re-used after it has suffered damage which is sufficient to impair the finished surface of the concrete.
- Before any reinforcement is placed into position within formwork, it shall be thoroughly cleaned and dressed with release agent.
- All rubbish, particularly, chippings, shavings and sawdust shall be removed from the interior of the forms before the concrete is placed. The face of formwork in contact with the concrete shall be cleaned and treated with form release agent. Release agents should be applied so as to provide a thin uniform coating to the forms without coating the reinforcement



Coating of formwork with form oil (Source: Own)

- The period which shall elapse between completion of placing concrete and removal of formworks are given in following table.

Table: Period of Removal of Formwork

S.N.	Description of Structural Member	Period of Time
1.	Walls, columns, and vertical sides of beam	16 - 24 hrs.
2.	Slabs (props left under)	3 days
3.	Beam soffits (props left under)	7 days
4.	Removal of props to slabs	
	a) For slabs spanning up to 4.5 m	7 days
	b) For slabs spanning over 4.5 m	14 days
5.	Removal of props to beams and arches	
	a) Spanning up to 6 m	14 days

	b) Spanning over 6 m	21 days

Source: IS 14687: 1999 Guidelines for Falsework for Concrete Structures

5.7. Brickwork

- Before brick laying, immersed it in water at least for 7 hours and make the surface dry before laying in course
- Mortar Preparation:
  - Batch the cement and sand in a desired ratio accurately with the help of batching box.
  - Mix the batch in dry condition at least three times until it becomes homogeneous.
  - Add water as per water cement ratio and then mix properly.
  - Use the mortar within half an hour after adding water.
- Wall shall be constructed not more than 1.5 m height in a day
- Avoid continuous vertical joints in masonry works.
- maintain level for whole length in at every 2 feet height
- Curing minimum 5 days
- No lateral load within 14 days of construction

a) Preparation of Cement Mortar

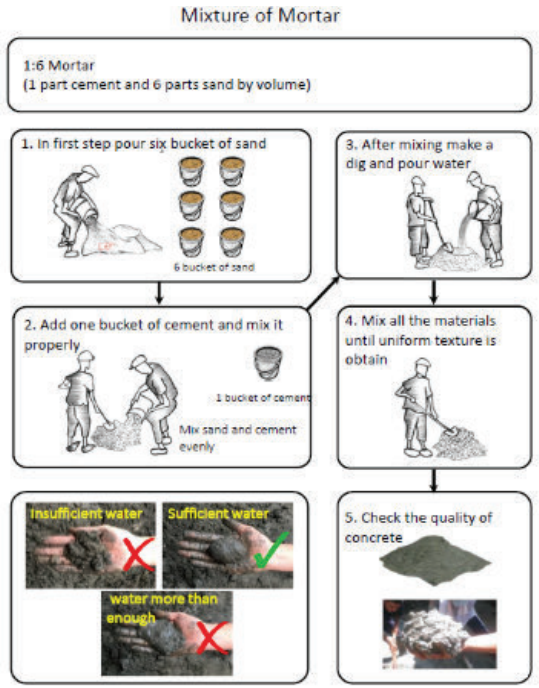
Mortar: Cement and sand should not be leaner than 1:4 (1-part cement and 4-parts sand) for masonry and 1:6 for plaster. Use cement mortar 1:6 or less on masonry works.

A3-3-47

Concrete: The concrete mix for RCC members should not be lean than 1:1.5:3(1-part cement, 2- parts sand and 4-parts aggregate). Water for mixing should be limited to 60 % of the weight of cement for hand mixing i.e. 30 liters of water for making 1 bag of cement. Concrete should be cured with water for at least 14 days after casting. Use concrete mortars or wall mortar within 45 minutes of mixing.



Mix proportion for mortar



Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

b) Soaking of Bricks

Bricks shall be soaked in water for a minimum of one hour before their use. Soaked bricks shall be taken out from the soaking tank sufficiently in advance so that the skin of bricks would be dry at the time of laying. Such soaked bricks shall be stacked on a clean place where they will not be spoiled by dirt, earth, etc.





Source: Integrated Training Manual on Building By-Laws and Building Code, MoFAGA

c) Laying

The brickwork shall be laid true to line, plumb, radiated or curved as required, built solid throughout. Prior to laying all bricks are to be thoroughly soaked in water until all air pockets are removed. Bricks are to be laid in a full cement mortar bed and when bonding, the brickwork is to be set back every course. The mortar joints shall be approximately 10 mm thick with a tolerance of (±) 2 mm and broken vertically. All exposed brick faces shall have the joints raked out to a depth 15 mm to receive plaster.

d) Protection and Curing

Masonry work shall be protected from rain and other adverse weather condition by suitable covering when the mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days. Care must take to protect brick edges during and after construction.

5.8. Stone Masonry Works

- Except for dry rubble walling, all joints (gaps) shall be sufficiently thick to prevent stone to stone contact and the gaps shall be completely filled with mortar. Stones shall be clean and sufficiently wetted before laying to prevent absorption of water from mortar.
- Placing loose mortar on the course and pouring water upon it to fill the gaps in stones shall not be allowed. Mortar shall be fluid, mixed thoroughly and then poured in the joints. No dry or hollow space shall be left anywhere in the masonry and each stone

shall have all its faces completely covered with mortar of the thickness as specified for joints.



Source: Integrated Training Manual on Building By-Laws and Building Code, MoFAGA

5.9. Construction site preparation check

The Building Owner shall be responsible for the safety of surrounding property and environment effected by construction of the infrastructure made by him. The Supervision Consultant shall provide technical support to owner to intact the surrounding properties and environment. Hence in commencement of work, he must consider required site preparation works to protect environment, surrounding properties, and safety and comfort workers and stakeholders.

1) take all measures for the protection of public properties such as public roads, electricity and telephone lines, sewer lines, cables, drains, etc. due to the construction work. In the event of any damage to such structures or properties, the Building Owner shall bear the cost to rectify the damages done and pay compensation to the owners of the respective private & public properties. The completion certificate should issue only maintaining the public infrastructures etc.
2) Ensure that the contractor will provide suitable sanitary facilities for all persons concern to the works in a appropriate location. Such toilet facilities shall be cleaned daily and all sanitary waste be disposed appropriately
3) The Supervision Consultant shall ensure that the Contractor will make adequate arrangements to the satisfaction of the Supervision Consultant for the disposal of all waste, storm run-off and sub-soil water, sewage and all other waste materials arising from or connected with the execution of the Works.
4) The Supervision Consultant shall ensure that the Contractor will clean equipment used for the Works in locations where debris and run-off will be prevented from gaining access to storm water and drainage courses. The Supervision Consultant shall also ensure that the Contractor will preserve existing trees as practically as possible and that will not trim

damage or remove trees, including their roots, unless previously authorized by the Supervision Consultant.

5.9.1. Construction site safety

Supervision Consultant shall assist Building Owner to maintain the safety of all workers, supervisors & third party involved in the construction. In case contract agreement is signed between the Building Owner& the Contractor for the construction of the building, the contract document includes all necessary items for the ensuring the safety of the workers, supervisors, third party and the supervision consultant team. For the construction of large or important structures, provision of safety supervisors shall be made by the Building Owner

The safety work must maintain following general conditions, but not limited to:

1) Provision of the safety gears and personal protective equipment shall be made at the site for the safety of all workers engaged in the construction work. Minimum level of protection on most construction sites is an approved Hardhat, Safety glasses, Leather boots and full shirt extending 4 inches over the shoulder and Long pants. Construction work shall not be carried out unless such provisions are made at the site.
2) Provision of first-aid box shall be always made at the construction site.
3) Insurance of workers shall be made against construction accidents as per the prevailing laws.
4) Personal hygiene services such as wash and toilet, dressing facilities. No other area is to be used for toileting.
5) Protection against pandemic- Registry with contact address in site entry point, Body temperature measurement, Handwash/sanitizer, safety distance
6) Protection and prevention of fires;
7) Protection barrio in scaffolding: Handrails in scaffolding with above 1.8 m fall height; Safety belts in high work condition
8) Proper housekeeping of the site;
9) Proper barricading construction area;
10) Awareness of safe driving and securing safe access ways;
11) Prevention of dropping objects;
12) Prevention of collapses;
13) Protection and prevention of accidents involving construction equipment;
14) Protection from and prevention of electric shock; Wires of electrical instruments should be conducted.
15) Dust control measures should be implemented
16) All employees must know the emergency response and notification procedures of the jobsite.
17) Employees on a walking/working surface (horizontal and vertical) with an unprotected side or edge which is 2 meters or more above a lower level must be protected from falling using a personal fall arrest system, railings, spotters, warning devices or other means.

18) Employees involved in activities that may subject the hands to injury (e.g., cuts, abrasions, punctures, burns, chemical irritants, toxins, vibration and forces which can restrict blood flow) must use hand protection appropriate for the hazard.
19) Protect excavations and openings in the working surfaces of an area with a barricade or hole cover. Hole covers must be marked and cleaned to prevent accidental displacement. No excavation should be left open overnight, it must be barricaded or backfilled prior to close of business.
20) Excavations, trenches or cuts that are 1.5m or more in depth in soft or unstable ground should be shored, sloped to the angle of repose, or stepped back with berms (benched).
21) A stairway, ladder, ramp or other safe means of access and egress must be in trench excavations that are 1.5m or greater in depth.
22) Keep heavy equipment back from edges of excavations. Materials, tools and spoil piles must be kept at least 1m from the edge.
23) Construction site should be covered with safety net in public traffic area.
24) Conduct a 5-10 minute pre-start talk with all workers before commencing specific safety required works.
25) As far as possible, carry out the roofing work only during good weather conditions and avoid extreme heat/cold. Better side with caution and always wait for ideal weather before begin roofing work.
26) Follow recommendations of IS 5216 1952 Safety procedure and practices in electrical works

5.9.2. Construction Safety against Deep Excavations and Earth Filling Works

1) All precautions shall be taken when excavation is made for foundation. Arrangements shall be made against the possibility of caving in of soil, rise in water table and settlement of adjoining areas and structures. Building Owner shall take the help of technicians to ascertain the risk involved in deep excavations. For deeper excavations such as multiple level basements or excavations in very weak soil, provisions of sheet pile walls, concrete protection piles or other geotechnical measures shall be made. Such structures shall be designed by professional engineers.

2) The Building Owner shall use the technology of deep foundations such piles with full technical support of a geotechnical engineer so as to avoid detrimental effect to the adjoining property such as vibration during driving, soil upheave, caving in from sides, high water accumulation, etc. In case of any unforeseen event, the Building Owner shall be fully held responsible to take immediate remedial actions and pay compensation to the private & public properties. It is strongly recommended to do insurance of the surrounding properties before starting the deep excavation works.

3) When earth filling work is to be done to raise the finished level in comparison to the adjoining areas, permanent retaining structures shall be erected before commencing such earth filling work. Such retaining structures shall be designed by professional engineers.

4) The Building Owner shall make all necessary arrangements for the safety of structures and buildings existing in the land parcels abutting to the land parcel of the Building Owner. If any problem arises due to the excavation work at the construction site, the Building Owner shall rectify such problem on its own cost.

5.9.3. Construction Safety of Adjoining & Public Properties

1) In case there is any possibility of settlement or damage to the adjoining properties due to the excavation or construction activities carried out by the Building Owner, the Building Owner shall carry out insurance against safety of such structures prior to the commencement of the excavation work.
2) The Building Owner shall take all measures for the protection of public properties such as public roads, electricity and telephone lines, sewer lines, cables, drains, etc. due to the construction work. In the event of any damage to such structures or properties, the Building Owner shall bear the cost to rectify the damages done and pay compensation to the owners of the respective private & public properties. The completion certificate should issue only maintaining the public infrastructures etc.
3) In case the contract agreement is signed between the Building Owner& the Contractor for the construction of the building, insurance clauses shall be introduced in the contract clauses and the cost of insurance shall be borne by the Building Owner as a provisional item in the contract

5.10. Confirmation of Completed Works

Contractor shall notice to owner on Completion of construction work. Receiving the work completion notice from contractor, owner/Supervision Consultant/contractor shall verify jointly the executed works including function status of sanitary and electrical works. Punchlist of observed defects/remaining finishing works shall be prepared jointly at the verification. Contractor's obligation deemed completed after rectifications of works mentioned in the punch list. It conforms the work completion status.

Contract between contractor and owner may specify defect liability period for a specified period. The period starts from work completion date. During this period, the contractor is obliged to make good any work that is determined to have been defects, which develops during the DLP that is no caused, by neglect or abuse. Supervision Consultant will attempt to correct all defects and outstanding works by the end of the period.

ANNEXES

Annex -1: Basic criteria of Building Bylaws in Nepal

1) Floor Area Ratio

- Floor Area Ratio (FAR) has a limited capacity in terms of resources and infrastructure.
- In order to avoid additional stress beyond the capacity of the city, a Floor Area Ratio (FAR) is calculated.
- It is also termed as Floor Space Ratio.
- It is simply formulated as the ratio of total covered area (actual area) of all the floors to the total plot area.
- Following formula is used to calculate the floor area ratio

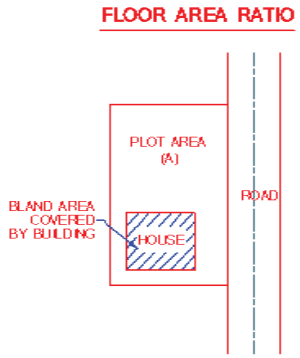
  FAR = Total area of all floors/ Plot Area
- Permissible FAR and Maximum Height will be as defined by local government.

Maximum Ground Coverage and Floor Area Ratios

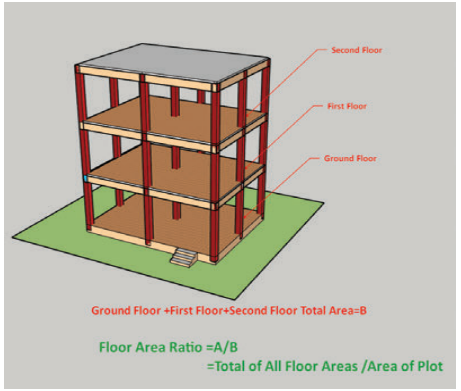
Type of Building	Area of Plot	Maximum Ground Coverage (%)	Maximum FAR
Residential Building	**Up to 250 Sq.m.**	**70**	**1.25**
Residential Building	**More than 250 to 500 Sq.m.**	**60**	**1.25**
Residential Building	**More than 250 Sq.m.**	**50**	**1.25**
School Campus	**As defined by concerned agencies**	**40**	**1.5**
Star Hotel	**As defined by concerned agencies**	**40**	**3.0**
Cinema, Hall, Theatre, City Hall	**As defined by concerned agencies**	**40**	**2.0**
Nursing Home, Policlinic	**As defined by concerned agencies**	**40**	**1.5**
Domestic or Small Industry	**As defined by concerned agencies**	**40**	**1.5**
Source: Building Bylaws, 2007 for new municipalities of Kathmandu Valley: Kathmandu Valley Town Development Committee (KVDA)			

Examples

- Suppose the Person X has got a plot of 1,00 square meter and the permissible FAR, according to municipality is 1.25. He can construct building which has maximum buildup area of 125 square meter obeying all other basic bye-laws as well.
- The FAR for every building will differ depending upon its usage, type of construction, the locality the width of the road



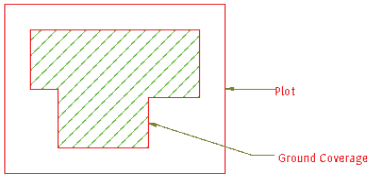
Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redeveloped referring sketch from Model Building Bylaws, MOUD

2) Ground Coverage

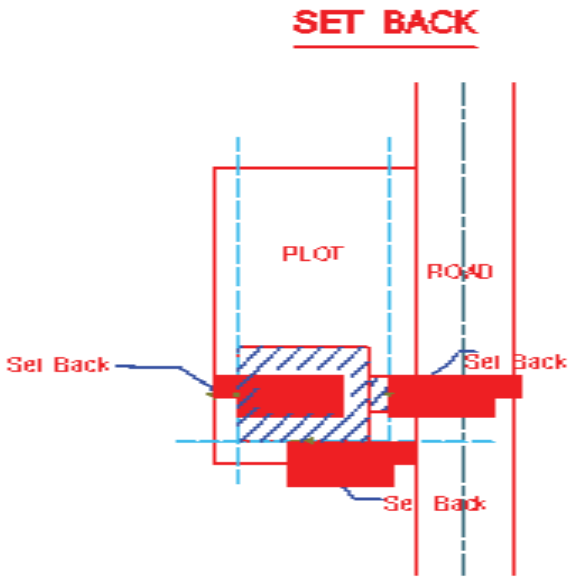
- The total area covered by the building on the ground floor is known as ground coverage. Based on restrictions of height and FAR, the ground coverage can be adjusted to get maximum usage of the plot.
- The ground coverage area is calculated by dividing the Building Ground Floor area with the total plot area. Building area means the floor space of a building when looking down at it from top. Ground Coverage Area = (Building Ground Floor Area / Site Area) X 100



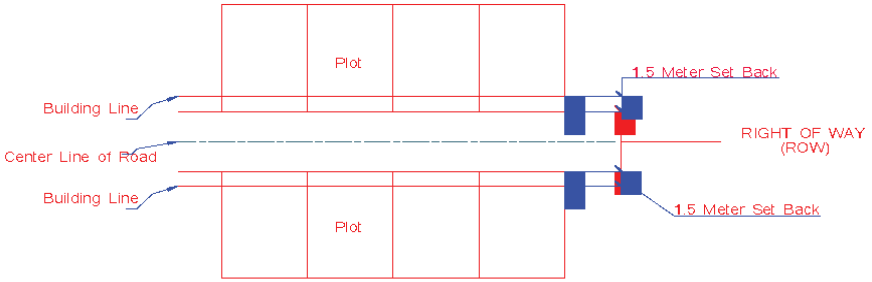
Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD

Setbacks

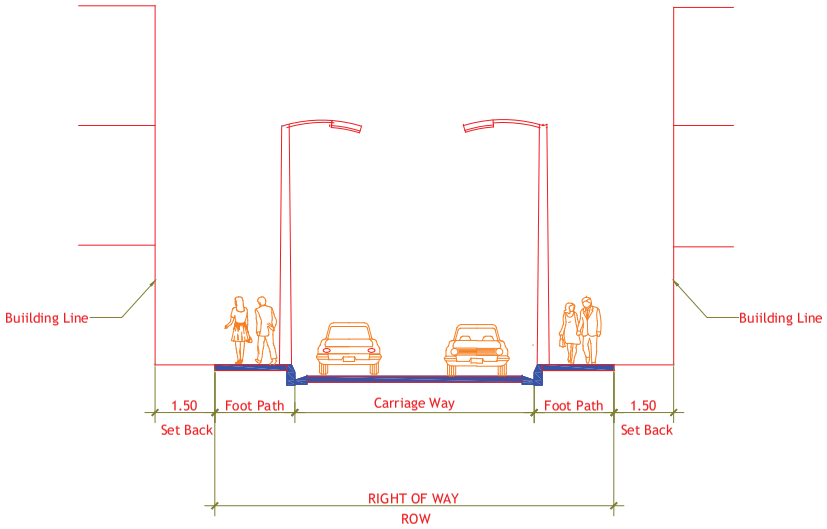
- A building setback is the open space between the building and the property boundary or lot line.
- We can construct the house only up to the setback line.
- Set back varies for different types of buildings.
- The setback line is applicable not just in the front, but also around the entire building.
- The total plot area is another determining factor for the setback line.



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



ROAD SECTION

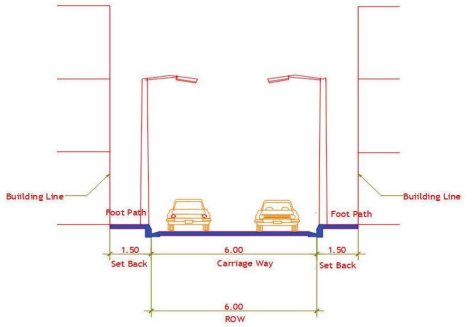
Source: Own

3) Rights of Way (ROW)

- The ROW is defined as a land corridor designed or constructed for the use of public access, vehicular traffic circulation and the location of public utilities such as pathways, roads and highways, regardless of the ownership of the land.
  - The ROW might be fixed as equal distance (D) on each side from a central line of public roads and is represented in the Land Use Plan in the map —Road Network – ROWI.
  - where ROW has been fixed, buildings and parts of buildings may not cross this line.
  - where ROW is not fixed, the minimum of ROW shall be 6M in all new build-up areas.
  - Where a Setback Line has not been fixed in the Land Use Map of the Municipality, 1.5 Meter minimum distance should be kept from the ROW with any building or structure. Minor projections by parts of buildings as sun and rain protections, cantilevers and entrance steps may be permitted only in the Setback.

A3-3-53

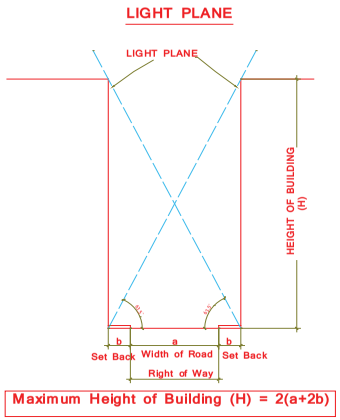
- Balconies, rooms and open ladder staircases cannot be constructed within the set-back. Compound walls in the Setback are not allowed.



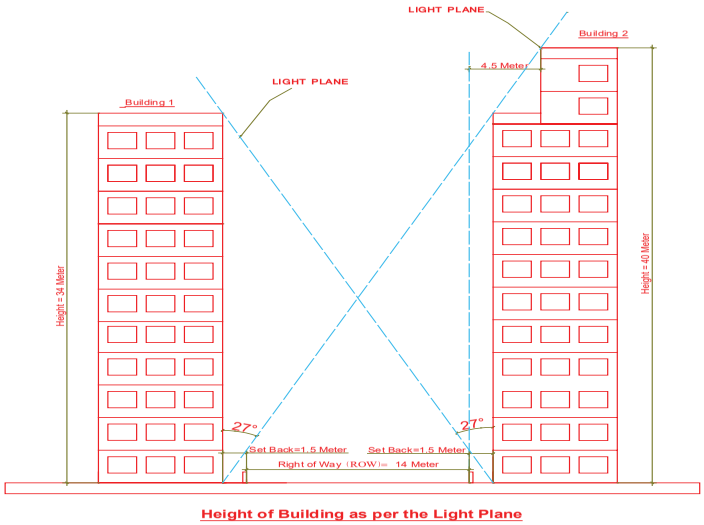
TYPICAL CROSS SECTION OF 6 METER WIDE MUNICIPAL ROAD

Height Restrictions

- The height of a building is the vertical distance between the average level of the ground and the topmost point of the building. Remember, if there is a basement to the house, it will not be considered in height measurement.
- Depending upon the locality and the FAR, there will be a maximum limit to how tall you can construct your house.
- As per Basic Standard on Settlement Development, Urban and Building Construction, Planning and Building Bylaws 2015, maximum permissible height is 17 meters from road level. The basement is the lower storey of a building, constructed below or partly below the ground. Depending upon the Zone there is a restriction to the height of the building.
- According to the building byelaws, maximum height of the building is governed by two factors.
  - FAR
  - Light plane
- Even though FAR permits higher building height, light plane factor restricts its height. As shown in the figures, the maximum height of building is not more than the height of light plane.
- The figures illustrate the light planes to restrict height of the building. According to this building height is permitted as two times of width of road+ setback.



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD

Annex- 2: Tips for Earthquake Resistant Construction of Buildings

Earthquake Resistant Buildings can be defined as follows:

a) Under minor but frequent shaking, the main members of the building that carry vertical and horizontal forces should not be damaged; however, building parts that do not carry load may sustain repairable damage.
b) Under moderate but occasional shaking, the main members may sustain repairable damage, while the other parts of the building may be damaged such that they may even have to be replaced after the earthquake; and
c) Under strong but rare shaking, the main members may sustain severe (even irreparable) damage, but the building should not collapse.

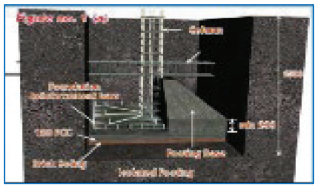
a) Tips for Earthquake Resistant Construction of RCC frame Structure Buildings



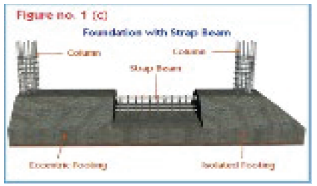
Source: Technical Poster, DUDBC

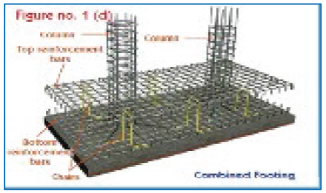
Construction of Foundations

- **Minimum cover to main reinforcement shall not be less than 50 mm for surface in contact with earth face. However, it may extend up to 75 mm when bottom of the footing is in direct contact with the soil.**
- **Minimum diameter of main bar is 12 mm.**
- **Minimum area of reinforcement in footing slab is 0.12% of concrete area.**
- **The reinforcement bars of columns should be extended into the footing to a distance not less than development length of the bar.**
- **However, the development length can be modified in ratio by providing more reinforcement than required.**
- **Special confining lateral ties provided to the column shall extend at least 300 mm into the footing and should not more than 100 mm c/c.**
- **If footing pads of two columns overlap each other, combine footing will be provided. In the case, foundation will be one of following two types:**
  - **Combine Footing pad with reinforcement mesh in bottom plus strip beam**
  - **Combine footing pad with Two layers of mesh in top and bottom of the footing pad**
- **In case, column locate in boundary of property land, strap or cantilever footing will be provided combining the footing with footing of adjacent column via strap beam.**
- **For combine footing with strip beam, detailing of longitudinal and transverse bars is similar to that of beams.**
- **All footing of a building should be kept as same horizontal level as far as possible unless**

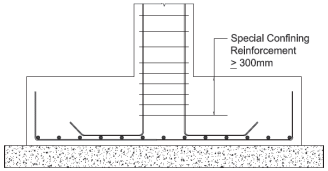








Source: Technical Poster, DUDBC

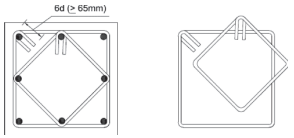


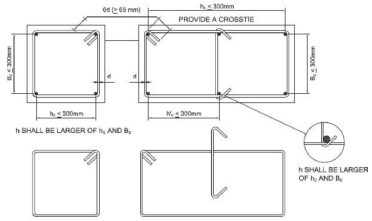
Source: NBC 105, MOUD

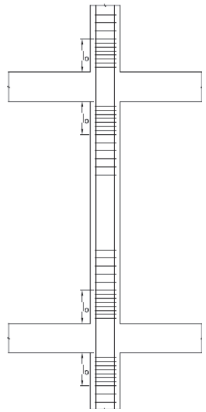
designed and prescribed by the structural designer.

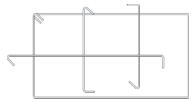
Construction of Columns

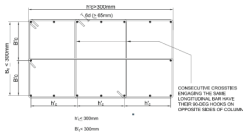
- **Minimum dimension of a column shall not be less than 20xd_b, where db is diameter of the largest diameter of longitudinal reinforcement bar in the beam passing through or anchoring at the joint. However, minimum dimension of column shall be 300 mm.**
- **Rectangular columns shall have a minimum of 8 numbers of bars.**
- **Minimum diameter of the longitudinal bar shall be 12 mm**
- **Transverse reinforcement shall have 135° hook ends with as extension of 6 times its diameter (but not less than 65 mm) at each end, which are embedded in the confined core of the column. Minimum diameter of hoop shall be 8 mm.**
- **Maximum spacing of parallel legs of the links/hoops shall be minimum of 300 mm c/c and half the least lateral dimension of the column.**
- **Spacing of the confining reinforcement shall be minimum of $B_c/4$; $6d_b$ and 100 mm, B_c is smallest cross-sectional dimension of column, d_b=diameter of smallest longitudinal bar of column**
- **Special confining reinforcement shall be provided over a length (lo) minimum of D_c (Largest cross section dimension of the column); Clear length of the column $l_{cl}/6$; 450 mm from the face of the joint towards mid height of the column on either side of the joint.**









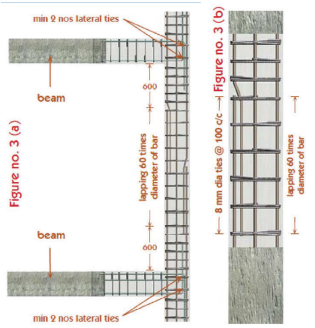


Source: NBC 105, MOUD

Lapping in Columns

When longitudinal steel bars have to be continued for spans larger than their manufactured lengths, the bars shall be connected by either splicing or mechanical couplers.

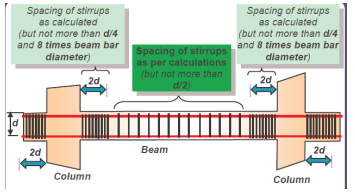
- **Maximum 50% of bar numbers can be splice in a location.**
- **Lap splices shall not be provided**
- **Within a joint**
- **Within a distance of 2d from face of the column/beam**
- **Lap splices shall be provided only in the central half of clear column height**
- **Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced.**
- **The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.**
- **The spacing of these links shall not exceed 150 mm.**



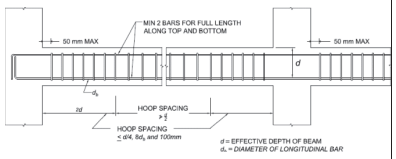
Source: Technical Poster, DUDBC

Construction of Beams

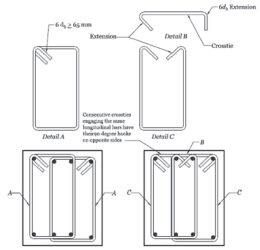
- **Longitudinal steel on bottom face of a beam framing into a column shall be at least half the steel on its top face at the same section.**
- **Longitudinal steel in beams at any section shall be at least 1/4th of maximum longitudinal steel provided at the beam.**
- **Vertical stirrups shall be used in beam as transverse reinforcement.**
- **Stirrups are permitted to be made of two pieces of bars also namely U-link with a 135° hook with an extension of 6 times diameter, but not less than 65 mm, imbedded in the core concrete and across-tie.**
- **The hooks of the stirrups and cross-ties shall engage around peripheral longitudinal bars. Consecutive cross ties engaging the same longitudinal bars shall have their 90° hooks at opposite sides of the beam.**
- **The minimum diameter of a transverse reinforcement shall be 8 mm.**
- **Closely spaced links shall be provided over a length equal to 2d from column face on either side. Spacing of links over the 2d length shall not exceed the minimum of (d/4; 8db; 100 mm). The first link shall be at a distance not exceeding 50 mm from the joint face.**



Source: IITK, BMTPC/Earthquake Tip



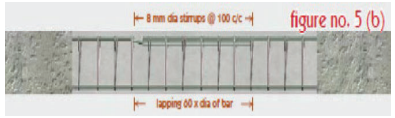
Source: NBC 105, MOUD



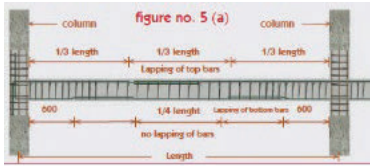
Source: NBC 105, MOUD

Lapping in Beams

- **Reinforcement bars at bottom should not be lapped at mid-¼ span of beam and should be lapped at edges 600 mm away from column faces.**
- **Reinforcement bars at top should be lapped at mid- 1/3 of span of beam.**



- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of vertical stirrups should be 100 mm c/c through the length of lapping.
- The minimum size of stirrups should be 8 mm diameter.



Source: Technical Poster, DUDBC

Beam and column joint

- At an exterior joint, top and bottom longitudinal bars of beams shall be provided with horizontal length beyond the inner face of the column, equal to horizontal development length (l_{dh}) terminating in a standard hook of length 12_{db}.
- The hook shall be located within the confined core of a column or of a boundary element with hook bent into the joint.
- If the requirements for l_{dh} cannot be satisfied in the exterior beam-column joint, the beam can be extended horizontally in the form of exterior stubs
- Lateral ties should be provided at the interval of 100 mm. within joints



Source: Technical Poster, DUDBC

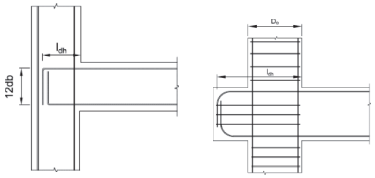
Development Length, $l_d = (l_{dh}+l_{db})$

for 12 mm Ø bars, l_d= 421 mm.

for 16 mmØ bars, l_d=561mm.

L_{dh} Calculation

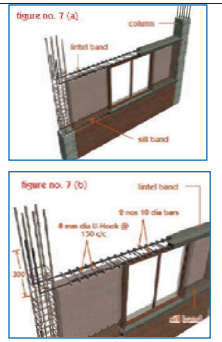
Concrete Grade	Rebar Grade	L_{dh}
M20	Fe 500	33.05xØ
M20	Fe 415	19.13xØ
M25	Fe 500	20.62xØ
M25	Fe 415	17.11xØ



Source: NBC 105, MoUD

7. Sill and Lintel Bands

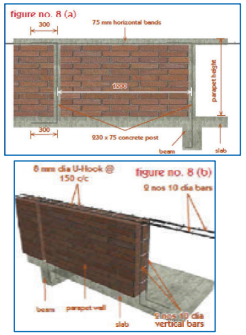
- To prevent the infill walls toppling down out of plane these shall be provided with horizontal reinforced concrete (RC) bands through the wall at about one-third and two-thirds of their height above the floor in each height (at sill and lintel level of openings).
- The RC bands should be tied up with columns abutting the wall by anchoring longitudinal bars fully with U-bars projected from columns.
- The width of the band should be equal to the wall thickness and its thickness equal to that of the Contractorry unit or 75mm, whichever is larger



Source: Technical Poster, DUDBC

8. Construction of Parapet Bands

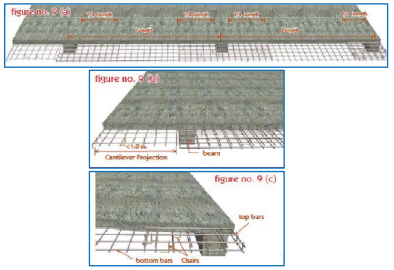
- Parapet bands should be provided to prevent toppling down of parapet walls at terrace and walls at verandahs.
- Concrete posts of size 230 x 75 mm with 2 nos. 10 mm diameter tied with 8 mm diameter U-hooks at 150 mm spacing should be erected from beams/slabs at 1200 mm spacing.
- The concrete posts should be tied up at top with 75 mm thick horizontal concrete bands with 10 mm diameter bars tied with 8 mm diameter U-hooks at 150 mm spacing



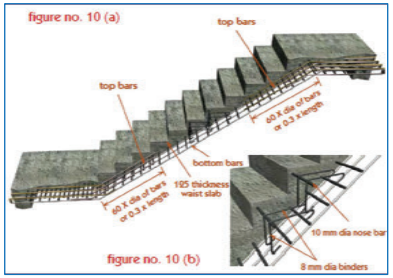
Source: Technical Poster, DUDBC

9. Construction of Slab

- For slab panel of size 4.5 m x 3.0 m, reinforcement bars of 8mm diameter can be provided at 150 mm spacing.
- For slab projections up to 1.0 m extra bars of 10 mm diameter should be provided.
- Chairs (10 mm diameter) should be provided for positioning the top bars as shown in the figure.



Source: Technical Poster, DUDBC

• **Cover blocks (1 Cement :1 Sand Mortar) of 15mm thickness should be used for bottom bars.**	
10. Construction of Staircase • **The minimum thickness of waist slab should be 125 mm.** • **Top bars should be curtailed up to 60 times diameter length or 1/3 length of slope portion of waist slab which is greater measured from starting/ending of slope.** • **Bottom bars should be provided continued from beam to beam.** • **Nose bars of 10 mm diameter should be provided at every step tied up by 8 mm diameter binders at 300 mm spacing as shown in figure no. 10 (b).**	 **Source: Technical Poster, DUDBC**

b) Tips for Construction of Earthquake Resistant Construction of Load Bearing Masonry Structure Residential Buildings up to three stories



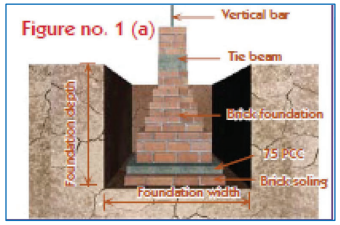
Source: Technical Poster, DUDBC

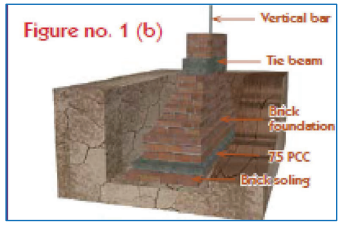
1. Construction of Foundations

- For one storied building, the recommended size of foundations are as follows:
- Width 750 mm and depth 800 mm for brick Masonry with cement mortar
- Width 750 mm and depth 800 mm for stone Masonry in cement mortar
- Width 850 mm and depth 800 mm for brick Masonry with mud mortar

For building up to three stories, the recommended size of foundations are as follows:

- Width 900 mm and depth 900 mm for brick Masonry with cement mortar
- Width 900 mm and depth 900 mm for stone Masonry in cement mortar
- Width 1050 and depth 1050 for brick Masonry with mud mortar. The buildings with brick Masonry in mud mortar should not be constructed more than two stories
- 75 mm thick Plain Cement Concrete (P.C.C.) in 1:2:4 ratio of cement sand aggregate should be laid over one-layer Brick flat soling for constructing brick Masonry in foundation

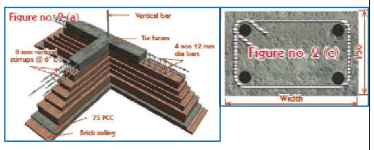




Source: Technical Poster, DUDBC

2. Construction of Tie Beams

- Tie beams should be provided for tying up the walls with each other and preventing dampness coming up from ground to superstructure
- The level of tie beam should be usually 450 mm to 750 mm from ground level
- The width of the tie beam should be equal to the wall thickness and its minimum thickness equal to 150 mm.
- 4 numbers 12 mm. diameter steel bars should be provided with 8mm. diameter vertical stirrups at 150 mm spacing.



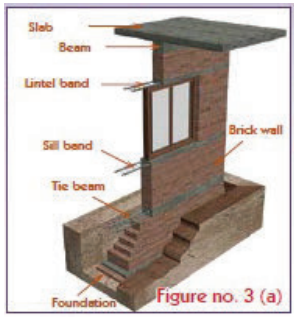


Source: Technical Poster, DUDBC

- Tie beam should be constructed with concrete in ratio 1:1.5:3 cement, sand and aggregate.

3. Thickness of Wall

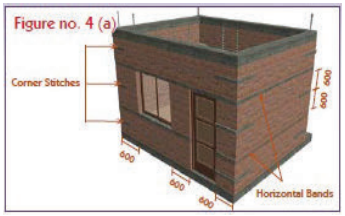
- For brick Masonry in cement sand mortar (1:6) the thickness of wall should be 350 mm at ground floor and 230 mm at first and second floors the width of room should not exceed 3.5 m.
- For stone Masonry wall in cement sand mortar (1:6) the thickness of wall should be 450 mm for ground floor and 350 mm for first floor. It is safe to construct maximum two floors with stone Masonry and the width of room should not exceed 3.5 m.
- For brick Masonry with mud mortar the thickness of wall should be 350 mm. at ground floor and 230 mm at first floor. It is recommended to construct maximum two floors with brick Masonry in mud mortar.



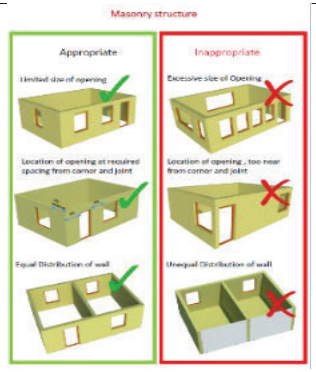
Source: Technical Poster, DUDBC

4. Locations of doors and windows in wall

- The doors and windows should be placed at minimum 600 mm distance away from wall corners and joints.
- Gap between two openings: Wall length between any two openings (doors and /or windows) should not be less than 600 mm. i.e. door and windows in a wall should be placed at 600 mm apart from each other horizontally.
- The total length of doors and windows in a wall should not be more than 50% for single storey construction.



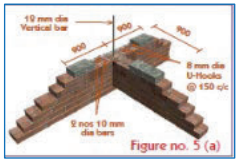
Source: Technical Poster, DUDBC

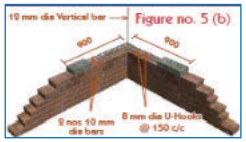


Source: Inspection Manual, NRA

5. Concrete Stitches at Junctions and Corners

- Concrete stitches should be provided at junctions and corners of walls.
- The width of the stitches should be equal to the width of the wall and its thickness equal to that of the Masonry unit or 75mm, whichever is larger. The length of the stitch should be 900 mm, from the corner or junction of the walls
- 2 numbers 10mm diameter bars with 8mm diameter U-hooks at 150 mm spacing should be provided for stitches
- The concrete stitches should be provided at every 600 mm height of wall

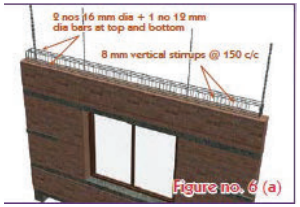




Source: Technical Poster, DUDBC

6. Floor Beams

- Floor beams should be provided through the whole length of wall with floor slabs
- The width of the beams should be equal to the width of the wall and height should be equal to minimum 325 mm.
- Reinforcement bars should be provided as shown in figure no. 6 (a)



Source: Technical Poster, DUDBC

7. Sill and Lintel Bands

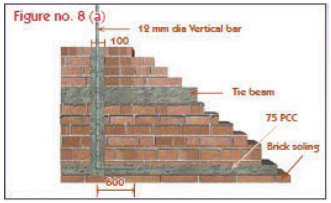
- Sill and Lintel bands should be provided at sill and lintel level of openings
- The width of bands should be equal to the thickness of wall and thickness should be 75mm. At openings more than 1.2 m the thickness of lintel bands should be equal to 150 mm at opening with 450 mm bearing in either side.
- 2 numbers 12mm diameter reinforcement bars with 8mm diameter U-hooks at 150 mm spacing should be provided for sill and lintel bands.
- For lintel bands of 150 mm thickness, 4 numbers 12 mm diameter with 8 mm diameter vertical stirrups at 150 mm spacing should be provided.

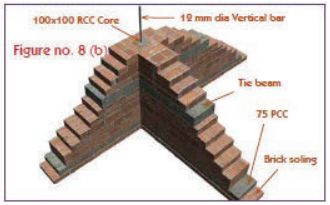


Source: Technical Poster, DUDBC

8. Vertical Bars

- Vertical bars of 12mm diameter should be provided at all corners and junctions of the walls from foundations to top of the slab
- Vertical bars of 10mm diameter should be provided at the side of openings from tie beams to slabs
- Concreting (1:2:4) should be provided around the voids of vertical bars making 100 mmx100 mm reinforcement concrete (RCC) core.
- Usually, construction of Masonry walls should be constructed gradually in a level. Walls should be left in steps for continuation part as shown in the figures no. 8 (a, b).
- Walls should not be constructed more than 1.0 m height in a day





Source: Technical Poster, DUDBC

Annex-3: Sample Registration Form for Contractor in Municipality

APPLICATION FOR ENLISTING AS A REGISTERED CONTRACTOR

To.

..... Municipality/ Rural Municipality

District: .....

Province: .....

Subject: Application for enlisting as a Registered Contractor in the Municipality

Dear Sir/ Madam,

I/We have been involved building construction works as a contractor since ..... years and now wish to provide similar services in the sector of **Construction of Buildings** to the interested building owners in the Municipality. Pursuant to the Clause 4.3 of the Building Construction Working Procedure 2078, I/we hereby request for enlisting me/us as the registered contractor in the municipality with the following details & supporting documents.

Personal details of the person/firm who is willing to provide the services as a registered contractor	
Full Name:	**Current Address:** ..... Municipality, ... Ward, ... District
Mailing Address: ..... Municipality, ... Ward, ... District	**Permanent Address:** ..... Municipality, ... Ward, ... District
Mobile no:	**Landline no.**
Citizenship no:	**Citizenship Issue date: ..... (YYYY/MM/DD)**
Citizenship issued by:	**Birth Date: ..... (YYYY/MM/DD)**
Gender ☐ Male ☐ Female ☐ Other	
Educational qualification ☐ Literate ☐ Primary (Upto 5) ☐ Basic (Upto 8) ☐ Secondary (up to 12) or higher	
Number of years of experience: ..... yrs	**Earthquake resistant building construction training date: ..... (YYYY/MM/DD)**
If the contractor is an individual person	

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Construction skill in (In case of individual) ☐ Mason ☐ Carpenter ☐ Metal worker Other:	**Earthquake resistant building construction training date: ..... (YYYY/MM/DD)**
If the contractor is a firm/company	
Name of the firm/company: Registration date of the firm/company: ..... (YYYY/MM/DD) VAT registration date: ..... (YYYY/MM/DD) Date of registration of business in the municipality: ..... (YYYY/MM/DD) Type of registration certificate according to the Construction Business Act: ☐ A ☐ B ☐ C ☐ D Date of registration certificate according to the Construction Business Act: ..... (YYYY/MM/DD)	
Name of construction worker employed by the firm/company who have trained in the earthquake resistant building	
1. Full name of trained construction worker (A): ..... Earthquake resistant building construction training date: ..... (YYYY/MM/DD) 2. Full name of trained construction worker (B): ..... Earthquake resistant building construction training date: ..... (YYYY/MM/DD)	
Documents to be included	
1. Copy of Nepali citizenship certificate 2. Copy of educational qualification certificate 3. Copy of certificate of training in earthquake resistant building construction 4. 2 (two) copies of passport size photo 5. Copy of company registration certificate in case of firm/company 6. Copy of value added tax (VAT) registration certificate in case of firm 7. A copy of the certificate licensed under the Construction Business Act in the case of a firm/company 8. Copy of business registration certificate in the case of firm/company in the municipality	
I hereby declare that all the information provided in this form is correct and I am ready to face penalties if it is found to be incorrect.	
Date of application ..... (YYYY/MM/DD)	**Full name of applicant** ..... Signature:
Thumb imprints of the applicant Right Left	**Photo of the applicant**

Annex-4: Sample Agreement Paper for Construction of Earthquake Resistant of Buildings between Building Owner and Contractors

AGREEMENT BETWEEN HOUSE OWNER AND CONTRACTOR

…… Municipality

"Contract for the construction of Earthquake Resilient Structures"

I …….. herby agree to this three-party agreement to construct an Earthquake Resilient Structure using …… As contractor to construct my …….. Building located in …….. Municipality, Ward no……. Plot no…….. with Area ……

On Behalf of the house owner:

1) I, the owner have selected a municipality registered contractor for the construction of the building
2) If I don't carry out the construction works as mentioned in 1, I will not apply for the completion certificate and I will not demand for it ever again
3) If the contractor doesn't fulfill his construction duties, then I am ready to edit this contract with a new contractor and reapply in the municipality
4) I hereby accept to follow all the building byelaws and building code suggestions of the designer/supervision consultants and I bear all the responsibility if any of those suggestions are breached in the construction of my building

On Behalf of the Contractor:

1) I will carry out the construction works according to the building byelaws, building codes and the approved drawings as per the suggestion of supervision consultant
2) I will ensure the quality of construction works by recommending only quality approved materials and technical works during construction
3) I will be present during interim site inspections and the final site inspection
4) If the owner doesn't follow the approved drawings, then I will immediately inform the supervision consultant and the municipality
5) I will be present for meetings when I am requested by the supervision consultants/ municipality
6) I will cover all the necessary site safety protocols for the owner during the construction works

Owner	Contractor
Name:	Name:
Signature:	Signature:
Contact number:	Contact number:
Email:	Email:
Date:	Date:
	NEC no.:

On Behalf of Municipality

Name:

Position:

Signature:

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Annex-5: Sample Commitment letter for Contractor for compliance of building Code and Building By-Laws in Construction

COMMITMENT CONTRACT
(For Compliance with Building Code and Building By-Laws)

This Commitment Contract is entered into on this **[Insert Date]** day of **[Month, Year]**, by and between:

1. House Owner:

Name: [Full Name of House Owner]
Address: [Permanent/Project Address]
Contact: [Phone / Email]
(Hereinafter referred to as **"the Owner"**)

2. Contractor:

Name: [Full Name of Contractor]
Contractor License No.: [License Number]
Firm Name (if applicable): [Name of Construction Firm]
Address: [Contractor's Address]
Contact: [Phone / Email]
(Hereinafter referred to as **"the Contractor"**)

Whereas,

The Owner has received a building permit from **[Municipality/Local Authority]** for the construction of a building located at **[Project Location/Plot No.]**, under Building Permit No. **[Insert Number]**, and
The Contractor has been appointed to execute the construction work at the aforementioned site.

Now, therefore, both parties agree to the following terms:

1. Purpose of the Contract

To ensure that all construction work is executed in full compliance with the approved drawings, the **[Applicable Building Code – e.g., Nepal National Building Code (NBC)]**, and relevant **Building By-Laws** of **[Name of Local Authority]**.

2. Responsibilities of the Contractor

The Contractor shall:

- Follow the approved structural, architectural, and MEP drawings submitted for permit and construction.
- Execute all construction activities in compliance with the prevailing **Building Code**, local **By-Laws**, and safety standards.

- Ensure coordination with and follow instructions from the **Supervision Consultant/Engineer** assigned by the Owner regarding all technical works, material specifications, construction techniques, and any changes or deviations.
- **Not make any structural or design deviations** from the approved documents without the **written approval** from both the **Supervision Consultant** and the **concerned local authority**.
- Maintain the quality of construction as per design specifications and technical standards.
- Allow regular site inspections by local authorities and project consultants.
- Be responsible for correcting any construction found to be non-compliant or unsafe, at no additional cost to the Owner.

3. Role of the Supervision Consultant

- The Supervision Consultant shall oversee the technical aspects of construction on behalf of the Owner.
- The Contractor shall maintain close communication and follow all technical instructions issued by the Consultant.
- Any clarification or technical changes during construction shall be routed through and approved by the Consultant.
- In case of disputes over quality or compliance, the decision of the Consultant shall be final and binding.

4. Responsibilities of the Owner

The Owner shall:

- Provide the Contractor with all approved documents and access to the site.
- Appoint and facilitate the role of the Supervision Consultant.
- Notify local authorities in case of unauthorized changes or suspected violations.
- Cooperate during inspections and construction progress reviews.

5. Liability for Non-Compliance

If any code violation, unsafe work, or non-compliance is found due to the Contractor’s action or negligence:

- The Contractor shall bear full responsibility for rectification, including material and labor costs.
- Any penalty, fine, or delay arising from such non-compliance shall be the Contractor's liability.
- Repeated violations may lead to contract termination and may be reported to the licensing authority.

6. Validity and Termination

This contract is valid throughout the construction period and until the completion and final certification of the building. Termination may occur upon mutual consent or due to breach of contract by either party with prior notice.

IN WITNESS WHEREOF, both parties agree to the above terms and sign this contract on the date first written above.

Signed:

For the Contractor
Signature: _____
Name: _____
Date: _____

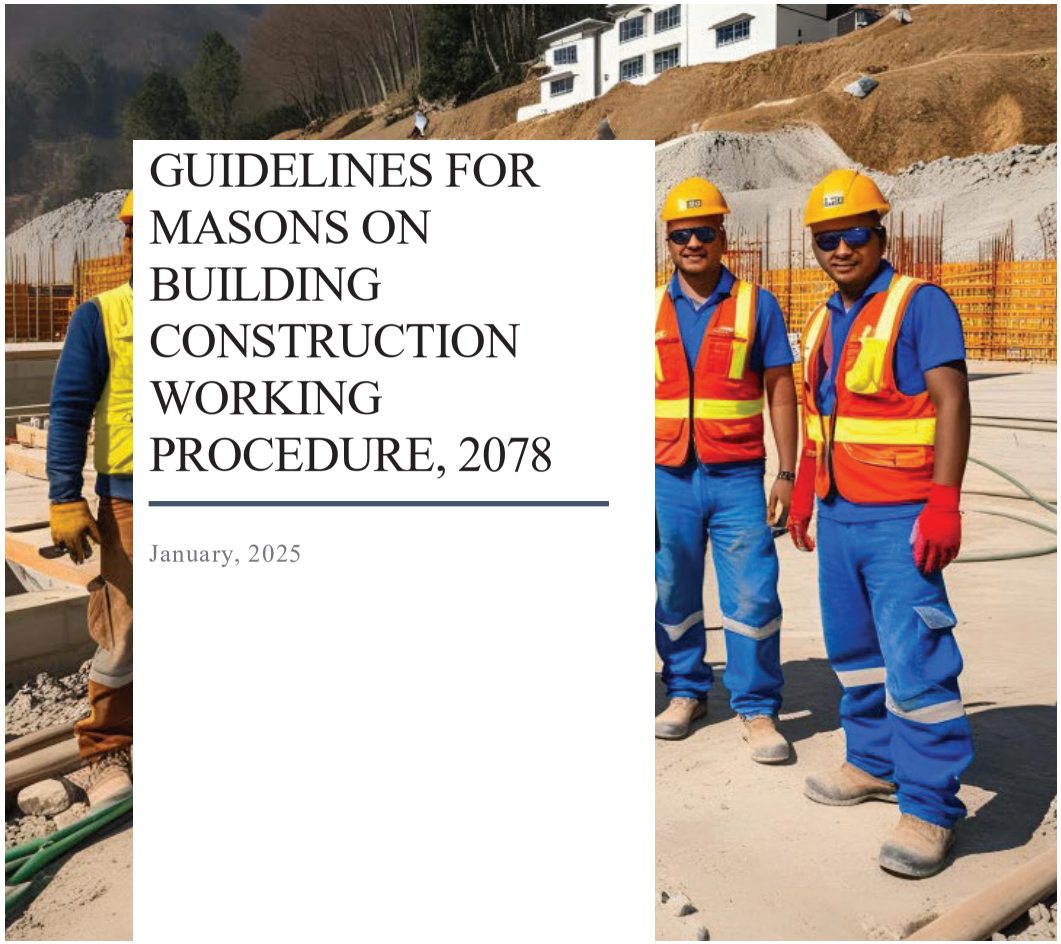
For the House Owner
Signature: _____
Name: _____
Date: _____

Witnesses:

1. Name: _____ | Signature: _____
2. Name: _____ | Signature: _____

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3-4. For Masons (English/Nepali)



GUIDELINES FOR MASONS ON BUILDING CONSTRUCTION WORKING PROCEDURE, 2078

January, 2025

A3-4-1

Under the project "The Project for Promotion of Nepal National Building Code Compliance for Safer Building Construction"

Department of Urban Development and Building Construction, Babarmahal, Kathmandu

Technically Supported by Japan International Cooperation Agency (JICA) Nepal



Attention to Municipality

The Municipality is responsible for issuing the building permit for building construction works at the design phase while it is responsible for issuing the inspection certificates and completion certificates as well during and after the construction respectively. The Municipality shall be responsible for the strict enforcement of the building By-Laws & the building code in the municipality during the design phase as well as during construction.

Building Owner

The Building Owner is the main body for Building Application who shall makes the final decision of the building design and its construction. The Building Owner is responsible for employing the Designer, the Supervision Consultant and the Contractor as well as application to Municipality.

Designer

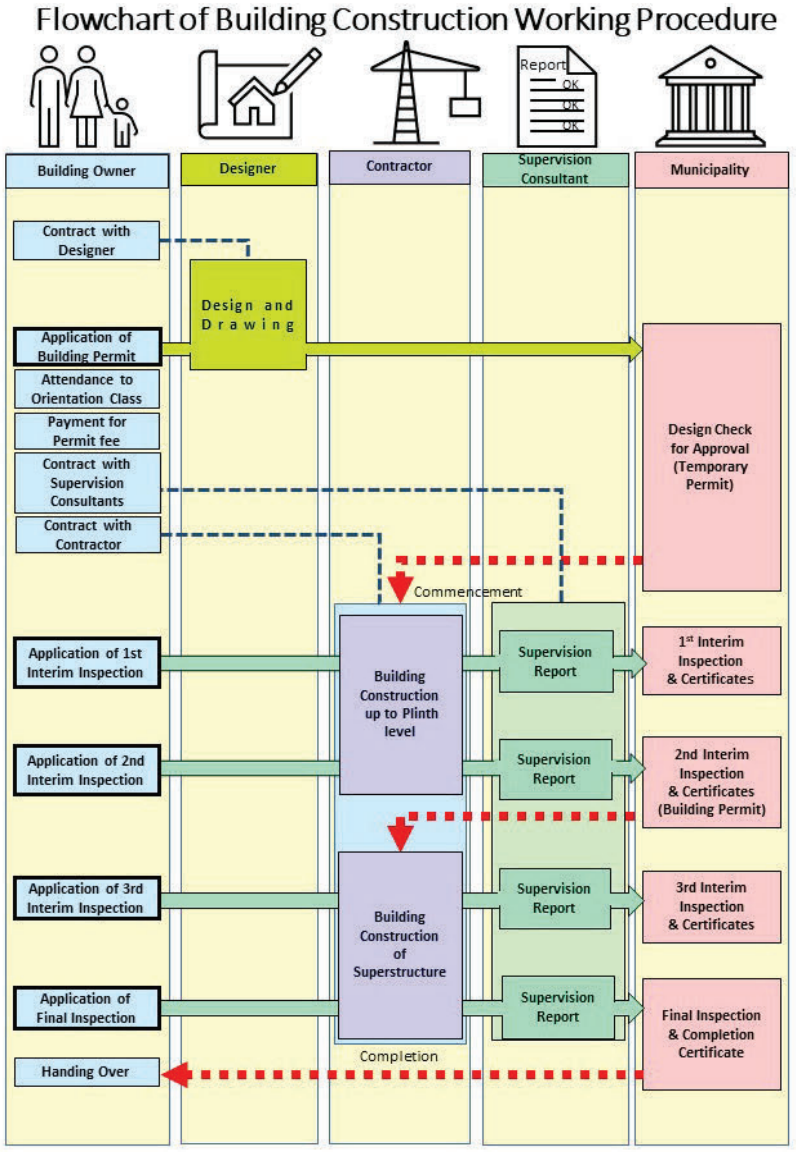
The Designer is responsible for preparing design documents for building construction. The Designer must be qualified for defined category of Building and registered to the Municipality. Construction and Supervision are implemented based on the design documents prepared by the Designer.

Contractor

Contractor is responsible for carrying out the construction work according to the design & drawing documents within the construction period specified in the contract as well as safety control on site. The Mason/Contractor must be qualified for defined category of Building and registered to the Municipality

Supervision Consultant

The supervision consultant is responsible for confirming that the construction work is being carried out according to the design documents and for reporting to the Municipality. The supervision consultant must be qualified for defined category of Building and registered to the Municipality.



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Why is BCWP required?

We all are living in the buildings all through our life. In order to protect our lives, health and property each other, following 2 rules are regulated.



1. National Building Code: to protect people's life and property from natural disaster and fire ensuring structural safety of buildings and convenience of occupants.

Shaking Ground and tree

No problem



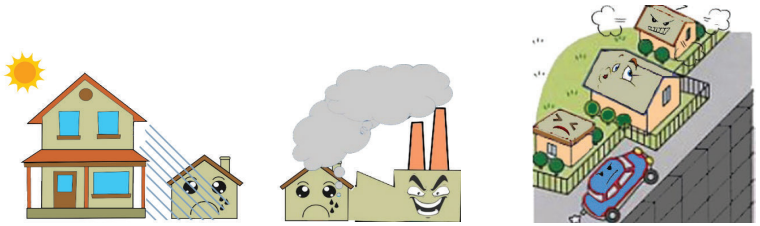
Fire

No

Problem



1. **By-Laws:** to keep comfortable environments for the whole people living in the area.



Then, BCWP is required to make all buildings follow above 2 rules fairly and impartially

What is the benefit of BCWP for Mason?

BCWP enable Mason

- to construct safer building against the natural disaster and fire.
- to construct building morally without any external objection from others
- to be confident in the quality of the constructed buildings through proper supervision
- to make sure that the constructed building is compliant so that it gets certified under the Final Inspection Certificate by Municipality



Certified Property by Municipality

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What is the requirement for Masons?

BCWP require masons

- to get trained in 5 days 'earthquake resilient building construction and get certified
- to get registered in the municipality where he/she wants to work
- to coordinate with the Designer, the Supervision Consultant and the Contractor prior to commencement of any works and never build any part of the structures other than the approved drawings
- to attend any refresher training or construction related training held by the municipality
- to be present and support the supervision consultant for supervision works
- to be present and support the inspection works conducted by the municipality
- to report to the supervision consultant and/or the municipality if pressured to construct any structure different than the approved drawings



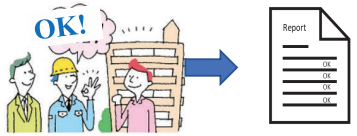






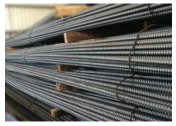
Please note …….

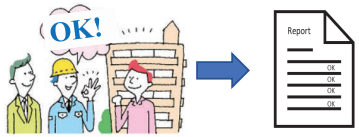
- BCWP has made supervision through supervision consultant mandatory in order to ensure the Quality of constructed works.



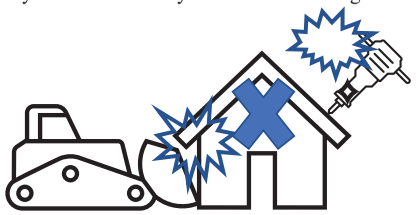
- Even in case that building owner would supply the building material to the mason/contractor, its quality shall be confirmed and reported by the Supervision Consultant. So, it is recommended to check the quality before the delivery to the site.







- If the Building is illegally constructed against BCWP, the Building is not allowed to use, and Building may be demolished by the cost of Building Owner.



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Abbreviations

GON	Government of Nepal
NRA	National Reconstruction Authority
MoUD	Ministry of Urban Development
MoFAGA	Ministry of Federal Affairs and General Administration
DUDBC	Department of Urban Development and Building Construction
KVDA	Kathmandu Valley Town Development Committee
JICA	Japan International Cooperation Agency
UNDP	United Nations Development Progarmme
UNCHS	United Nations Human Settlement Programmes (UN-Habitat)
NEC	Nepal Engineering Council
NS	Nepal Standard
IS	Indian Standard
BCWP	Building Construction Working Procedures
e-BPS	Electronic Building Permit System
RCC	Reinforced Cement Concrete
RC	Reinforced Concrete
PCC	Plain Cement Concrete
NBC	National Building Code
NNBC	Nepal National Building Code
DPC	Damp Proof Course
Re-bars	Reinforcement Bars
CAO	Chief Administrative Officer
ROW	Right of Way
FAR	Floor Area Ratio
OPC	Ordinary Portland Cement
PPC	Portland Pozzolana Cement
M15	Design Mix Concrete with characteristic strength of 15 MPa
M20	Design Mix Concrete with characteristic strength of 20 MPa

M25	Design Mix Concrete with characteristic strength of 25 MPa
TMT Bars	Thermo-mechanically treated Bars
BoQ	Bill of Quantity
CGI	Corrugated Galvanized Iron
d_b	Diameter of Rebar
l_{dh}	Horizontal Development Length
N/A	Not Applicable

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Preamble

This guideline for masons on building construction working procedures has been prepared to guide masons on overall building permit process of municipalities specially focusing on earthquake resistant construction of buildings in line with building code. The guideline has also focused on the steps to be followed by masons to maintain the quality of construction works. Necessary illustrations and sketches have been provided to educate the masons on detailing of structural works and quality constructions. The main objective of the guideline is to make the masons more responsible for compliancy of buildings with building code, rules and regulations of municipalities in line with BCWP. Through this guideline it is tried to involve masons into overall building permit system of the municipality as they are integral part of safer building construction.

Section 1. Preliminary

1.1. Short title, Commencement & Application

1. These guidelines shall be called "The Guidelines for Masons on Building Construction Working Procedure, 2078 (2022 AD)".
2. This guideline shall extend to the whole territory of Nepal.
3. This guideline shall come into operation immediately.
4. This guideline shall be applicable for the issue of building permit from the municipality to all kind of the Building Construction including repair, retrofitting, renovation, expansion, addition of storeys and changing of occupancy type, compound wall.

1.2. Definition

In this guideline, unless the context otherwise requires, the expressions given below shall have the meaning indicated against each of them.

1. "Building" means any closed structure constructed using various construction materials for the purpose of human habitation.
2. "Building Construction" means construction of new building, reconstruction after demolition of the old building, expansion of building, addition of storeys, change of façade of the existing building, additions or alterations of windows, doors, parapets, balconies, height, porticos, etc. and other related works.
3. "e-BPS" means the Electronic Building Permit System through which building permit is issued online by the municipality.
4. "Drawing" means all drawings and relevant documents pertaining to the construction of building.
5. "Designer" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of the preparation of drawings & designs and/or construction.
6. "Supervision Consultant" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of carrying of construction supervision of the building as prescribed by the municipality.
7. "Deed of Public Inquiry(*Sarjamin Muchulka*)" means the document prepared after the public inquiry on the land plot, access road, neighboring plots with regard to the construction of building conducted by the ward chairman or his representative in presence of the land owners of the adjoining plots including the signatures of the presentee.
8. "Storey" means the portion of building between two floors or between the floor and the ceiling.
9. "Plinth" means the portion of a structure between the surface of the surrounding ground and surface of the floor immediately above the ground.

10. "Plinth Level" means the level of the floor of a building immediately above the surrounding ground.
11. "Plinth Area' means the built-up covered area of the building / buildings immediately at plinth level.
12. "Superstructure" means the portion of the building above the Plinth Level.
13. "Occupancy Type" means the "use to which the building is put, such as residential, commercial, cold storage, warehouse, apartment, hospital, hostels, institutional, etc.
14. "Occupancy Change" means change of occupancy type of the building from the approved occupancy type at the time of building permit issuance.

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Section 2. General information of BCWP

2.1. Background and Purpose of BCWP

The building construction practices in Nepal is improving drastically in recent decades. New construction materials, equipment, technologies are being introduced in the construction sector for carrying out the sophisticated construction works smoothly, properly and timely. That is in the case of the bigger and large-scale building construction projects such as high-rise apartments, group housing, commercial complexes, corporate office buildings and so on. The qualified technical team and professional contractors are involved in such large-scale building projects. Quality tests and technical supervision and monitoring are carried out in a professional way. However, for most of residential buildings which are comparatively small scale in terms of cost and volume of works, the professional qualified technicians are rarely involved and quality works mostly depends on the informal contractors and semi-skilled masons. Construction details are not followed and the new technologies and testing methodologies are rarely used to assure the quality constructions. Building act, 1999 and Building Regulation, 2009 of Nepal has made mandatory provision of technical supervision of building construction works with qualified technicians. However, these are not being enforced by most of the municipalities. There is lack of standard working procedures and guidelines to carry out inspection works as per prevailing building By-Laws and building code. The role and responsibilities of the major stakeholders of building constructions are not clearly defined. There are no cross checking and monitoring mechanism to regulate the building constructions in the urban and rural municipalities. Moreover, the informal stakeholders of building sectors are not trained, capacitated and sensitized on building norms, criteria, quality control and detailing to safeguard the building stocks from possible natural disasters mainly the earthquakes. Realizing these adverse situations on building sector, DUDBC has taken initiation to develop Building Construction Working Procedures (BCWP) based on Building Act 1999 to support municipalities to enforce building regulations following building By-Laws and building code of Nepal. The main purpose of the BCWP is to make uniformity in the building permit process in the municipalities all over the country with introduction of interim inspections of building constructions by municipal technicians. The other purposes of developing and enforcing new BCWP are as follows:

- To make the municipal technicians, designers, supervision consultants, contractors and masons and Building owner more responsible on overall building permit system of municipalities.
- To make the technical supervision mandatory for all new building constructions in municipalities
- To improve the quality of construction works with introduction of compulsory lab testing of construction materials and concrete works
- To improve compliancy of building By-Laws and building code in design and construction

- To safeguard the building stocks in urban and rural areas of the country from probable earthquake disasters

2.2. Flowchart of BCWP



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2.3 Steps of Building Permit Process

The steps of Building Permit Process in municipalities as per new BCWP are as follows:

Step 1: Selection of Designer, Supervision Consultant and Contractor & Masons from the list published in the municipality's website



Step 2: Preparation and submission an Application Documents, Designs and Drawings at Registration Desk



- Preparation of designs, drawings & details through the registered designers in the municipality
- Checking and verification of the application form, designs and drawings by the building owner
- Signatories of the building owner or his/her authorized representative and the designer in application form and design/drawings along with the names, addresses and contact numbers
- Submission of Building application to registration desk of the Municipality

Step 3: Approval of Submitted Designs, Drawings & Details



- Completeness check of design drawings and required documents by registration desk
- Checking of design drawings as per prevailing building By-Laws by Building By-Laws Section/Unit of Municipality
- Checking of design drawings as per building code by Building Code Section/Unit of Municipality
- Suggestion to building owner/designer for corrections of design drawings, if any
- Endorsement building application for Registration

Step 4: Field Verification and Public Inquiry:



- Sending the submitted application form with designs & drawing from the Registration Desk to the ward office
- 15 days' notice to neighbours for registering complaints, if any
- Complaint Processing by technical/legal section of municipality, if any
- On-Site verification and Public Inquiry by Ward Office
- Field Report Submission by Ward Office Technician and Admin staff
- File Submission to Technical Desk/Section by the Ward Office

Step 5: Payment of Building Permit Fee



- Recommendation by technical desk/section for payment of building permit fee to the Revenue Desk
- Payment of Building Permit Fee by Building Owner
- Final verification of design drawings and copies of required documents with original one by the Technical Desk/Section

Step 6: Attendance to the Orientation Class on NBC &Earthquake Resistant Building Construction by the Building Owner:



- Attend by building owner in the orientation class on National Building Code & Earthquake Resistant Building Construction along with the hired masons/contractors
- Forward the name list of the building owners who have attended orientation classes to the Technical Desk/Section

Step 7: Temporary Building Permit for the Construction up to Plinth Level



- Design final check & recommendation for issuing Temporary Building Permit to Chief Administration Officer (CAO) by Technical desk/Section
- Verification building application and approval by CAO
- Issuance of temporary building permit along with a set of approved drawings by Technical Desk/Section

Step 8: Construction up to the Plinth level



- Commencement of the Building Construction Works
- Layout and preparation of foundation works
- Supervision report about the preparation of foundation works by the Supervision Consultant

Step 8(a): First Interim Site Inspection by municipality

- Construction up to foundation and column re-bars
- Application for first interim site inspection with Supervision Report by the Registered Supervision Consultant
- The first interim site inspection is carried out by the municipal technician for the construction arrangement of foundation before casting.
- Verify that the actual layout of the foundations and columns along with their rebar arrangements has been done as per the approved designs & drawings.

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- In the case of masonry structures, layout of masonry foundations and walls shall be checked.

Step 8(b): First Interim Inspection Certification



- If the construction below plinth level is confirmed with approved designs and drawings, then first Inspection Certificate is issued
- notice to proceed will be issued to Building Owner for construction works up to plinth level

Step 8(c): Second Interim Inspection by municipality



- Construction up to plinth level casting
- Application for second interim site inspection with Supervision Report by the Registered Supervision Consultant
- The second interim site inspection is carried out to verify the actual construction up to the plinth level including the plinth beam as per the approved designs & drawings after casting.

Step 8(d): Second Interim Inspection Certification:



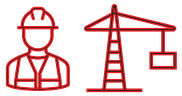
- The municipal technician shall recommend for the issuance of second Inspection Certificate along with recommendation for the issuance of Permanent Building Permit if the actual construction has been done up to the plinth level as per the approved design drawings.

Step 8(e): Permanent Building Permit for Construction of Superstructure



- Chief Administrative Officer (CAO) issues the Permanent Building Permit for the construction of superstructure of the building upon receiving the recommendation from the Technical Desk

Step 9: Construction of Superstructure of the Building



- Commencement of the Superstructure Construction
- Supervision Report by Registered Supervision Consultant

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Step 9(a): Third Interim Inspection by Municipality



- Construction up to first floor beam and slab re-bars.
- Application for third interim site inspection with Supervision Report by the Registered Supervision Consultant
- The 3rd interim site inspection is carried out at first floor level to verify that the actual construction has been done as per the approved designs and drawings before casting.
- The Technical Section issues the 3rd Inspection Certificate
- Interim inspections for upper storeys may be carried out by the municipality to verify that the construction is being undertaken in full compliance with the approved designs & drawings.

Step 9(b): Third Interim Inspection Certification:



- The municipal technician shall recommend for the issuance of Third Interim Inspection Certificate if the actual construction has been done up to the first floor level as per the approved design drawings.

Step 10: Building Completion Certificate

Step 10(a): Final Inspection for Completion Certificate by Municipality



- Completion of Construction
- Application for Building Completion Certificate with Supervision Report by the Registered Supervision Consultant
- Municipal technician carries out final inspection of the building, review technical supervision report and verify that the actual construction has been done as per the approved designs and drawings and maintenance of public infrastructure road, drain etc have been completed.
- Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon recommendation from technical section

Step 10(b): Issuance of building construction completion Certification:



- If the inspection report indicates that the building has been completed as indicated in the Supervision Report and the building has been painted at least one coat on the inside and outside surfaces and maintenance of public infrastructure road, drain etc. have been completed, then the building construction completion certificate shall be issued to the Building Owner by the Municipality.



2.3. Critical Points of BCWP for Masons

Masons should consider following critical points of BCWP for facilitating building owner for compliancy of building bylaws/ building code in the constructions:

- Masons need to be registered in the concerned municipality to work for building constructions on behalf of the owner
- The technical supervision is mandatory for all buildings and building owners need to hire supervision consultant for carrying the supervision works
- Masons need to carry construction works under direct monitoring of supervision consultant
- Masons should assist supervision consultant to provide photographic evidences and record of construction detailing and quality works
- Tested and certified construction materials should be used for maintaining quality of building constructions
- Compressive strength test of concrete is compulsory for every story to assure the quality of reinforced cement concrete works
- Municipality will carry out three interim inspections and one final inspection of building constructions for assurance of compliancy of building bylaws and building code
- Interim inspection certificates are required for getting permanent building permit and final completion certificates from the municipality
- Masons need to fulfill the instructions provided by the municipal technicians during interim inspections regarding quality construction and detailing works
- Masons need to address of site safety along with cleanliness and management of construction materials in site

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2.4. General information of Building By-Laws and building code in Nepal

Earthquake Risk in Nepal

Earthquakes have been the cause of devastating natural disasters since the dawn of the civilization in Nepal. Nepal, which has remained rich in natural and cultural, ethnic, linguistic diversity, also has a long history of destructive earthquake owing to its location in an active earthquake belt between Indian and Tibetan plates. It is well known that the loss of lives in earthquake occurs due to the inadequacy of structural performance of buildings resulting in their collapse. Experiences from past earthquakes have shown that buildings designed and constructed with appropriate seismic considerations can withstand such loading quite successfully although there may be some repairable damage. But most of the houses including engineered buildings in Nepal are highly vulnerable to even moderate intensities due to lack of knowledge of earthquake safety measures. Nepal experienced catastrophic damage in 2015, 1934 and 1988 earthquakes. In 1934 the earthquake of 8.4 Richter scale magnitudes hit the mid and eastern part of Nepal causing 80,000 houses totally collapsed. And that earthquake affected all total 104,000 buildings. Same as on 1988 (Bhadra 5th 2045 B.S.) the earthquake of 6.7 Richter scale that struck in eastern Nepal caused 20,000 numbers of houses collapsed in eastern Terai and killed more than 600 people.



Photo of damaged building in 2015 Earthquake

That earthquake drew attention of the Ministry of Urban Development (Former Ministry of Physical Planning and works), need for changes and improvement in current building construction practices in Nepal. It was recognized and request of Government of Nepal, technical assistance from UNDP and UNCHS (Habitat) had set up a three-year program "Policy and Technical Support to the Urban Sector" within the ministry. Then the sub-project "National Building Code Development Project" (UNDP/UNCHS/(Habitat)NEP/88/054) was formulated in 1992-93 within the Department of Urban Development and Building Construction (DUDBC) (former Department of Buildings) including with the government counterpart from the department. The Project developed Nepal National Building Code of Nepal which included 20 volumes of the different kinds of the Codes.

2.4.1. Background of NBC

Building code is a set of standard practice adopted by engineering community for designing and constructing buildings and backed by legislation. It is an engineering tool for ensuring structural safety of buildings and convenience of occupants. In other words, in context of Nepal, building code is an official document which comprises of earthquake resistant design and construction technology considering suitability of Nepal's geology, environment using locally available construction materials and technology as far as possible. The main purpose of the building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law of a particular jurisdiction when formally enacted by the appropriate authority. Thus in context of Nepal implementation of National Building Code is mandatory in all Urban and Rural Municipalities of Nepal according to Building Act 1999 (First Amendment 2007). Building code is not changeable according to the location or topography of municipalities. The code is unique for all over Nepal as it covers all categories of buildings especially structural design part which are constructed in the country.

Although too late, initiations have been taken to implement the National Building Code in municipalities of Nepal. Many municipalities have been implementing Nepal National Building code in building permit process. And DUDBC is strictly applying NBC in government buildings. Other municipalities and rural municipalities are trying to apply NBC gradually.

Department of Urban Development and Building Construction (DUDBC) had added three additional codes in 2003 besides the existing 20 volumes of the codes. They are Architectural (NBC 206), Sanitary (NBC 207) and Electrical code (NBC 208). After the Earthquake of 2015 NBC 202, 203, 204 and 206 have been updated. NBC 205: Mandatory Rules of Thumb for RC Buildings without masonry infill has been updated in 2012 as NBC 205: Ready to use detailing for RC Buildings without masonry infill. The present 23 volumes of codes have been formerly approved by the Government in the year 2003. The name list of Nepal National Building Codes is as follows:

- NBC 000: Requirement of State-of-the-Art Design and Introduction:
- NBC 101: Materials Specifications
- NBC 102: Unit Weight of Material
- NBC 103: Occupancy Load (Imposed Load)
- NBC 104: Wind Load
- NBC 105: Seismic Design of Buildings in Nepal
- NBC 106: Snow Load
- NBC 107: Provisional Recommendation on Fire Safety
- NBC 108: Site Consideration for Seismic Hazards.
- NBC 109: Masonry: Unreinforced

- NBC 110: Plain & Reinforced Concrete
- NBC 111: Steel
- NBC 112: Timber
- NBC 113: Aluminum
- NBC 114: Construction Safety
- NBC 206: Architectural Design Requirement.
- NBC 207: Electrical Design Requirements for (Public Buildings)
- NBC 208: Sanitary and Plumbing Design Requirements)
- NBC 201: Mandatory Rules of Thumb: Reinforced Concrete Building with Masonry Infill
- NBC 202: Mandatory Rules of Thumb: Load Bearing Masonry
- NBC 203: Guidelines for Earthquake Resistance Building Construction: Low Strength Masonry
- NBC 204: Guidelines for Earthquake Resistance Building Construction: Earthen Buildings (Eb)
- NBC 205: Mandatory Rules of Thumb: Reinforced Concrete Building without Masonry Infill

2.4.2. Background of Building By-Laws

Building By-Laws refer to the set rules and regulations for building planning architectural designing enforced by municipalities which are mandatory to be obliged by building owners during building application and building construction.

Ministry of Urban Development (MoUD) had developed and circulated "Model building By-Laws (2014)" as a reference document for new municipalities to formulate building By-Laws.

The Ministry of Federal Affairs and Local Development (MoFALD), immediately after the major earthquake of April 2015, had circulated basic directives (2015) for housing development, urban planning, and building construction for all municipalities to upgrade and formulate building By-Laws considering resilience of the cities from earthquake and other natural disasters.

Similarly, Ministry of Urban Development (MoUD) had published and circulated the Basic Standards on Settlement Development, Urban Planning & Building Construction (2015) (BSSDUPBC 2015) as a guiding document for the new municipalities to formulate complete building By-Laws as per their geo-physical circumstances and conditions. This standard was approved by Government of Nepal on 30 September 2015 was published in Nepal Gazette on 8th April 2016. The first amendment on this standard was prepared and published in Nepal Gazette on 10 April 2017.

Building By-Laws may vary in different municipalities according to the local context, geography, topography such as provision of floor area ratio as per the land use zones, right of ways for local roads etc. However, municipalities cannot make weaker By-Laws than BSSDUPBC 2015 of MoUD.

If any municipality has already applied stronger By-Laws than the BSSDUPBC 2015, the municipality one will prevail.

Building By-Laws for the Construction in Kathmandu Valley, 2064 was approved by Government of Nepal on 1st May 2007 which was effective from 15 may 2007. This By-Laws was amended by the Government of Nepal on 16th November 2008 and 28 June 2010.

The basic criteria of building By-Laws are Right of ways (ROW), front Setbacks, side setbacks, setbacks from river, lake, pond, forest, high tension electric lines, ground coverage, floor area ratio (FAR), light planes, rules for open spaces and so on. The detail description of the basic criteria of building By-Laws has been provided in Annex-2.

Deviations from the building By-Laws may lead not only to the rejection of the building permit during application process but also to the rejection of certifications for the construction of superstructure and issuance of building completion certificates if the construction is found to violate the provisions of the building By-Laws.

Apart from the building By-Laws, provisions of the building code should be followed during construction of buildings.

Masons should understand that violation/ignorance of building code is violation/ignorance of the law of the country and negligence in structural safety of buildings.

Undermining building code means compromising safety of its inhabitants from earthquake disasters which is inevitable in earthquake prone country like Nepal.

Thus, masons should strictly follow Building Construction Working Procedures (BCWP) for getting compliance of both building code and building By-Laws in design/ drawing and in actual construction.

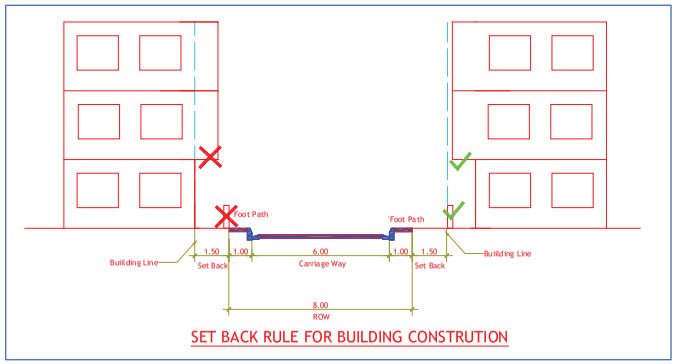


Figure 1: Set back rule for building construction

2.4.3. Category of buildings

NBC 000 categorizes design and construction of buildings into four types according to their level of sophistication.

Classification of National Building Code according to their use

Category	Type of Building Code	Purpose
A	**International State-of-Art** **Applicable codes: NBC 000**	**Applicable to large building structures. The structures must comply with existing international state-of-the-art building codes.**  **(Source: Internet)** **For Example: Constitutional Assembly Building at Baneshwor, Kathmandu**

<table>
<tr><th>Category</th><th>Type of Building Code</th><th>Purpose</th></tr>
<tr><td>B</td><td>Professionally Engineered Buildings
Applicable codes:
<table><tr><td>NBC 101</td><td>NBC 107</td><td>NBC 113</td></tr><tr><td>NBC 102</td><td>NBC 108</td><td>NBC 114</td></tr><tr><td>NBC 103</td><td>NBC 109</td><td>NBC 206</td></tr><tr><td>NBC 104</td><td>NBC 110</td><td>NBC 207</td></tr><tr><td>NBC 105</td><td>NBC 111</td><td>NBC 208</td></tr><tr><td>NBC 106</td><td>NBC 112</td><td></td></tr></table></td><td>Buildings designed and constructed under supervision of engineers, buildings with plinth area more than 1,000 sq. ft., buildings having more than 3 stories, buildings with span more than 4.5 m and buildings with irregular shapes
For example: Multi-Storied Commercial Buildings
 
(Source: Own)</td></tr>
<tr><td>C</td><td>Mandatory Rules of Thumb
Applicable codes: NBC 110, 201, NBC 202, NBC 205</td><td>Buildings of plinth area less than 1,000 sq. ft., less than 3 stories, buildings having span less than 4.5 m and regular buildings designed and constructed by technicians in the areas where professional engineers' service is not available
 
(Source: Own)
For Example: Three Storied RCC framed Structured Residential Buildings.</td></tr>
</table>

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Category	Type of Building Code	Purpose
D	Guidelines for Remote Rural Buildings (Low Strength Masonry/ Earthen Buildings	Buildings constructed by local masons in remote areas and not more than 2 stories  (Source: Own) For Example, Brick or Stone in mud mortar Rural Building with slate/CGI Sheet roofing.

Section 3. General Role and Responsibility of Masons in Building Permit Process

3.1. Legal Position of Masons

1) Basic Standards on Settlement Development, Urban Planning & Building Construction, 2072 (2015)

Clause 13.21."Mason or contractor needs to be trained a minimum of 5 days in Earthquake resilient construction and registered in the local level in order to construct a building with proper supervision form supervision consultant"

2) Building Acts, 2055(1998 AD)

Clause 14. Punishment states,

"(1) If any person or body builds a building without getting its design approved pursuant to this Act or in a manner to be contrary to such an approved design or the standards set forth in the building code, in the case of within the municipal area, the municipality, and in the case of the village development area, the Urban Development Office shall give order to immediately stop such construction.

"(2) If any person or body builds a building without getting its design approved pursuant to this Act or in a manner to be contrary to such an approved design or the standards set forth in the building code, the municipality or the Urban Development Office, as the case may be, may order to demolish such a building or any part thereof and also fine the person or body doing such construction with a sum not exceeding Fifty Thousand Rupees."

"(3) If the municipality or the Urban Development Office, as the case may be, make an order to demolish a building or any part thereof pursuant to Sub-section (2), the municipality or the Urban Development Office, as the case may be, shall write to the concerned officers to withhold the transfer of the title to, or mortgage such, a property to any person in any manner, to refrain from distributing water supply, electricity, telephone etc. to the building so build and to cut off such water supply, electricity, telephone line etc. if already distributed, and the concerned offices shall also do accordingly as requested.

3) Compliance with BCWP

Once masons who are registered in the municipalities and are working on behalf of building owner will be legally bound to follow the provisions of BCWP, endorsed by the municipality. The legal responsibilities for masons as informal contractor for making building compliances in construction are as follows:

- The Mason shall, with due care and diligence, execute and complete the works and remedy any defect therein in accordance with the approved designs and drawings.
- Mason shall take full responsibility for the adequacy, stability and safety of all Site operations and method of construction.
- The Mason shall give prompt notice to the Supervision Consultants, with a copy to the building owner, of any error, omission, fault or other defect in the design which he discovers.
- The Mason shall facilitate to provide the essential quality record of the works to the Supervision Consultant to prove that the building is constructed according to approved drawings
- Masons need to be capable to understand the design drawings, earthquake resistant technology and to have sufficient technique to construct them on site.
- Masons need to strictly follow the provisions of building bylaws enforced by the municipalities.
- Masons need to follow the design and detailing as per approved building design/drawing by municipality and apply earthquake resistant technologies in building construction.
- Masons need to follow the instructions given by the supervision consultant during constructions.
- Masons are responsible for preparing the sites for interim and final inspections by the municipality.
- Masons also need to follow the instructions provided by the municipal engineers during the inspections.

4) Responsibility as per Labor Act

The Mason as an employer should carry the construction works considering the occupational safety and health of labors as per the Labor Act 2017.

Clause 69: Duties of employer towards labor:

a. The duties of the Mason as employer towards the labor in respect of occupational safety and health shall be as follows:
b. To make safe environment for work by making appropriate safety and health arrangements at the workplace.
c. To make provision for the use, operation, storing and transportation of chemical, physical or biological materials or equipment so that it would not adversely affect the safety and health.
d. To provide necessary information, notice and training relating to the safety and health to the labor, as required.
e. To provide necessary training and information in an appropriate language to the labor in relation to the use and operation of the equipment or chemical, physical or biological materials related to the work.
f. To make proper arrangement for the safe entry and exit from the workplace.

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g. To provide personal safety means to the labor as required.

Clause 70. Duties of employer towards non-labor:

a. The Mason as an employer shall make such provision as may be necessary to avoid any adverse effect on the safety and health of any non-labor who walks in and out of, or passes through, the workplace.
b. Where any operating system of the workplace is likely to cause any harmful effect or risk on the safety or health of any person, the Mason as an employer shall make arrangement for giving, putting a signal or providing information in that respect.

3.2. Responsibility of Masons at different stages of building permit process

3.2.1. General Responsibility of Masons for Building Application Stage

1) Participation of Masons in Training Program on Earthquake Resistant Construction of Buildings

- As per new BCWP, all municipalities should organize training programs for masons in regular basis.
- Such training programs should be free-of-cost and local masons should compulsorily participate in such training programs.
- Masons in informal sector of building construction are recommended to be trained or educated from formal institutions.
- They should have enough practical experiences and learning with upgraded skills.
- The masons shall have theoretical knowledge to some extent about the quality of construction materials and workmanship.
- The masons also shall be trained on basic earthquake resistant technology of buildings.

Objectives of the Mason Training programs are as follows:

- To make the local workforce aware on earthquake risk of country and the region and make them realize that earthquakes are common in the region
- To help realize them on the need of earthquake-resistant construction
- To enhance the knowledge and skill of local skilled construction workers (masons, steel fixers, carpenters) on earthquake-resistant construction technology-specially focusing on the mostly prevailing construction typologies and materials, for example on brick and stone masonry construction, reinforced cement concrete construction
- To make local masons aware on the possible options for repair and strengthening of unsafe existing buildings

- To help masons to understand various social consideration for effective technology transfer and help them to realize their role in such technology transfer process and
- To motivate local masons for contributing and promoting for safer construction practices in municipalities

2) Registration of Masons in Municipality

- For enforcement of building code practically in the field, the masons working in informal sector of building should be trained. Only then, building owners can get trained masons in building construction.
- As per new BCWP, the municipalities now onwards should initiate registering masons free-of-cost and should make public the standing list/roster of trained masons.
- So, all masons working at local level should first get five days' training program on earthquake resistant construction of buildings organized by the municipality or other institutions and get registered in the municipality.
- The municipality may ask training certificates, experience certificates and any academic qualification certificates if they have.
- Municipalities shall maintain roster of trained Masons and shall make them public for building construction purpose.
- Sample Application form for registration of Masons in Municipality is attached as **Annex 3.**

3) Contract with Building Owner

- As per new BCWP, the building owner now onwards, mandatorily shall use only registered trained masons for building construction.
- The owner can select registered masons for building construction from the roster of masons maintained by the concerned municipality.
- If the building owner wants to change the masons during construction period, he/she should inform about it to technical section of municipality.
- These provisions have been introduced by the Government to ensure that new buildings are constructed with incorporation of earthquake resistant technology and to improve the quality of construction works.
- For small scale private buildings projects implemented through masons, it is recommended to have formal agreement between Building owner and Masons in the witness of municipality technical section or ward office before commencing building construction works
- The agreement paper shall include minimum clauses, term and conditions including brief specification of works to carry out the building constructions.
- The Mason should confirm working with the building owner and should sign the agreement paper with negotiated quotation/rates for the civil and finishing works.

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- The Mason also should sign commitment paper for complying the building construction with building bylaws, building code and other rules, regulations circulated by municipality.
- The sample contract paper between building owner and the Masons for construction of Earthquake Resistant Construction of Buildings is attached as **Annex 4.**

3.2.2. General Responsibility of Masons for building Construction stage

a) Confirmation of Building permit:

The Masons shall check and confirm the temporary building permission issued by the municipality before the commencing the construction works. Without such permission, the Masons shall not commence the building works.

b) **Confirmation of Design documents**

The Masons shall check and confirm the design documents approved by the Municipality. The Masons also should go through the technical details and specification of the works. In case any defects or unclear indication is found, the Masons shall notice to the Building Owner and Supervision Consultants.

c) **Confirmation of Compliance under the Design documents regarding by-laws**

- Building position and its layout

The Masons shall check and confirm that position and layout of the proposed building meet criteria of prevailing building bylaws of the municipality. The Masons shall consult with municipal technicians or supervision consultant regarding the criteria to be followed for layout and positioning of the building foundations, columns and wall. The Masons shall ensure that the Right of Way (ROW) /Set back rules of access roads are strictly followed and any permanent structures such as ramps, steps and boundary walls will not fall within the ROW/Set Back line. The Masons also shall check that room projections and balconies are also within the setback area.

- Building size and height

The Masons shall check and confirm that the building size and the height defined in the approved design/drawing, meet the criteria of building bylaws of the municipality. If there is any confusion regarding limitations of the size and height defined by the municipality, the Mason shall consult with municipal technician or the supervision consultant for clarification. Generally, limitations of size and height of the buildings depends on land use plan and zones defined by the municipality. The Masons should go through the building bylaws of the municipality before construction of buildings to get basic concept of the criteria to be followed.

d) Confirmation of Compliance under the Design Document regarding NNBC

- Quality of the construction material

The Masons shall obtain the approval from the supervision consultants in advance for using the construction materials such as cement, sand, aggregates, re-bars, bricks, stone, timber etc. The Masons shall cooperate to show sufficient ground that the proposed construction materials are of good quality and will produce sufficient strength required for building. The Masons shall assume that tests shall be required on all materials to be used in the works and on all finished works or part of works. For that the Masons shall cooperate to carry visual observations, manual and lab testing if necessary. The Masons shall coordinate with Supervision Consultant to ensure that all the materials as per the specifications attached with the contract paper and meet the criteria of Nepal Standard.

- Construction methodology

The Masons shall consult with the supervision consultant and get consent regarding the construction methodology to be followed for major items of the works. The building constructions should be carried out using latest equipment, machines and technology available in the market to get the best quality of the works. The Masons shall ensure that the construction methodologies to be applied are in line with specification of works.

- Quality of Workman ship of construction

All materials incorporated and all workmanship performed shall be strictly in conformity with the requirements of the specifications and the Masons shall be responsible for the quality of the works in the entire construction within the contract. The Masons shall cooperate with Building Owner to provide, use and maintain on the site, throughout the period of execution of the contract, laboratory equipment for carrying out on-site tests required for the selection and control of the quality of materials

e) In case of defects

The Masons shall follow the instructions of the supervision consultant during execution of the construction works. Each finished works should be perfect in line and level without any defect. The finished works should be also satisfactory to the building owner and supervision consultant. The Masons shall rectify the defect according to the instruction form the Supervision Consultant during the field monitoring.

f) Record and report to the Supervision Consultant for Four Level Interim Inspection

The Masons shall cooperate to record and report his works with certain evidences utilizing the photos according to the instruction from the supervision consultant. The photographic records should reflect the progress of the works to be included in the technical reports that will be submitted with application for the four level of interim inspections. The Masons shall cooperate supervision consultant to record photographs of major items of the works and critical details to ensure that the structural works are carried in complete compliance of design drawing and building code.

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g) Attendance of Interim Inspection by the Municipality

The Masons shall be present during the interim inspections carried by the municipal technicians. The Masons shall cooperate to record the instructions (both verbal and written) provided by the municipal technician. The Masons will be liable to carry correction measures recommended by the municipal technician during interim inspections.

h) Confirmation of Building permit from Municipality

The Masons shall confirm the permanent building permission issued by the municipality before the construction of superstructure. Without such permission, the Masons shall not commence the building works. The Masons will be responsible for encouraging building owner to follow earthquake resistant technologies and detailing as per approved municipal structural design/drawings during construction works. The Masons should coordinate with supervision consultant to follow provisions of building code for building construction works. The Tips for Earthquake Resistant Construction of Buildings is attached as **Annex 2.**

3.2.3. General Responsibility of Masons for building Completion stage

a) Conduct final check for completion

Masons shall notice to owner on completion of construction works as per design drawing and specifications. Receiving the work completion notice from Masons, Building Owner, Supervision Consultant and the Masons shall verify jointly the building construction works. The Masons need to rectify the defects any item of works in his own cost and finalize other additional works as per the punch lists.

b) Record and report the works to the Supervision Consultant for final inspection

The Masons shall cooperate with Supervision Consultant to keep record of all completed items and elements of buildings, photographic evidences of major items, compressive test reports of concrete, field test and manufacturer test reports of approved construction materials and finishing items. These records and reports are required for the final inspection of the building. Based on these records, reports the supervision consultant confirms the compliancy of building with building bylaws/building code and prepare final completion report for municipality.

c) Attendance of Final Inspection by the Municipality

The Masons shall be present during the final inspection carried out by the municipal technicians. The Masons shall cooperate with building owner to repair or maintain any public infrastructures such as road, footpath, water supply line, sewer line, storm water, drainage or side drains of the road if these are damaged during construction. The Masons should cooperate with building owner to remove and clean off the left-over construction materials and debris from the building premises. The Masons shall cooperate to record the

instructions (both verbal and written) provided by the municipal technician. The Masons will be liable to carry correction measures recommended by the municipal technician during final inspection

d) Confirmation of Completion Certificate from the Municipality

The Masons shall also confirm with the building owner about the issuance of completion certificate by the municipality after final inspection of completed building by the municipal technician. After receiving the completion certificate from the municipality, the building owner may provide work completion letter to the Masons.

3.3. Punishments to defaulters

a) Actions by the building owner:

- If the building owner found that the Masons' work is unsatisfactory or quality of materials used is inferior or the workmanship is poor, the building owner can cancel the agreement and remove the Mason from the work based on the agreement paper between building owner and Mason.
- If the Masons do not follow the instructions provided by the supervision consultant during the technical supervision and monitoring of construction works, or the supervision consultant complains building owner about Masons' poor performance of the work, the building owner has right to remove Masons from the work based on the agreement paper between building owner and Masons.
- The building owner should inform municipality about changing of the Masons for building construction.

b) Actions by the Municipality

- **Warning Letter at the First Occurrence of Unethical Activity:**

At the first instance of notice of occurrence of unethical activity by the Masons such as field constructions not complying with approved building design and drawing or if the Masons work is not satisfactory or some serious discrepancies were made in construction, municipality shall issue a written warning letter to the Masons notifying not to repeat such activity and that at the second occurrence, the Mason shall be debarred from the work.

- **Debarring the Mason from work at the Second Occurrence of Unethical Activity:**

When the Masons is found to have done unethical activity for the second time even after the issue of warning letter at the first occurrence, municipality shall black-list the Masons temporarily for a period of six months debarring the Masons from working within the municipality.

- **Black-listing at the Third Occurrence of Unethical Activity:**

Municipality shall black list the Masons completely and debarred him/her from working in the municipality as a registered Masons if such activity is found to have repeated for the third time. Names and addresses of such Masons who have been debarred shall be published on the website of the municipality. At the same time, municipality shall cancel the registration of the Masons and remove his/her name from the municipal roster.

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Section 4. Technical details of the task for Masons General

4.1. Why buildings fail during earthquake

Buildings are generally failed during earthquake due to lack of strength and ductility, that is introduced by following causes:

- Design deficiency i.e. failure to understand failure mechanism, deficient code provisions and calculation
- Construction deficiency i.e. lacks of quality assurance: material, construction details

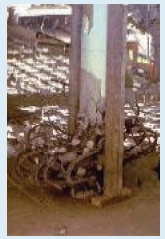
1) Failure of Reinforced Cement Concrete (RCC) framed Buildings during earthquake

Reinforced Cement Concrete (RCC) framed building are failed due to following reasons:

- Inadequate size of foundations, columns Beams
- Deficiency in Detailing (Beam/Column joints, Lapping, spacing of lateral ties/stirrups, sill/lintel bands for infill walls
- Soft story
- Short columns
- Deficiency in quality of concrete works

a) Undefined Load path • **Both the pictures show the damages caused by an earthquake at the junction of column and beam.** • **In first building, the beam is resting on the next beam and there is no column at the joint. This causes heavy torsion on that section.** • **In the second building, a portion of the joint is shown where a beam is joined with a next beam and which again joins with the third beam and at both the joint there is no column at each joint.**	 **Source: Training Manual for Urban Masons, DUDBC**

b) Soft Storey Effect in RC Frame • Soft storey effect happens when any storey is weaker/less stiff than other stories. • Examples could be open bottom storey such as shops, parking space and more compact upper stories (constructed for residential or office space). • More walls in upper storeys make it stiffer than lower storey.	  **Source: Training Manual for Urban Masons, DUDBC**
c) Eccentric Beam Column Joint • The first picture of this slide shows eccentric beam column joint. • In the second picture, damage was • due to eccentric beam column joint.	  **Source: Training Manual for Urban Masons, DUDBC**
d) Pancake Damage • This picture shows pancake damage of a RC framed hotel building. • This building collapsed in Kathmandu at Dallu, during earthquake of April 2015. • It shows RC framed construction are not immune to earthquake damage unless designed and constructed properly.	 **Source: Training Manual for Urban Masons, DUDBC**

e) Failure due to lack of Lateral ties • These pictures show column failure because of lack of stirrups. • Because of very little stirrups, the column bursts • The third picture in shows too much cover on one side where as almost no cover on other side. • Though there are a lot of steel bars in both the columns, the column failed because of lack of stirrups. • It shows that vertical bars are not only enough for strength of column. Furthermore, in third picture, all the bars are lapped in one location and at the bottom of the column.	   **Source: Training Manual for Urban Masons, DUDBC**
f) Failure due to short column effects • Upper part of the column suffered very little structural damage compared to middle part. • Though the longitudinal bars are same, the difference in quantity of transverse stirrups have made total difference.	  **Source: Training Manual for Urban Masons, DUDBC**
g) Anchorage Failure of Columns • These pictures show column failure because of insufficient anchorage between lower and upper column bars and lack of sufficient stirrups in the anchorage region. • Because of insufficient lapping length and very few stirrups, the column slipped easily. • The picture also shows improper position of splicing the vertical bars and all the vertical bars are lapped at the same location.	  **Source: Training Manual for Urban Masons, DUDBC**

h) Failure of Staircase • **Staircase is a sensitive element of a building.** • **Specially for buildings with more than one storey, it is a staircase from where people escape and if staircase collapses then there may be a serious problem.** • **So, staircase should also be given due attention while constructing a building.**	 **Source: Training Manual for Urban Masons, DUDBC**

a) Failure of Load Bearing Masonry Buildings during earthquake

Load bearing Masonry Buildings are failed due to following reasons:

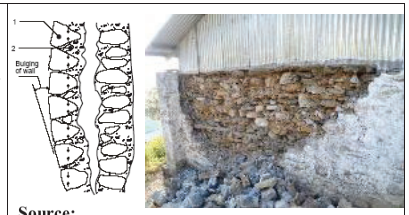
- Inadequate integrity Between walls, between floor/ roof components, between floor/ roof and walls
- Inadequate out-of-plane flexural capacity
- Inadequate in-plane strength of diaphragm
- Deficient configuration: unbalanced stiffness
- Large openings
- Weak mortar
- Poor workmanship

Diagonal Cracks from corner door/window opening • **This photograph shows a masonry building in which cracks are initiated from the corner of the window during the earthquake.** • **A masonry wall subjected to in-plane shaking may get sliding, rocking or diagonal tension cracking depending upon many factors.**	 **Source: Training Manual for Urban Masons, DUDBC**

Failure of Gable Wall • **The problem with duo-pitched (two slopes) sloped roof buildings is failure of gable walls.** • **Gable wall in a building is at the highest level and the displacement of wall at the top is more than that at the bottom.** • **Usually, these gable walls are untied at the top. Also, the height becomes more in gable walls so this wall can fall more easily.**	 **Source: Training Manual for Urban Masons, DUDBC**
Failure of wall at one direction • **The flexural strength of masonry wall is very less. Therefore, during earthquake shaking, masonry wall may be damaged due to out of plane toppling.** • **This picture shows a masonry building suffered by out of plane collapse during earthquake.**	 **Source: Training Manual for Urban Masons, DUDBC**
Failure of long unsupported wall • **Long unsupported walls can easily fall down in an earthquake.** • **They may fall even in normal condition if not properly constructed.** • **In an earthquake lateral force hits the wall horizontally throughout the wall and most at the top of the wall.** • **The more the length to thickness or height to thickness ratio of walls the easier to fall down.**	 **Source: Training Manual for Urban Masons, DUDBC**

Failure of Roofing • **The roofing failed due to weak connection between floor to roof and also within roof members**	 **Source: Training Manual for Urban Masons, DUDBC**
Corner Cracks due to Toothed Joints • **The junctions are inherently weak locations and constructing the junction with tooth joint caused maximum damage during the earthquake.**	
Failure wall due to opening very near to corner • **The photograph presents overturning of wall because of lack of support. As the door is placed at the corner the wall does not have any support.**	 **Source: Training Manual for Urban Masons, DUDBC**
Damages at joints • **In the picture, the smooth vertical surface shows that there was no connection between inner and outer walls. As a consequence, during earthquake, the outer wall overturned.** • **It is also visible window openings are large and are placed closer to the wall junctions which made that part weaker.** • **Maximum stresses develop at the corners and joints during earthquake and walls start separating from the joints or corners and finally the building leads to collapse.**	 **Source: Training Manual for Urban Masons**

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Delamination of walls • **One of two layer of the wall get collapsed due to weak bonding between two layers i.e. lack of through stones**	 **Source: Training Manual for Urban Masons, DUDBC**

4.2. Critical Control Points under BCWP:

To avoid the building damages and failure described in aforementioned Clause 3.1, BCWP aims the at fundamental quality of structural works especially of rebar arrangement and concrete strength. To control such quality, following two inspections and testing methods are highlighted under BCWP:

1) Inspection of the rebar arrangement before the casting at Interim Inspections by the Municipality

The Masons shall demonstrate the rebar arrangement to the Municipal Engineer for Interim Inspections. In case that the Masons is not able to demonstrate all the rebar arrangement in one-time, alternative evidences such as photo report can be acceptable. The Masons shall consult with Supervision Consultant in advance if necessary.



Rebars layout for Foundation and Strap Beam (Source: JICA Project for promotion of NNBC)

2) Compressive strength test of concrete for every story

In case of RC structure which shall conform to NBC 110, 105, 201, 205, the Masons shall provide the Supervision Consultant required number of testing cube sampled at every casting depending on its concrete volume. In case the strength is not confirmed, the Masons may be instructed to demolish the casted structure. Therefore, the Masons is strongly recommended to ensure the strength of the concrete in advance of casting on site in order to avoid the incompliance of required concrete strength.




Photos of sampling and comp. test (Source: JICA Project for promotion of NNBC)

4.3. Record and report the work

To ensure the quality of the building, physical inspection by the Supervision Consultant is the best way. However, in case the supervision consultant is not available fulltime on site, alternative evidence such as photo report will be acceptable on the condition that the photos can clearly demonstrate the details of the works. Followings are the example of photo report to the Supervision Consultants.





Re-bars Layout for columns, beams and slabs (Source: JICA Project for promotion of NNBC




Photo of Concrete Mixing

Photo of Test Sampling for Compressive strength test

4.4. Fundamental Quality Assurance under BCWP (RCC Structure)

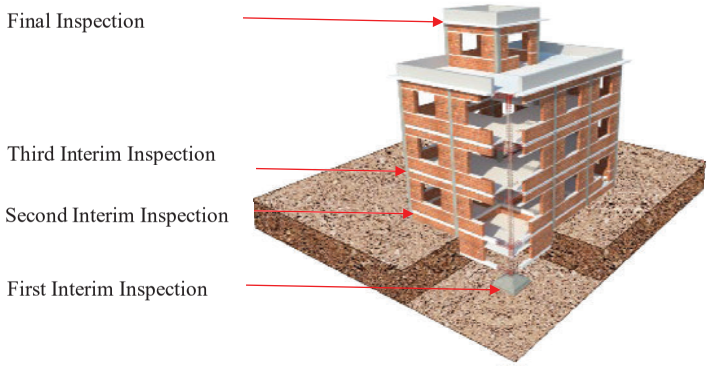
Construction Works under BCWP shall include, but not limited to following sequence:

S. No.	Check works	Check method
1.	Preparation	
1.1	Confirmation of Approved Drawing	Document Check
1.2	Confirmation of Building Contract	Document Check
2.	Groundwork	
2.1	Setting out	Measurement
2.2	Excavation works	Visual check and measurement
2.3	Bearing soil (or Piling works)	Visual Check and soil sampling
2.4	Soil Treatment for foundation	Visual check
2.4	Backfilling	Visual check
3.	RCC Works	
3.1	Re-bar material	Document Check and Visual check
3.2	Concrete material	Document Check and Visual check
3.3	Re-bar arrangement	
1)	Foundation	Visual check
2)	Column	Visual check
3)	Beam	Visual check
4)	Beam and Column Joint	Visual check
5)	Slab	Visual check
6)	Splicing of Bars	Visual check
3.4	Form works up to plinth level	
3.5	Mix proportion & Concrete Mixing	Document Check and Visual check
3.6	Concrete Casting	Visual check
3.7	Concrete Strength Test	Test data
3.8	Curing of concrete	Document check and Visual check

4.5. Details of Four Level Interim Inspections:

Description about for Four Level of Inspections by Municipality

As per BCWP, municipality technicians will inspect the building construction at four stages namely at foundation before casting of footing, at plinth level after casting of plinth tie beams, at first floor level before casting of floor slab and finally at complete finishing of the building. The Masons has to make preparation of sites as instructed by the supervision consultant.



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Source: Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

- For first site inspection, the Masons has to prepare all foundations with laying of re-bar mesh, erection of vertical bars of column and reinforcement of footing ties for the case RCC framed structure buildings. In case of Load Bearing Wall Structure Buildings, the strip footing with foundation need to make ready with vertical bars at all corners and junctions.




Source: Own

- For 2nd inspection the contractor has to complete RCC work of plinth tie beam for RCC framed structured building and in case of Load Bearing Wall Building plinth band has to be completed. The main bars, vertical stirrups, beam column joint detailing, lap positions for tie beam and other details should be as per design drawing and compliant with building code.




Source: Own





Photo of Concrete Mixing

Photo of concrete casting for substructure

Photo of Substructure before back filling

Required evidence in Supervision Report

- For the third interim inspection, the contractor has to complete all rebar works for beam and slab at first floor with necessary centering and shuttering. The main bars, shear reinforcements, beam column joint detailing, beam rebar lap positions and other detailing should be as per design drawing compliant with building code.




Source: Own

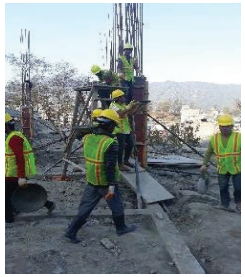



Photo of rebar arrangement of 1st floor Column

Photo of casting of the Columns

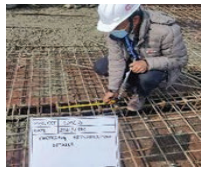
Inspection record of column rebar Test record

Required evidence in Supervision Report

- For the final inspection, the contractor has to complete all structural and finishing works of the building including door/windows fitting, cement plaster and at least one coat of painting. The whole building should be compliant with building bylaws and building code.




Source: Own





・Inspection record of rebar ・Sampling of Test cubes ・Test record

Required evidence in Supervision Report

- The Masons shall facilitate supervision consultant and building owner for collecting all necessary documents including quality testing reports and photographic evidences of structural detailing works.

S. No.	Inspection	Timing	Main Check Points but not limited to
1	1st Interim Inspection	Before casting of Foundation	• Setting out of column and Building size • Excavation depth and bearing soil condition • Piling works record (if any) • Rebar arrangement of foundation and Column • Technical report by Supervision Consultant

2	2nd Interim Inspection	After concreting of Plinth Tie Beam	• Setting out of column and Building size • Back filled soil condition • Rebar arrangement of Column • Technical report by Supervision Consultant (incl. Rebar and Concrete)
3	3rd Interim Inspection	Before the casting of first floor beam & slab	• Rebar arrangement of beam and slab • Technical report by Supervision Consultant (incl. Rebar and Concrete)
4	Final Inspection	After completion of building	• Final figure of the building (Building Height) • Technical report by Supervision Consultant (incl. Rebar and Concrete)

4.6. Materials quality and storage check

4.6.1. Material quality

The materials to be used in the works shall be of the qualities and kinds specified. Selection and use of appropriate and good quality materials is a prerequisite for quality construction of building. Materials shall be delivered to the works before it is required for use in work. Delivery shall be made sufficiently in advance of constructional requirements to enable samples to be selected, tested and approved by the Supervision Consultant.

a) Cement

- Cement is a binder, a substance which sets and hardens independently, and can bind other materials together.
- The most important use of cement is the production of mortar and concrete—the
- bonding of natural or artificial aggregates to form a strong building material which is durable in the face of normal environmental effects.
- The cement may be of various types such as Ordinary Portland Cement (OPC), Portland Pozzolana Cement (PPC), low heat cement, rapid hardening cement, expansive cement, white cement etc.
- Cement used for concrete shall be any of the Portland cement conforming to the requirements of NS 49-2041.
- Cement, which is stored on site, shall be kept in a room that provides adequate protection against moisture and other factors which may promote deterioration
- Cement shall not be kept in storage for longer than six weeks.

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Grade of Cement

The grade of cement indicates the compressive strength of cement. Higher the grade of cement superior will be the quality and strength of cement used in construction work. Cement grade directly affects the compressive strength of the concrete mix. In concrete, cement is an essential ingredient that play important role in binding all other ingredients together and make the solid and hard concrete product.

The strength of cement is denoted by the grade of cement. There are mainly 3 types of cement grades available in the market which can be used for building construction.

Different grades of cement are as follows,

- OPC 53 Grade
- OPC 43 Grade
- OPC 33 Grade
- PPC Grade Cement
- PSC Grade Cement
- Super Grade Cement

OPC 33 Grade

OPC 33 grade cement means ordinary Portland 33-grade cement. In these, the number 33 represents the compressive strength of cement at end of 28 days of curing and tested as per standard code recommendation. It means, if cement mortar cube is tested for compressive strength after 28 days, it should be more than 33 N/mm2 for OPC 33 grade cement.

OPC 43 Grade Cement

The OPC 43 Grade cement gives compressive strength at end of 28 days curing is 43 N/mm2. These cement grades are used for making a concrete mix of higher grade up to M 30 grade of concrete.

OPC 53 Grade

The OPC 53 grade cement is the most popular grade of cement used in construction. In fact, all the construction work where it is a bridge, road, dam, building, water tanks, tunnel are using OPC 53-grade cement. OPC 53 means, It gives compressive strength of 53 N/mm2 when it is tested for compressive strength as per NS standard.

PPC Grade of Cement

PPC full form is Portland Pozzolana cement is made of gypsum and pozzolanic material and fly ash which is waste material of power plant. These types of cement are used where low

heat of hydration is required during concreting work. It is mostly suitable for mass concrete work like bridge and dam construction work. It offers a good finished surface of the concrete.

PSC Grade of Cement

PSC means Portland Slag Cement is produced by internal grinding of Portland cement clinker. This cement is manufacturing use partial slag and partial ordinary Portland cement. As the slag is a waste product of power plant is eco-friendly construction materials.



Source: Own

b) Aggregates

- Coarse aggregate shall be clean hard and durable crushed rock, crushed gravel or natural gravel
- All aggregates shall not contain any deleterious materials.
- The aggregate should be completely free from lumps of cray or organic and vegetable matter, fine dust etc.
- National occurring stone aggregates and gravel, and brick aggregate are commonly used as coarse aggregates.



Source: Own

c) Sand

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- Sand shall be clean river or pit sand of approved quality and free from salt, earth, dust or other organic impurities. If required, it shall be washed with clean water.
- Coarse sand for concrete work shall be from local rivers or from any other place and shall conform to cement concrete specification.
- It should be chemically inert.
- In should be clean and coarse.
- It should be free from any organic or vegetable matter.



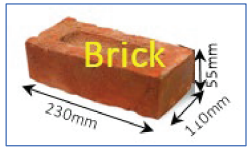
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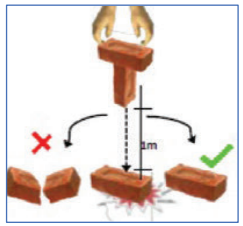
d) Bricks

- The bricks shall be free from cracks, flaws, grit and other impurities such as lime, iron and deleterious salts.
- All bricks shall be well burnt, sound and hard with sharp edges giving a ringing sound when struck with a mallet.
- Bricks shall not absorb water more than one sixth of their weight after one hour of soaking by immersion in water.



Source: Own





Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

e) Reinforcement Steel Bars

- Reinforcement shall be free from pitting due to corrosion, loose rust, mill scale, paint, oil, grease, adhering earth, ice or other materials that may impair the bond between the concrete and the reinforcement or that may in the opinion of the Engineer cause corrosion of the reinforcement.

- This requires not only purchase of good quality steel reinforcement and proper storage of it, but also sequencing the construction process to minimize the exposure of the reinforcement
- Strength and ductility of the reinforcement to be used shall confirm to relevant NS standard.
- Bars shall comply with the dimensions described in the drawings and shall not break in single bending.
- The steel used for reinforcement shall be Thermo-mechanically treated (TMT) Bars with 0.2 Per cent Proof stress/ yield stress, Min, N/mm2.
- The minimum tensile strength shall be 10 Per cent more than the actual 0.2 per cent proof stress/yield stress but not less than 565.0 N/mm2.
- It shall have no crack, scale or rust. Binding wire used to bind reinforcements shall be annealed galvanized binding wire of 20 gauge.





Source: Own

f) Scaffolding

- Scaffolding shall consist of timber and necessary battens and planks.
- All scaffolding members before installation shall be checked for their strength and stiffness and tied up properly.
- Steel scaffolding if available is preferred and be used where necessary. It shall be erected on double supports.
- Holes shall not be made in wall for supports.
- Planks shall be fitted and tied together. In case of finishing work such as plastering, painting and distempering, no part of the scaffolding should touch the structure.
- Where ladders are used, gunny bags shall be tied up at the ends to prevent any damage to work by sliding or tipping.



Source: Own

g) Stone

- Building stone shall be hard, tough, sound and durable, hammer dressed to secure close joints so that the stones when laid will come in the close proximity.
- Stones shall be fairly equal in size and every stone shall be fitted to the adjacent stones.
- Face stone shall be comparatively larger and uniform in size and color to give a good appearance.



Source:

Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

h) Timber

- Generally, the timber shall be Sal wood unless otherwise stated of the best quality obtained from an approved saw mill.
- Timber for carpentry shall be straight and free from twist, sapwood, shakes, dead and loose knots, worm holes, other holes, signs of decay and other defects, and seasoned.
- All the timber shall be seasoned and free from decay, harmful fungi and insect attacks and from any other damage of harmful nature which will affect the strength, durability, appearance or its usefulness for the purpose for which it is required.
- The minimum compressive strength of the timber shall be 70 kg/cm2.



Source: Own

i) Water

Water shall not produce any objectionable stain or unsightly deposit on the surface.

- Water to be used in mixing concrete shall be free from injurious amounts of oils, acids alkalis, organic material or other deleterious substances.
- It should be as clean as drinking water.

Source: Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

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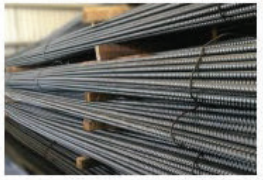
4.6.2. Material Storage

1) Storage of Cement



Cement should be stored in a dry place, stacked in regular piles not exceeding ten bags and should be effectively protected from moisture and contamination so that there are no losses, formation of lumps and to ensure that proper quality is maintained. Pile of cement in storage should be at least 450 mm apart from walls. Cement piles should maintain in the sequence of entry date and first in first out from store should be maintained.

2) Storage of Rebar



Rebar for reinforcement should be stored in such a way as to prevent distortion and corrosion. Care should be taken to protect the reinforcement from exposure to adverse atmosphere during storage, fabrication and use.

3) Storage of Timber with seasoning provision

Fresh timber has water in the form of sap and moisture inside it. Hence, timber needs to be dried before being used. The process of drying of timber is known as the seasoning of timber and the moisture should be removed during seasoning under controlled conditions as nearly possible at a uniform rate from all parts of the timber.

Stacking of Timber

- Timber should be arranged in stacks with minimum height of 150mm above the ground level.
- The height of stacks should be 1.5 – 2.0 meter.
- Place heavy weights on the top of the stack to prevent warping



Source: Own

4.7. Construction site preparation check

4.7.1. Construction site safety

- The masons should coordinate with the building owner for construction safety of the workers, supervisors, third party and make necessary provision for fire safety of the site, safety from electric shocks and safety from other hazards.
- Masons should coordinate with building owner for providing safety kits for the workers such as hard hat/ helmet, gloves, boots & safety belts etc.
- Suitable lighting should be provided for adequate illumination at place of work
- Safety net should be provided enveloping the façade of the building.
- The masons should coordinate with the building owner for ensuring that work areas are adequately marked and that adequate temporary fencing, cones, flags, and temporary markings are available and used at all times.
- The masons should take all measures for the protection of public properties such as public roads, electricity and telephone lines, sewer lines, cables, drains, etc. due to the construction work.

4.7.2. Confirmation of Building Position (Setting out)

Layout of the buildings

- The building layout is first and crucial step of building construction. Proper marking of the grid lines should be done.
- The center lines of grids at x and y direction should be at accurate right angle. The grid lines should be cross checked for right angle with diagonal dimensioning.
- End points of grid lines should be fixed permanently using wooden pegs/posts enclosed by brick/stone masonry at certain distance from the foundations as the reference points for construction of substructure and superstructures.
- The columns and walls should be in grid at both orthogonal directions.
- During the period of Commencement of works the Masons shall survey the construction area and confirm the levels. The Masons shall immediately notify the Supervision Consultant of any discrepancies and shall agree with the Supervision Consultant any amended values to be used during the contract, including replacements for any stations missing from the original stations.
- The Masons shall check, replace and supplement as necessary the station points and agree any revised or additional station details with the Supervision Consultant.
- All stations and reference points shall be clearly marked and protected to the satisfaction of the Supervision Consultant. The Masons shall establish working Bench Marks tied with reference stations soon after taking possession of the site. The

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coordinates and the elevations of the reference stations shall be obtained from the Supervision Consultant. The working Bench Marks shall be near all major/medium structure sites. Regular checking of these Bench Marks shall be made and adjustments, if any, got agreed with the Supervision Consultant and recorded.

- The Masons shall be responsible for the accurate establishment of the center lines based on the Drawing and data supplied. The centerlines shall be accurately referenced in a manner satisfactory to the Supervision Consultant. A schedule of reference dimensions shall be prepared and supplied by the Mason to the Supervision Consultant.
- The existing profile and cross-sections shall be taken jointly by the Supervision Consultant and the Masons. These shall form the basis for the measurements and payments.



Source: Training Manual for Urban Masons, DUDBC

4.7.3. Confirmation of bearing method and its capacity

The Masons shall coordinate with supervision consultant for ensuring that the bearing method specified in the design drawing adequately shows the bearing capacity. In case there is any inadequate situation, the Mason shall inform the supervision consultant and follow the instruction by the supervision consultant.

a) Confirmation of Bearing Capacity of Soil

- Confirmation of bearing of footing soil is most important stage of construction. Because defective work at this stage of construction is the most critical and the most difficult to repair.
- Basically, geo-technical investigation confirms the bearing capacity of the site and it determine type of foundation selection.

- However, for the buildings of low budget, geo-technical investigation may not be conducted, and the structure design of foundation may had been done with assumed bearing capacity.
- In the situation, Supervision Consultant should confirm considered bearing capacity of footing base by the structural designer for foundation design and basis of the assumption.
- The information should be available in design report/Structure design of foundation. Considered bearing capacity may be confirmed at the site can be done as follow:

  (1) Dig at least 2 pits of size 1mx1mx up to 0.5m below footing bottom level and inspect type of soil.

  (2) Observe ground water level.

  (3) The observed soil in the pit shall be classified as per the table of NBC 205.

- Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils.
- Type of the soil should verify with soil assumption of design report.
- If soil of site is found suspicious then recommend asking owner to conforming with design engineer.
- A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.

(1) Dig a pit of 1mx1mx1m

(2) Fill the pit with the same soil with simple compaction.

(3) If pit is not filled with the soil, then soil is weak

(4) If pit is just filled with the soil, then soil is medium type

(5) If soil remains after filling the same pit, then soil is hard.

S.N.	Type of Foundation Material	Soil Classification
1	**Rocks in different state of weathering, boulder bed, gravel, sandy gravel and sand-gravel mixture, dense or loose coarse to medium sand offering high resistance to penetration when excavated by tools, stiff to medium clay which is readily indented with a thumb nail.**	**Hard**
2	**Fine sand and silt (dry lumps easily pulverized by the finger), moist clay and sand-clay mixture which can be indented with strong thumb pressure**	**Medium**
3	**Fine sand, loose and dry; soft clay indented with moderate thumb pressure**	**Soft**
4	**Very soft clay which can be penetrated several centimeters with the thumb, wet clays**	**Weak**

b) Piling works

Based on method of construction piles may be

1. Driven piles and
2. Bored/Drilled and cast-in-situ piles.

Driven piles are more mechanical and shall be done as per standard specification.

The description of installation of Bored/Drilled and Cast-In-Situ Piles are as follows:

- Before starting of drilling, filling materials i.e., reinforcement cage, dry mixed concrete in mixture in ready condition and vibrators should be in ready position.
- Topsoil needs to be cut-off and levelled off to same plane so that the depth of the drilling remains constant throughout all area.
- Drilling may be mechanical or manual. The works shall be performed under recognized and approved methods, using materials and equipment meeting specifications. Casing pipe shall remove after completion of drilling work.
- Any disturbance that occurred due to the condition of the soil, i.e., hard strata found, shall be reviewed and decided to compliance of design. Provisions to be made for other disturbance such as dewatering, erosions etc. which might occur during drilling of hole.
- The Masons should consult with supervision consultant to conduct a pre-construction survey of the nearby properties before commencing the piling work so that all pre-existing conditions are recorded.
- The owners of neighboring property should be given a copy of the survey report, which can be used as a reference for any future disputes or damage claims by any neighbors.
- The Supervision Consultant shall conduct close monitoring of the work and any unwanted effect should be proceeding with temporary halting of the work.
- In the case, shall review and consider other systems or additional measures to prevent further damage.
- Filling in the bored columns perform simultaneously as the drill works progress. Once the pile installation is completed, the site must be cleared and rendered level ready for the structure layout and the next phase to begin, as well as verification of proper placement of all piles in relation to the structural needs and drawings.

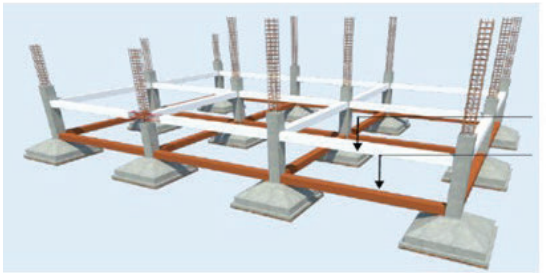
c) Laying of foundations

- Foundations should not be laid on the loose or fill up ground and should go up to firm ground.
- All foundations should be laid in a level
- If the soil is very weak, it is recommended to provide 300 mm thick gravel packing before laying the foundation.
- Foundation should not be laid on water-logged soil. Water needs to be pumped out and gravel packing can be provided if the soil is swampy.

d) Improving bearing capacity of Soil

If the foundations are left open for one rainy season it will enable the soil to settle down, and it will also be known whether the natural movements of the soil below due to increment of moisture are likely to cause any damage. Foundations in bad soil can be improved by:

- Increasing the depth of the foundation except when the material grows wetter as the depth increases.
- Compacting the soil by ramming
- Ramming in sand, gravel, moorum, broken stone or brick bats in situ be. tween the foundation concrete and soil. This is useful for silt or black cotton, soils and also clayey soils.
- Removing the poor soil and filling the gap with sand, rubble stone, gravel or other hard material. This increases the bearing power to about twice its original value. This method is especially useful for black cotton soils. Cement grouting in rammed materials will make the foundations much harder.
- Draining out water from wet foundations.
- Driving piles, either of wood or concrete, or driving and withdrawing piles and filling the holes with sand or concrete. This will increase the density of the soil.
- Artificial stabilization can be used to seal off permeable strata for deep excavations or to give soft soils additional strength if they are likely to flow. Cement grouting: water bearing gravel and coarse sand can be made very much permeable by pumping cement grout into them.



Source: Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

4.8. Workmanship

- Construction work should include the best practices and workmanship for quality product. Workmanship plays a vital role in construction industry in Nepal as most of the work types are manual.

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- In load bearing masonry and reinforced concrete frame building construction, it is very important to have qualified worker's team with appropriate experience and competent workmanship.
- It is also very important to have a feasible and well-thought construction sequence to let the worker's team perform their tasks in a proper and timely manner.
- The design engineer and the architect play important roles in ensuring that the design is feasible and can be understood by construction team.
- Workmanship is the last, but vital, link in converting design to reality.
- These worker's team are the last link in the chain of construction and, therefore, are literally the ones whose actions make the elements.
- The design engineer should keep the structural configuration and detailing of the structural system and its sub-elements as simple and straight forward as possible.
- It is good practice to use standard or typical detailing as much as possible.
- Of course, ultimately, it is the responsibility of the whole building team from the architect and the design engineer to the field worker's team to construct building successfully.
- Workmanship related to load bearing masonry and reinforced concrete frame building constructions are described below

4.8.1. Concrete works

a) Concrete Mixing

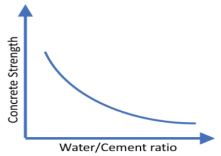
- The cement and aggregates shall be thoroughly mixed together in the specified proportions, in a batch type mechanical mixer.
- All the cement and aggregates constituting a batch is mixed till the mix is of uniform color. The mixing time in no case shall be less than one minute.
- If the drum rotates at lower speeds, the minimum period shall be increased inversely proportional to speed.
- The period of mixing shall be measured from time when all the materials including water are put in the drum.
- The entire contents of the drum shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
- No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.



Source: Own

b) Water/Cement Ratio

Water/ cement Ratio is the most critical factor for concrete strength. The more water concrete contains, the less strength concrete results. It was frequently observed on site that the too much water for concrete workability result in the shortage of concrete strength. So, the Contractor shall strictly pay attention to measure the water according to the specifications.



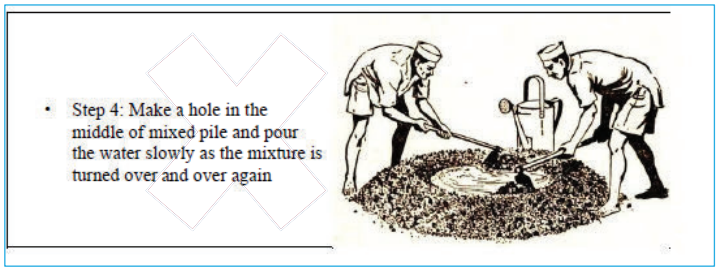
- The quantity of water for nominal mix of concrete is tabulated in the table below. The nominal mix concrete may be used for concrete of M20 or lower.
- However, for design mix the quantity of water depends on kind of sand, aggregates, cement and type mixes. So, the Contractor is strongly recommended to conduct Trial Mix for the confirmation of concrete strength in advance of actual casting.

	Cement x 1bag =50kg=35liter	Sand	Aggregates	Water (litre)
M15	**1**	**2**	**4**	**32**
M20	**1**	**1.5**	**3**	**30**
M25	**1**	**?**	**?**	**?**

Example of Typical Mix proportion for reinforced concrete

Source: IS 456:2000

Manual Concrete mixing is no longer allowed for RC structure according to NBC 110. The Contractor shall mix the concrete only with the mechanical mixer.



Source: Manual for Mason Training on Earthquake Resistant Construction of Buildings, DUDBC

- However, for remote and hilly areas of Rural Municipalities where the mechanical mixer machines are hardly available or very difficult to transport, the manual mixing may be allowed only on the following condition.
  1. The mixing condition, equipment and mixed proportion including extra cement shall be confirmed by the Supervision Consultants in advance.
  2. The cement, sand, aggregates and water shall be thoroughly mixed together in the specified proportions in **an enclosed waterproofed box suitable for the batch size.**
  3. All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than two minutes by two persons.
  4. If the manpower is short, the minimum period shall be increased inversely proportional to manpower.
  5. The period of mixing shall be measured from time when all the materials including water are put in the drum.
  6. The entire contents of the enclosed box shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
  7. No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.
  8. Compressive strength test shall be conducted as well as Mechanical mixing concrete.

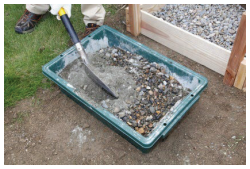
- The steps of manual mixing are illustrated as below.



1. Prepare an "Enclosed Waterproofed Box" suitable for the batch size



2. Mix cement and measured sand in dry condition



3. Mix measured aggregated and shovel from the bottom to surface



4. Pour the measured water slowly



5. Mixture is turned over again until certain workability comes up

c) Placing & Compaction of concrete

- Concrete shall not be allowed to fall freely through a height of more than 1.5m. Fresh concrete shall not be placed against concrete that has been in position for more than 30 minutes unless a construction joint is formed.
- The placing and compaction of concrete shall at all times be under the direct supervision of supervision consultant.
- Regular Slump test should be carried out to control the addition of water and to maintain required consistency.
- Concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against the formwork and around any reinforcement and other embedded item, without displacing them. Care shall be taken at arises or other confined spaces. Successive layers of the same pour shall be thoroughly worked together. Concrete shall be compacted with the assistance of mechanical immersion vibrators.





Source: Own

d) Curing of Concrete

- Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperatures differentials within the concrete sufficient to cause cracking.
- Curing shall be continued for as long as may be necessary to achieve the above objectives but not less than seven days
- The curing process shall commence as soon as the concrete is hard enough to resist damage from the process.
- Exposed concrete surfaces shall be closely covered with impermeable sheeting, properly secured to prevent its removal by wind and the development of air spaces beneath it.
- If it is not possible to use impermeable sheeting, the Mason shall keep the exposed surfaces continuously wet by means of water spray or by covering with a water absorbent material which shall be kept wet.





Source: Own

e) Remedial Treatment of Concrete Surfaces

- Any remedial treatment to concrete surfaces shall be inspected immediately after the stripping of formwork and shall be carried out within 2 hours.
- Surface defects such as small areas of **honey-combing** cavities, large isolated blow holes, broken corner edges, etc., shall be repaired with mortar consisting of a cement and sand ratio equal to that of the concrete being repaired.



Source: Own

- Under no circumstances will surface repairs be allowed where **reinforcing steel is exposed**. In this case the Mason shall put extensive remedial works, such as demolition of concrete, forward.

f) Cover of Concrete

- Cover is defined as the distance between the outer surface of the concrete to the inserted reinforcement.
- Cover to concrete is provided to protect the steel reinforcement bars (re-bars) from environmental effects to prevent their corrosion; to provide thermal insulation, which protects the reinforcement bars from fire, and; to give reinforcing bars sufficient embedding to enable them to be stressed without slipping.

Unless otherwise described, the clear cover of concrete to the reinforcement shall be

as follows:

- Horizontal, vertical or inclined slabs: 15 mm or the size of the main bars whichever is greater.
- Lintels: 20 mm or the size of the main bars whichever is greater.
- Beams: 25 mm or the size of the main bars whichever is greater, 15 mm minimum for binders.
- Columns: For all columns having any diameter of reinforcement, the clear cover shall be 40 mm or the size of the main bars whichever greater

Foundation: 50 mm for normal soil





Cement Cover Blocks (Source: Own)

4.8.2. Rebar arrangement

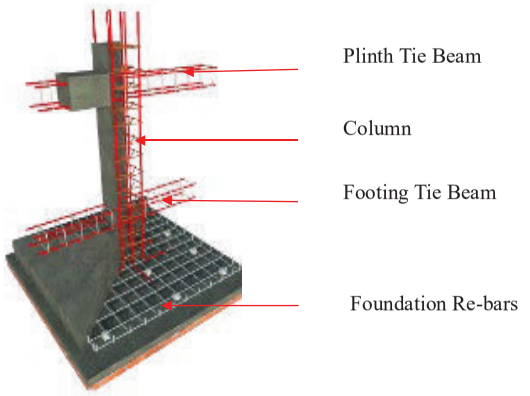
- Reinforcement shall be clean and free from loose mill scale, rust, oil, grease, tar, paint mud, ice, retarders, concrete droppings and contamination by salts or other deleterious matter and shall be maintained in such condition up to the time of concreting.
- The bars shall be accurately bent and formed to the dimension indicated in the Drawings. The Mason shall prepare bar bending schedules for each structure and calculate the weight of the reinforcement. Binding wire used to bind reinforcements shall be annealed galvanized binding wire of 20 gauges.
- Spacers shall be securely fixed to the reinforcement at the time of placing concrete. Spacers shall be of cement mortar of the same strength as the concrete, or other approved material. Plastic spacer blocks shall not be used in the works. Effective measure shall be adopted to ensure that reinforcement remains accurately in position during the placing, compaction and setting of the concrete.




Source: Own

a) Erection of columns re-bars

- Column positions need to be marked correctly at PCC of foundation.
- Generally, bar benders ignore about lap position of columns. They just cut half single piece of rod and the lap positions may come near or within joint.
- Actually, length of column re-bars need to calculated properly to avoid the lap positions near or at the joint.

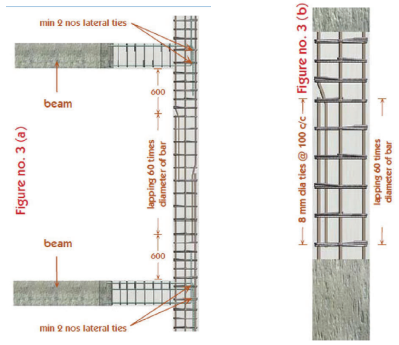


Source: Guideline: Booklet of minimum requirement for

R.C.C Framed structure, National Reconstruction Authority

- The lapping in columns should be at the mid height of column starting from 600 mm from top of beam or ending up to 600 mm from bottom of beam.
- The reinforcement bars should not be lapped at one level i.e. should be lapped in staggered position aligned in a vertical line.
- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of lateral ties should be 100 mm c/c throughout the length of lapping.
- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
- Within a joint
- Within a distance of 2d from face of the column/beam
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced.

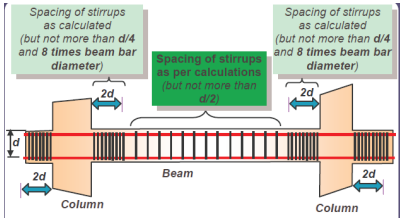
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.
- The spacing of these links shall not exceed 150 mm.



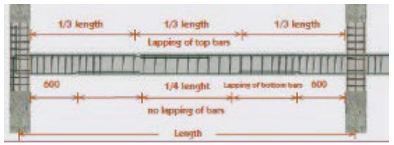
Source: Technical Poster, DUDBC

b) Laying of Beam Re-bars

- Longitudinal steel on bottom face of a beam framing into a column shall be at least half the steel on its top face at the same section.
- Longitudinal steel in beams at any section shall be at least 1/4th of maximum longitudinal steel provided at the beam.
- Vertical stirrups shall be used in beam as transverse reinforcement.
- The minimum diameter of a transverse reinforcement shall be 8 mm.
- Closely spaced links shall be provided over a length equal to 2d from column face on either side. Spacing of links over the 2d length shall not exceed the minimum of (d/4; 8db; 100 mm). The first link shall be at a distance not exceeding 50 mm from the joint face.
- Beam re- bars at bottom should not be lapped at mid-¼ span of beam and should be lapped at edges 600 mm away from column faces.
- Reinforcement bars at top should be lapped at mid- 1/3 of span of beam.
- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of vertical stirrups should be 100 mm c/c through the length of lapping. The minimum size of stirrups should be 8 mm diameter.



Source: IITK, BMTPC/Earthquake Tip



Source: Technical Poster, DUDBC

c) Beam and column joint

- All reinforcement bars of beams should pass inside the vertical bars of columns.
- At an exterior joint, top and bottom longitudinal bars of beams shall be provided with horizontal length beyond the inner face of the column, equal to horizontal development length (ldh) terminating in a standard hook of length 12db.
- The hook shall be located within the confined core of a column or of a boundary element with hook bent into the joint.
- If the requirements for ldh cannot be satisfied in the exterior beam-column joint, the beam can be extended horizontally in the form of exterior stubs
- Lateral ties should be provided at the interval of 100 mm. within joints

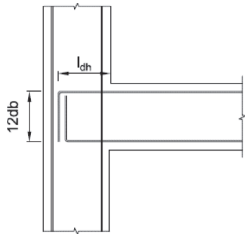


Figure 4-10 Anchorage of beam longitudinal bars in column

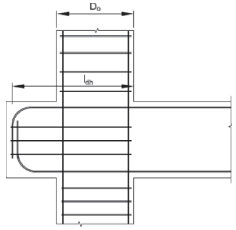
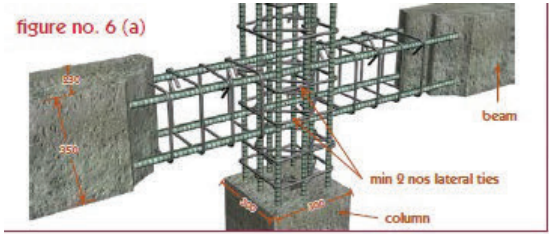


Figure 4-11 Provision of Beam stub

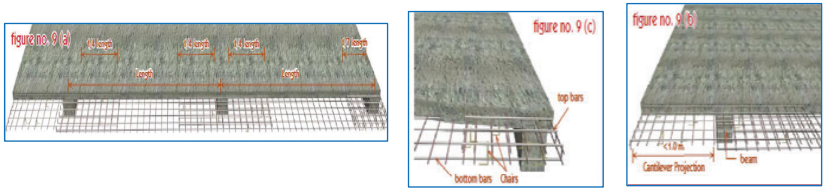
Source: NBC 105:2020, MOUD/DUDBC



Source: Technical Poster, DUDBC

d) Laying of re-bars for slab

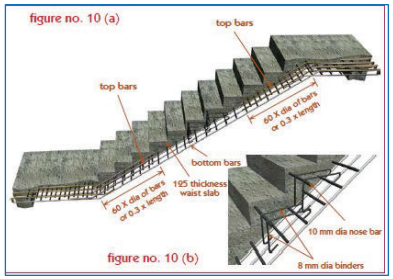
- For slab panel of size 4.5 m x 3.0 m, reinforcement bars of 8mm diameter can be provided at 150 mm spacing.
- For slab projections up to 1.0 m extra bars of 10 mm diameter should be provided.
- Chairs (10 mm diameter) should be provided for positioning the top bars as shown in the figure.
- Cover blocks (1 Cement :1 Sand Mortar) of 15mm thickness should be used for bottom bars.



Source: Technical Poster, DUDBC

e) Construction of RCC staircase

- The minimum thickness of waist slab should be 125 mm.
- Top bars should be curtailed up to 60 times diameter length or 1/3 length of slope portion of waist slab which is greater measured from starting/ending of slope.
- Bottom bars should be provided continued from beam to beam.
- Nose bars of 10 mm diameter should be provided at every step tied up by 8 mm diameter binders at 300 mm spacing.



Source: Technical Poster, DUDBC

4.8.3. Form works

Formwork shall be fixed in perfect alignment and to the true shape and dimensions of the permanent work shown on the Drawings. A method of support, which would result in holes or tie wires extending through the full width of a member, will not be permitted. No deformation of the formwork will be allowed of the formwork whilst filling and full of concrete. Top formwork is to be provided to concrete faces where the slope exceeds one in four.

a) Cleaning and Treatment of Formwork

All rubbish, particularly, chippings, shavings and sawdust shall be removed from the interior of the forms before the concrete is placed. The face of formwork in contact with the concrete shall be cleaned and treated with form release agent. Release agents should be applied so as to provide a thin uniform coating to the forms without coating the reinforcement.



Coating of formwork with form oil (Source: Own)

b) Removal of Formwork

Forms shall be removed without shock vibrations or other damage to the concrete. Great care shall be exercised during the removal to avoid shocks or reversal of stress in the concrete. The minimum period before striking formwork is given in Table below in normal circumstances where ambient temperature does not fall below 15° C where ordinary Portland cement or other than OPC is used and adequate curing done.

c) Time for Formwork to be in Place

S. No.	Type of Formwork	Minimum Period Before Striking Formwork	
		For Concrete Made Using OPC	For Concrete Made Using Cement Other than OPC or Using Mineral Admixtures Like Fly Ash and Slag
	Vertical formwork to columns, walls, beams	16-24 hours	16-24 hours
	Soffit formworks to slabs (Props to be re-fixed immediately after removal of formworks	3 days	7 days
	Soffit formwork to beams (Props to be re-fixed immediately after removal of formworks)	7 days	10 days
	Props of slabs Spanning up to 4.5 m. Spanning over 4.5 m.	 7 days 14 days	 10 days 14 days
	Props of beams and arches Spanning up to 6 m Spanning over 6 m	 14 days 21 days	 14 days 21 days

Source: IS 456:2000 (Fourth Revision) (Reaffirmed 2005)

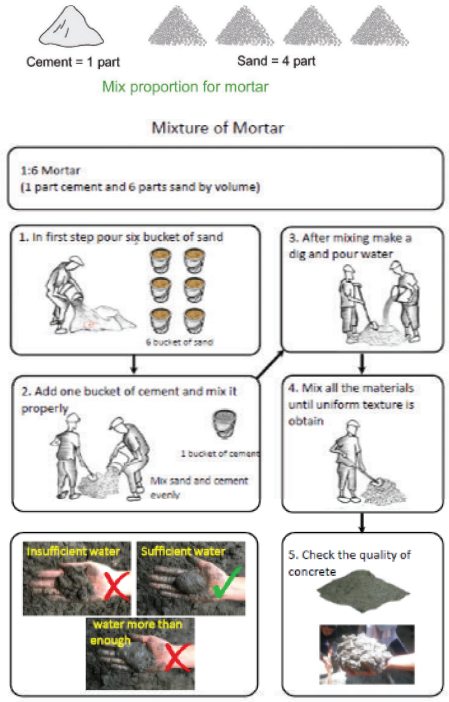
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4.8.4. Brickwork

a) Preparation of Cement Mortar

Mortar: Cement and sand should not be leaner than 1:4 (1-part cement and 4-parts sand) for masonry and 1:6 for plaster. Use cement mortar 1:6 or less on masonry works.

Concrete: The concrete mix for RCC members should not be lean than 1:1.5:3(1-part cement, 2- parts sand and 4-parts aggregate). Water for mixing should be limited to 60 % of the weight of cement for hand mixing i.e. 30 liters of water for making 1 bag of cement. Concrete should be cured with water for at least 14 days after casting. Use concrete mortars or wall mortar within 45 minutes of mixing.



Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

b) Soaking of Bricks

Bricks shall be soaked in water for a minimum of one hour before their use. Soaked bricks shall be taken out from the soaking tank sufficiently in advance so that the skin of bricks would be dry at the time of laying. Such soaked bricks shall be stacked on a clean place where they will not be spoiled by dirt, earth, etc.





Source: Integrated Training Manual on Building Bylaws and Building Code, MoFAGA

c) Laying

The brickwork shall be laid true to line, plumb, radiated or curved as required, built solid throughout. Prior to laying all bricks are to be thoroughly soaked in water until all air pockets are removed. Bricks are to be laid in a full cement mortar bed and when bonding, the brickwork is to be set back every course. The mortar joints shall be approximately 10 mm thick with a tolerance of (±) 2 mm and broken vertically. All exposed brick faces shall have the joints raked out to a depth 15 mm to receive plaster.

d) Protection and Curing

Masonry work shall be protected from rain and other adverse weather condition by suitable covering when the mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days. Care must take to protect brick edges during and after construction.

4.8.5. Stone Masonry Works

- Except for dry rubble walling, all joints (gaps) shall be sufficiently thick to prevent stone to stone contact and the gaps shall be completely filled with mortar. Stones shall

be clean and sufficiently wetted before laying to prevent absorption of water from mortar.

- Placing loose mortar on the course and pouring water upon it to fill the gaps in stones shall not be allowed. Mortar shall be fluid, mixed thoroughly and then poured in the joints. No dry or hollow space shall be left anywhere in the masonry and each stone shall have all its faces completely covered with mortar of the thickness as specified for joints.



Source: Integrated Training Manual on Building Bylaws and Building Code, MoFAGA

4.8.6. Finishing works

a. Plaster works

Surface preparation: Surfaces to be rendered must be clean and free from all dust, loose materials, grease, etc. and be well wetted for a few hours. The wall should not be soaked but only damped evenly. The walls should not be too wet as plastering on wet walls is seldom satisfactory. Plaster may be applied in one, two or three coats. Two coats are usually sufficient. The thickness of the first cost should be just sufficient to fill up all unevenness in the surface. No single cost should exceed 12 mm in thickness. Lower coat should be thicker than upper coats. Thick coats shrink more and crack. 1:6 cement sand mortar (1-part cement and 6 parts sand) is generally used for plastering wall surface while for ceiling 1:3 cement sand mortar is used.

Plastering shall be started from top and worked down. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. Wooden screeds 75 mm wide and of the thickness of the plaster shall be fixed vertically 2.5 to 4 meters apart to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster's float and pressing the mortar so that the raked joints

are properly filled. The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and sideways motion 50 mm or 75 mm at a time. Finally, the surface shall be finished off with a plaster's wooden float. The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness. The average thickness of plaster shall not be less than the specified thickness. The minimum Thickness over any portion of the surface shall not be less than the specified thickness minus 3 mm. The thickness of the plaster shall not be less than 12 mm not more than 20mm. In case of plaster thicker than 20mm, it shall be built by two or more coats each coat not exceeding 12mm in thickness.

b) Painting works

Preparation and priming of surfaces:

Concrete and Cement rendered surfaces shall be smooth and free from defects and shall be allowed to dry out thoroughly. Surfaces shall be thoroughly brushed down and left free from all efflorescence, dirt and dust. All such surfaces, which are to be finished with oil or enamel paint, shall be primed with two coats of alkali resisting primer. Plaster surfaces shall be perfectly smooth and free from defect. All such surfaces shall be allowed to dry for a minimum period of four weeks. Surfaces shall be stopped with approved plaster compound, rubbed down flush, thoroughly brushed down and left free from all efflorescence, dirt and dust. Fair-faced surfaces shall be dry, brushed down and free from dust or dirt and shall be treated with an approved alkali resisting primer (for plastic emulsion). Metal work generally shall be thoroughly wire brushed to remove all scale, rust, and through sand papering shall be done before any painting is done. Where severe rust exists, the special anti-rust primer must be used. After painting it shall be stored in covered shed and 60cm above ground. Shop primed surfaces shall have bare places touched up with an approved metal primer. Un-primed surfaces shall be given one coat of primer as last. Galvanized surfaces, which are thoroughly weathered, shall be, brushed down with white spirit, washed down and given one coat of zinc chromate primer. Bituminous-coated surfaces shall be given as isolating coat of shellac knotting followed by an approved metal primer. Woodwork generally shall be rubbed down, given one coat shellac knotting, one coat wood self-knotting primer, and all cracks, nail holes, defects, and uneven surfaces, etc., stopped and faces up with hard stopping rubbed down flush. Before oiling woodwork all stains must be removed and uniform colour obtained and filled.

Colours and Priming:

The priming undercoats and finishing coats shall each be of differing tints and the priming and undercoats shall be of the correct types and tints to suit the respective finishing coats. All finishing coats shall be of colours and tints selected by the supervision consultant. The

paintwork shall have and uniform finish and all paint for external work shall be exterior quality only.

Rubbing Down:

Each coat of paint shall be properly dried and shall be well rubbed down with fine glass paper before the next coat is applied. The paintwork shall be finished smooth and free from brush marks. Samples Cards of all paints, etc., shall be submitted to and samples prepared for approval of the Engineer before laying on and such samples, when approved, shall become the standard for work.

4.9. Confirmation of Completed Works

The structural and finishing works completed by the contractor should be checked by the supervision consultant for line level and finishing. The completed works also should be satisfactory to the building owner. All doors and windows should be fitted with all necessary accessories. The sanitary and plumbing works should be completed with testing for water pressure and leakages. All sanitary fixtures should be ready to use. The electrical switches, sockets and fixtures should be ready to use and functional. Floor finishing works such as marbles, tiles and plaster punning should be in line and level. Wall plaster, putty and painting works should be also completed with final finishing touch. All external works such as apron, drains, septic tank, soak pit, sewer line connections, water supply line connections, steps, ramps, compound walls, entrance gates etc. should be completed by the contractor for handing over the completed building to building owner. The supervision consultant will facilitate building owner for confirmation of the completed works in accordance with the contract and specifications.

4.10. Quality Control Laboratory test for the Works

a) Testing of Concrete

Normal and Accelerated Strength Tests should be conducted for concrete.

Testing of 28-day crushing strength of concrete shall be controlled not less than the following frequencies.

Quantity of concrete in the Work, m^3	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional 50 m3 or part thereof

Source: IS 456:2000

A test shall be the average test value for three cubes prepared from the same batch of concrete, the samples being consolidated in the moulds by Roding as per BSI 1881.

4.11. Confirmation of Completed Works

- The structural and finishing works completed by the Masons should be checked by the supervision consultant for line level and finishing.
- The completed works also should be satisfactory to the building owner.
- All doors and windows should be fitted with all necessary accessories.
- The sanitary and plumbing works should be completed with testing for water pressure and leakages.
- All sanitary fixtures should be ready to use.
- The electrical switches, sockets and fixtures should be ready to use and functional.
- Floor finishing works such as marbles, tiles and plaster punning should be in line and level.
- Wall plaster, putty and painting works should be also completed with final finishing touch.
- All external works such as apron, drains, septic tank, soak pit, sewer line connections, water supply line connections, steps, ramps, compound walls, entrance gates etc. should be completed by the Masons for handing over the completed building to building owner.
- The supervision consultant shall facilitate building owner for confirmation of the completed works in accordance with the contract and specifications.

A3-4-41

Section 5. ANNEXES

Annex -1: Basic criteria of Building Bylaws in Nepal

Floor Area Ratio

- Floor Area Ratio (FAR) has a limited capacity in terms of resources and infrastructure.
- In order to avoid additional stress beyond the capacity of the city, a Floor Area Ratio (FAR) is calculated.
- It is also termed as Floor Space Ratio.
- It is simply formulated as the ratio of total covered area (actual area) of all the floors to the total plot area.
- Following formula is used to calculate the floor area ratio

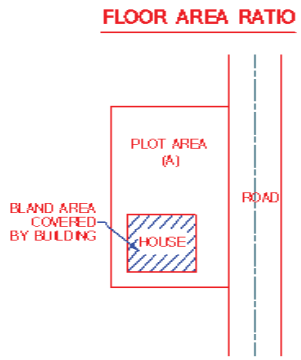
  FAR = Total area of all floors/ Plot Area
- Permissible FAR and Maximum Height will be as defined by local government.

Maximum Ground Coverage and Floor Area Ratios

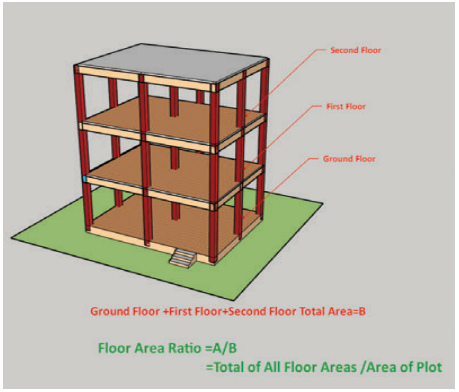
Type of Building	Area of Plot	Maximum Ground Coverage (%)	Maximum FAR
Residential Building	Up to 250 Sq.m.	70	1.25
Residential Building	More than 250 to 500 Sq.m.	60	1.25
Residential Building	More than 250 Sq.m.	50	1.25
School Campus	As defined by concerned agencies	40	1.5
Star Hotel	As defined by concerned agencies	40	3.0
Cinema, Hall, Theatre, City Hall	As defined by concerned agencies	40	2.0
Nursing Home, Policlinic	As defined by concerned agencies	40	1.5
Domestic or Small Industry	As defined by concerned agencies	40	1.5
Source: Building Bylaws, 2007 for new municipalities of Kathmandu Valley: Kathmandu Valley Town Development Committee (KVDA)			

Examples

- Suppose the Person X has got a plot of 1,00 square meter and the permissible FAR, according to municipality is 1.25. He can construct building which has maximum buildup area of 125 square meter obeying all other basic bye-laws as well.
- The FAR for every building will differ depending upon its usage, type of construction, the locality the width of the road



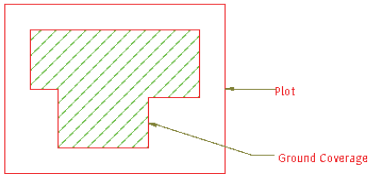
Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redeveloped referring sketch from Model Building Bylaws, MOUD

Ground Coverage

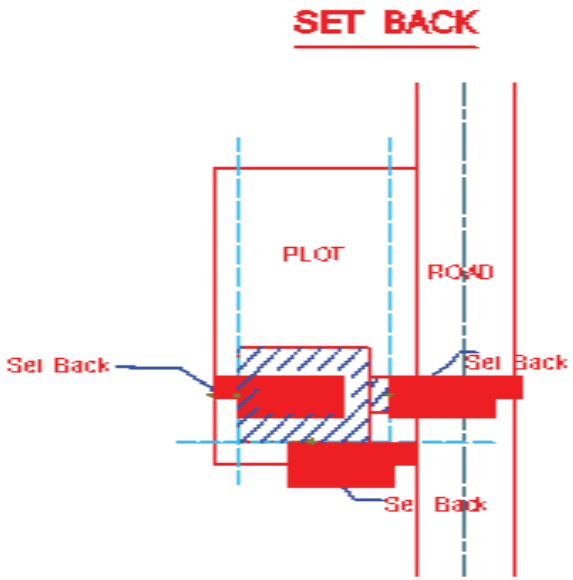
- The total area covered by the building on the ground floor is known as ground coverage. Based on restrictions of height and FAR, the ground coverage can be adjusted to get maximum usage of the plot.
- The ground coverage area is calculated by dividing the Building Ground Floor area with the total plot area. Building area means the floor space of a building when looking down at it from top. Ground Coverage Area = (Building Ground Floor Area / Site Area) X 100



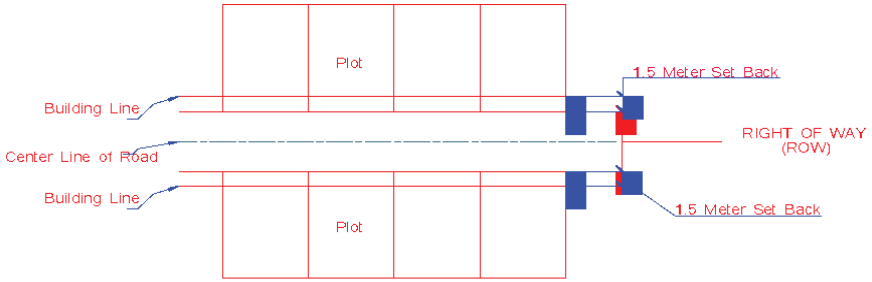
Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD

Setbacks

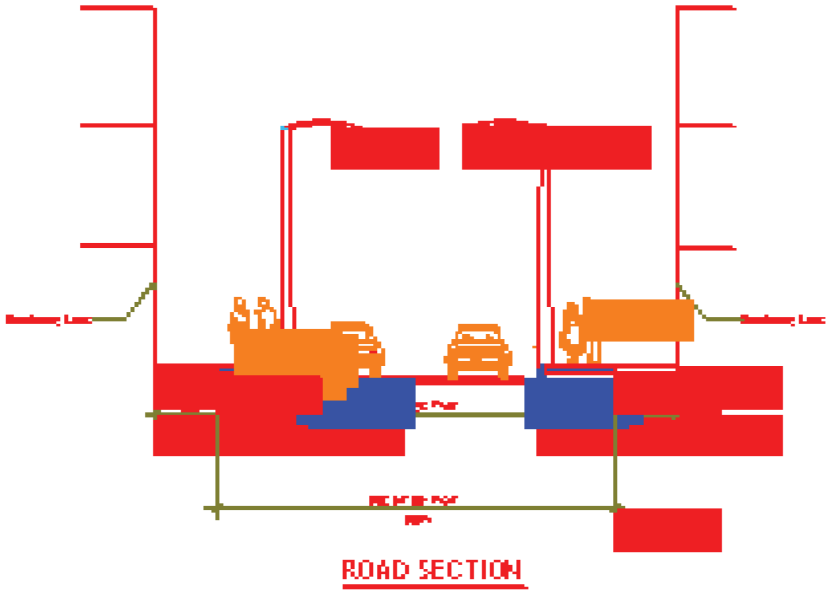
- A building setback is the open space between the building and the property boundary or lot line.
- We can construct the house only up to the setback line.
- Set back varies for different types of buildings.
- The setback line is applicable not just in the front, but also around the entire building.
- The total plot area is another determining factor for the setback line.



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Own

Rights of Way (ROW)

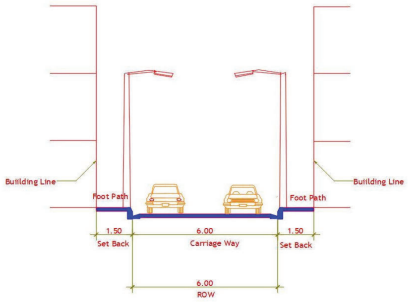
The ROW is defined as a land corridor designed or constructed for the use of public access, vehicular traffic circulation and the location of public utilities such as pathways, roads and highways, regardless of the ownership of the land.

- The ROW might be fixed as equal distance (D) on each side from a central line of public roads and is represented in the Land Use Plan in the map —Road Network – ROWI.
- where ROW has been fixed, buildings and parts of buildings may not cross this line.
- where ROW is not fixed, the minimum of ROW shall be 6M in all new build-up areas.
- Where a Setback Line has not been fixed in the Land Use Map of the Municipality, 1.5 Meter minimum distance should be kept from the ROW with any building or structure. Minor projections by parts of buildings as sun and rain protections, cantilevers and entrance steps may be permitted only in the Setback.

Balconies, rooms and open ladder staircases cannot be constructed within the set-back. Compound walls in the Setback are not allowed.

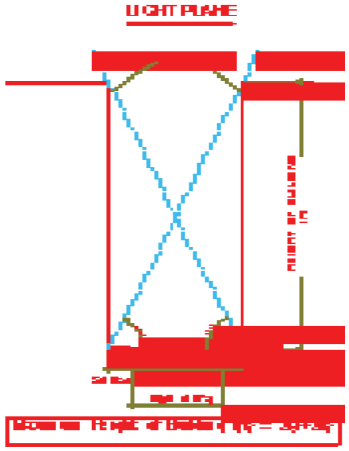
Height Restrictions

- The height of a building is the vertical distance between the average level of the ground and the topmost point of the building. Remember, if there is a basement to the house, it will not be considered in height measurement.
- Depending upon the locality and the FAR, there will be a maximum limit to how tall you can construct your house.
- As per Basic Standard on Settlement Development, Urban and Building Construction, Planning and Building Bylaws 2015, maximum permissible height is 17 meters from road level. The basement is the lower storey of a building, constructed below or partly below the ground. Depending upon the Zone there is a restriction to the height of the building.
- According to the building byelaws, maximum height of the building is governed by two factors.
    - FAR
    - Light plane
- Even though FAR permits higher building height, light plane factor restricts its height. As shown in the figures, the maximum height of building is not more than the height of light plane.
- The figures illustrate the light planes to restrict height of the building. According to this building height is permitted as two times of width of road+ setback.

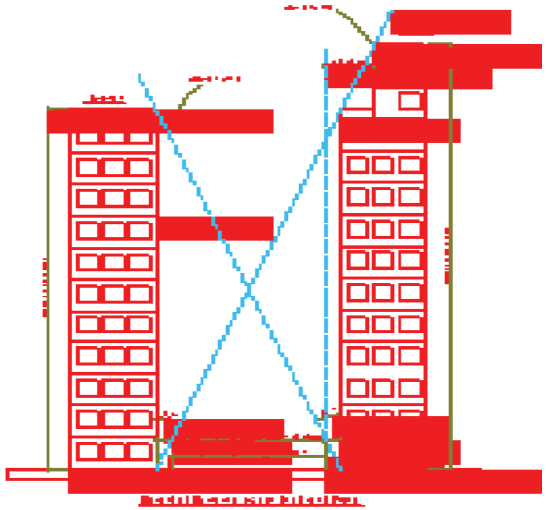


TYPICAL CROSS SECTION OF 6 METER WIDE MUNICIPAL ROAD

A3-4-44



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD



Source: Redrawn referring sketch of "Basic Standards on Settlement Development, Urban Planning & Building Construction (2015)", MOUD

Annex- 2: Tips for Earthquake Resistant Construction of Buildings

Earthquake Resistant Buildings can be defined as follows:

a) Under minor but frequent shaking, the main members of the building that carry vertical and horizontal forces should not be damaged; however, building parts that do not carry load may sustain repairable damage.

b) Under moderate but occasional shaking, the main members may sustain repairable damage, while the other parts of the building may be damaged such that they may even have to be replaced after the earthquake; and

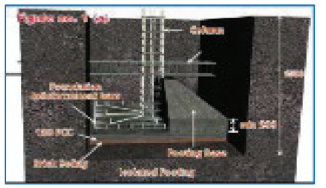
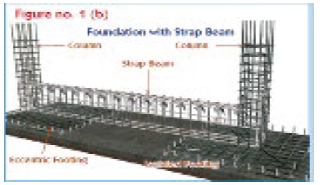
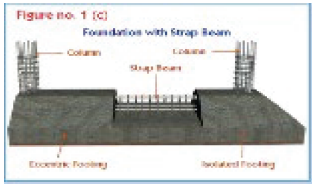
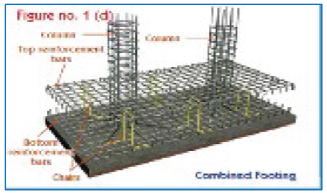
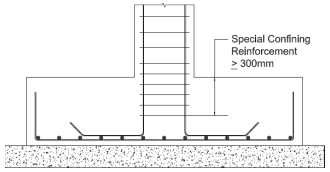
c) Under strong but rare shaking, the main members may sustain severe (even irreparable) damage, but the building should not collapse.

a) Tips for Earthquake Resistant Construction of RCC frame Structure Buildings



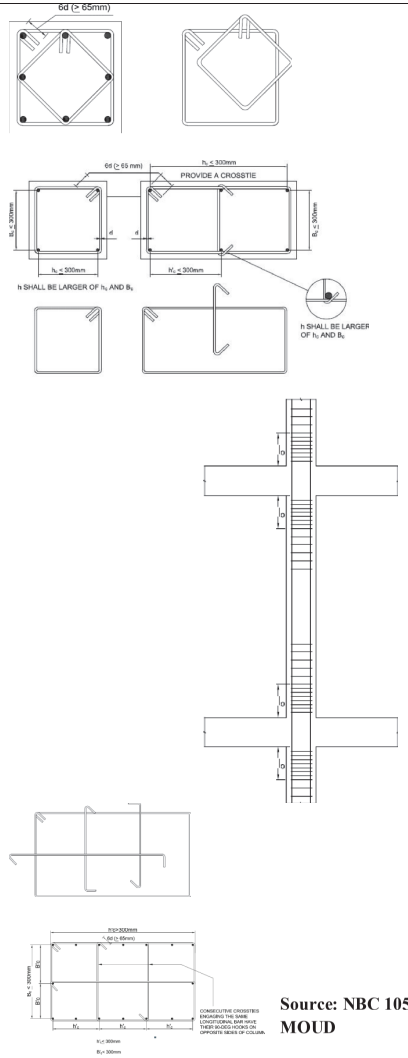
Source: Technical Poster, DUDBC

A3-4-45

Construction of Foundations • **Minimum cover to main reinforcement shall not be less than 50 mm for surface in contact with earth face. However, it may extend up to 75 mm when bottom of the footing is in direct contact with the soil.** • **Minimum diameter of main bar is 12 mm.** • **Minimum area of reinforcement in footing slab is 0.12% of concrete area.** • **The reinforcement bars of columns should be extended into the footing to a distance not less than development length of the bar.** • **However, the development length can be modified in ratio by providing more reinforcement than required.** • **Special confining lateral ties provided to the column shall extend at least 300 mm into the footing and should not more than 100 mm c/c.** • **If footing pads of two columns overlap each other, combine footing will be provided. In the case, foundation will be one of following two types:** • **Combine Footing pad with reinforcement mesh in bottom plus strip beam** • **Combine footing pad with Two layers of mesh in top and bottom of the footing pad** • **In case, column locate in boundary of property land, strap or cantilever footing will be provided combining the footing with footing of adjacent column via strap beam.** • **For combine footing with strip beam, detailing of longitudinal and transverse bars is similar to that of beams.** • **All footing of a building should be kept as same horizontal level as far as possible unless designed and prescribed by the structural designer.**	    **Source: Technical Poster, DUDBC**  **Source: NBC 105, MOUD**
Construction of Columns • **Minimum dimension of a column shall not be less than $20xd_b$, where db is diameter of the largest diameter of longitudinal reinforcement bar in the beam passing**	

through or anchoring at the joint. However, minimum dimension of column shall be 300 mm.

- Rectangular columns shall have a minimum of 8 numbers of bars.
- Minimum diameter of the longitudinal bar shall be 12 mm
- Transverse reinforcement shall have 135° hook ends with as extension of 6 times its diameter (but not less than 65 mm) at each end, which are embedded in the confined core of the column. Minimum diameter of hoop shall be 8 mm.
- Maximum spacing of parallel legs of the links/hoops shall be minimum of 300 mm c/c and half the least lateral dimension of the column.
- Spacing of the confining reinforcement shall be minimum of Bc/4; 6db and 100 mm, Bc is smallest cross-sectional dimension of column, db=diameter of smallest longitudinal bar of column
- Special confining reinforcement shall be provided over a length (lo) minimum of Dc (Largest cross section dimension of the column); Clear length of the column lcl/6; 450 mm from the face of the joint towards mid height of the column on either side of the joint.

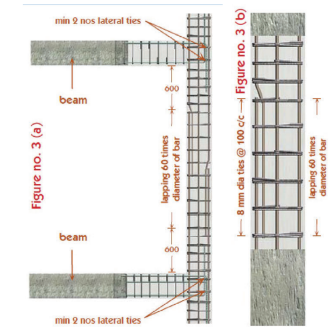


Source: NBC 105, MOUD

Lapping in Columns

- When longitudinal steel bars have to be continued for spans larger than their manufactured lengths, the bars shall be connected by either splicing or mechanical couplers.
- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
- Within a joint
- Within a distance of 2d from face of the column/beam
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced.
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.
- The spacing of these links shall not exceed 150 mm.

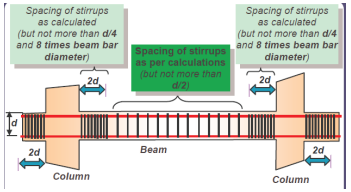
Source:



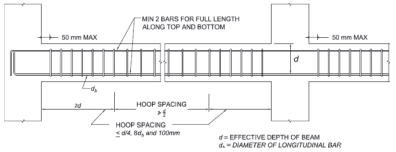
Technical Poster, DUDBC

Construction of Beams

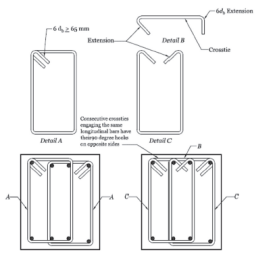
- Longitudinal steel on bottom face of a beam framing into a column shall be at least half the steel on its top face at the same section.
- Longitudinal steel in beams at any section shall be at least 1/4th of maximum longitudinal steel provided at the beam.
- Vertical stirrups shall be used in beam as transverse reinforcement.
- Stirrups are permitted to be made of two pieces of bars also namely U-link with a 135° hook with an extension of 6 times diameter, but not less than 65 mm, imbedded in the core concrete and across-tie.
- The hooks of the stirrups and cross-ties shall engage around peripheral longitudinal bars. Consecutive cross ties engaging the same longitudinal bars shall have their 90° hooks at opposite sides of the beam.
- The minimum diameter of a transverse reinforcement shall be 8 mm.
- Closely spaced links shall be provided over a length equal to 2d from column face on either side. Spacing of links over the 2d length shall not exceed the minimum of (d/4; 8db; 100 mm). The first link shall be at a distance not exceeding 50 mm from the joint face.



Source: IITK, BMTPC/Earthquake Tip



Source: NBC 105, MOUD

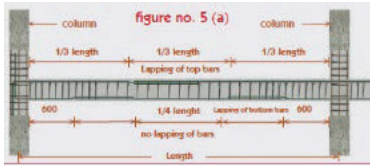


Source: NBC 105, MOUD

Lapping in Beams

- Reinforcement bars at bottom should not be lapped at mid-¼ span of beam and should be lapped at edges 600 mm away from column faces.
- Reinforcement bars at top should be lapped at mid- 1/3 of span of beam.
- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of vertical stirrups should be 100 mm c/c through the length of lapping.
- The minimum size of stirrups should be 8 mm diameter.





Source: Technical Poster, DUDBC

Beam and column joint

- At an exterior joint, top and bottom longitudinal bars of beams shall be provided with horizontal length beyond the inner face of the column, equal to horizontal development length (ldh) terminating in a standard hook of length 12db.
- The hook shall be located within the confined core of a column or of a boundary element with hook bent into the joint.
- If the requirements for ldh cannot be satisfied in the exterior beam-column joint, the beam can be extended horizontally in the form of exterior stubs
- Lateral ties should be provided at the interval of 100 mm. within joints



Source: Technical Poster, DUDBC

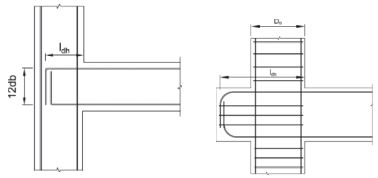
Development Length, $l_d = (l_{dh}+l_{db})$

for 12 mm Ø bars, l_d= 421 mm.

for 16 mmØ bars, l_d=561mm.

L_{dh} Calculation

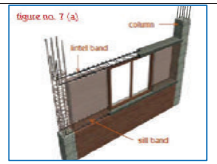
Concrete Grade	Rebar Grade	L_{dh}
M20	Fe 500	33.05xØ
M20	Fe 415	19.13xØ
M25	Fe 500	20.62xØ
M25	Fe 415	17.11xØ

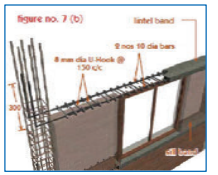


Source: NBC 105, MoUD

Sill and Lintel Bands

- To prevent the infill walls toppling down out of plane these shall be provided with horizontal reinforced concrete (RC) bands through the wall at about one-third and two-thirds of their height above the floor in each height (at sill and lintel level of openings).
- The RC bands should be tied up with columns abutting the wall by anchoring longitudinal bars fully with U-bars projected from columns.
- The width of the band should be equal to the wall thickness and its thickness equal to that of the masonry unit or 75mm, whichever is larger

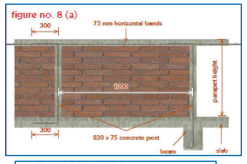


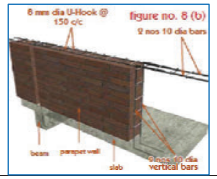


Source: Poster, Technical DUDBC

Construction of Parapet Bands

- Parapet bands should be provided to prevent toppling down of parapet walls at terrace and walls at verandahs.
- Concrete posts of size 230 x 75 mm with 2 nos. 10 mm diameter tied with 8 mm diameter U-hooks at 150 mm spacing should be erected from beams/slabs
- at 1200 mm spacing.
- The concrete posts should be tied up at top with 75 mm thick horizontal concrete bands with 10 mm diameter bars tied with 8 mm diameter U-hooks at 150 mm spacing

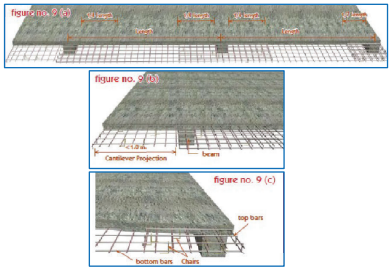




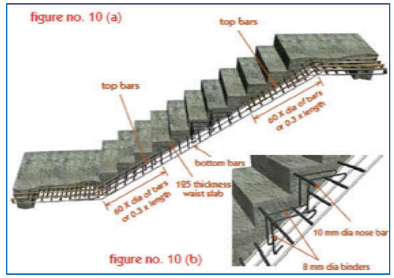
Source: Technical Poster, DUDBC

Construction of Slab

- For slab panel of size 4.5 m x 3.0 m, reinforcement bars of 8mm diameter can be provided at 150 mm spacing.
- For slab projections up to 1.0 m extra bars of 10 mm diameter should be provided.
- Chairs (10 mm diameter) should be provided for positioning the top bars as shown in the figure.
- Cover blocks (1 Cement :1 Sand Mortar) of 15mm thickness should be used for bottom bars.



Source: Technical Poster, DUDBC

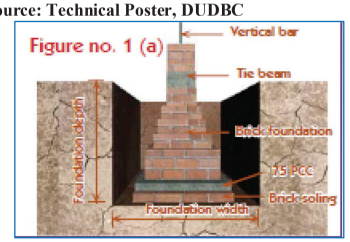
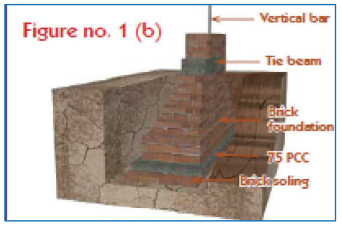
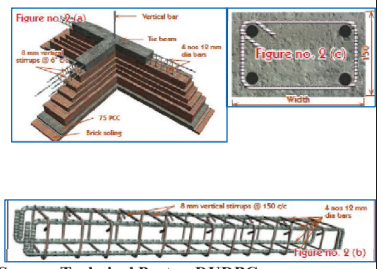
Construction of Staircase • **The minimum thickness of waist slab should be 125 mm.** • **Top bars should be curtailed up to 60 times diameter length or 1/3 length of slope portion of waist slab which is greater measured from starting/ending of slope.** • **Bottom bars should be provided continued from beam to beam.** • **Nose bars of 10 mm diameter should be provided at every step tied up by 8 mm diameter binders at 300 mm spacing as shown in figure no. 10 (b).**	 **Source: Technical Poster, DUDBC**

a) Tips for Construction of Earthquake Resistant Construction of Load Bearing Masonry Structure Residential Buildings up to three stories



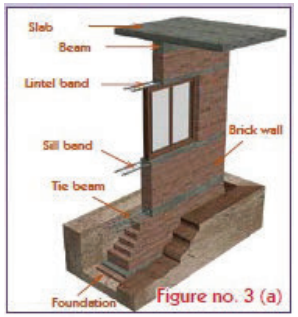
Source: Technical Poster, DUDBC

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Construction of Foundations **For one storied building, the recommended size of foundations are as follows:** • **Width 750 mm and depth 800 mm for brick masonry with cement mortar** • **Width 750 mm and depth 800 mm for stone masonry in cement mortar** • **Width 850 mm and depth 800 mm for brick masonry with mud mortar** **For building up to three stories, the recommended size of foundations are as follows:** • **Width 900 mm and depth 900 mm for brick masonry with cement mortar** • **Width 900 mm and depth 900 mm for stone masonry in cement mortar** • **Width 1050 and depth 1050 for brick masonry with mud mortar. The buildings with brick masonry in mud mortar should not be constructed more than two stories** • **75 mm thick Plain Cement Concrete (P.C.C.) in 1:2:4 ratio of cement sand aggregate should be laid over one-layer Brick flat soling for constructing brick masonry in foundation**	**Source: Technical Poster, DUDBC**  
Construction of Tie Beams • **Tie beams should be provided for tying up the walls with each other and preventing dampness coming up from ground to superstructure** • **The level of tie beam should be usually 450 mm to 750 mm from ground level** • **The width of the tie beam should be equal to the wall thickness and its minimum thickness equal to 150 mm.** • **4 numbers 12 mm. diameter steel bars should be provided with 8mm. diameter vertical stirrups at 150 mm spacing.** • **Tie beam should be constructed with concrete in ratio 1:1.5:3 cement, sand and aggregate.**	 **Source: Technical Poster, DUDBC**

Thickness of Wall

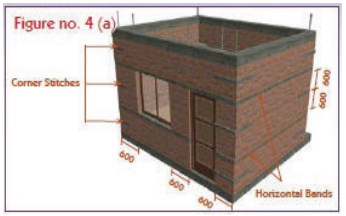
- For brick masonry in cement sand mortar (1:6) the thickness of wall should be 350 mm at ground floor and 230 mm at first and second floors the width of room should not exceed 3.5 m.
- For stone masonry wall in cement sand mortar (1:6) the thickness of wall should be 450 mm for ground floor and 350 mm for first floor. It is safe to construct maximum two floors with stone masonry and the width of room should not exceed 3.5 m.
- For brick masonry with mud mortar the thickness of wall should be 350 mm. at ground floor and 230 mm at first floor. It is recommended to construct maximum two floors with brick masonry in mud mortar.



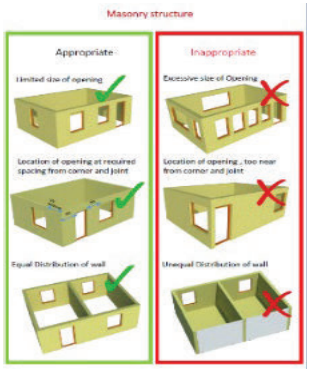
Source: Technical Poster, DUDBC

Locations of doors and windows in wall

- The doors and windows should be placed at minimum 600 mm distance away from wall corners and joints.
- Gap between two openings: Wall length between any two openings (doors and /or windows) should not be less than 600 mm. i.e. door and windows in a wall should be placed at 600 mm apart from each other horizontally.
- The total length of doors and windows in a wall should not be more than 50% for single storey construction.



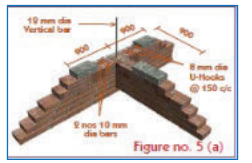
Source: Technical Poster, DUDBC

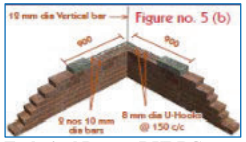


Source: Inspection Manual, NRA

Concrete Stitches at Junctions and Corners

- Concrete stitches should be provided at junctions and corners of walls.
- The width of the stitches should be equal to the width of the wall and its thickness equal to that of the masonry unit or 75mm, whichever is larger. The length of the stitch should be 900 mm, from the corner or junction of the walls
- 2 numbers 10mm diameter bars with 8mm diameter U-hooks at 150 mm spacing should be provided for stitches
- The concrete stitches should be provided at every 600 mm height of wall



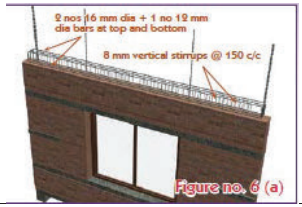


Source: Technical Poster, DUDBC

Floor Beams

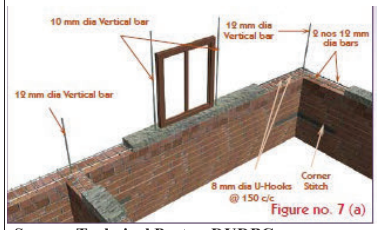
- Floor beams should be provided through the whole length of wall with floor slabs
- The width of the beams should be equal to the width of the wall and height should be equal to minimum 325 mm.
- Reinforcement bars should be provided as shown in figure no. 6 (a)

Source: Technical Poster, DUDBC



Sill and Lintel Bands

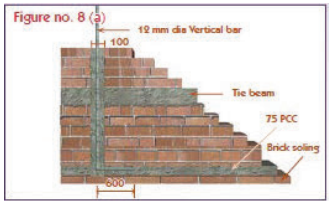
- Sill and Lintel bands should be provided at sill and lintel level of openings
- The width of bands should be equal to the thickness of wall and thickness should be 75mm. At openings more than 1.2 m the thickness of lintel bands should be equal to 150 mm at opening with 450 mm bearing in either side.
- 2 numbers 12mm diameter reinforcement bars with 8mm diameter U-hooks at 150 mm spacing should be provided for sill and lintel bands.
- For lintel bands of 150 mm thickness, 4 numbers 12 mm diameter with 8 mm diameter vertical stirrups at 150 mm spacing should be provided.

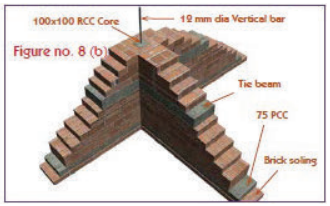


Source: Technical Poster, DUDBC

Vertical Bars

- **Vertical bars of 12mm diameter should be provided at all corners and junctions of the walls from foundations to top of the slab**
- **Vertical bars of 10mm diameter should be provided at the side of openings from tie beams to slabs**
- **Concreting (1:2:4) should be provided around the voids of vertical bars making 100 mmx100 mm reinforcement concrete (RCC) core.**
- **Usually, construction of masonry walls should be constructed gradually in a level. Walls should be left in steps for continuation part as shown in the figures no. 8 (a, b).**
- **Walls should not be constructed more than 1.0 m height in a day**





Source: Technical Poster, DUDBC

A3-4-50

Annex-3: Sample Registration Form for Masons in Municipality

APPLICATION FOR REGISTRATION AS A MASON IN THE MUNICIPALITY

To.

…….. Municipality/ Rural Municipality

District: ……

Province: …….

Photograph of the Applicant

Re: <u>Application for enlisting as a Registered Mason in the Municipality</u>

Dear Sir/ Madam,

I have been working in building construction sector as Mason for ……years in Nepal and now wish to provide similar services as a registered Mason in the sector of **<u>Building Constructions</u>** to the interested building owners in the municipality. Pursuant to the Clause 4.4 of Building Construction Working Procedure (BCWP)-2022, I hereby request for enlisting me/us as the registered mason in the municipality with the following details & supporting documents.

<u>Detail Description of the Mason applying to be registered in the municipality:</u>

Name:	Current Address:
Mailing Address:	Permanent Address:
Mobile No.:	Telephote No:
Citizenship No.:	Citizenship Issued date:
Citizenship Issued district office:	Date of Birth:
Gender: • Male • Female • Others	Experience of working in Building Construction: ……Years

Education: • literate • Primary School • Secondary School • Certificate Level	Date of participation in the Training on Earthquake Resistant Construction of Buildings:
Expertise in Construction: • Mason • Carpentry • Bar Bending, Steel Works • Others	
Documents included with the applications 1. Copy of Citizenship 2. Copy of Education certificates 3. Copy of Training Certificates 4. Passport Sized Photos (2 Nos.) 5. Copy of experience or recommendation letter from construction company if any	

Declaration for Authenticity and non-blacklisting

I hereby declare that the above- mentioned details and documents are true and authentic and fully understand that in case of any discrepancy, I will be held fully liable as per the prevailing laws of the country.

Left Right

……..

(Signature of the Applicant)

Name:

Date:

Thumb Prints of the Applicant

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Annex-4: Sample Agreement Paper between Building Owner and Mason for Construction of Buildings

Agreement between Building Owner and Masons for construction of Earthquake Resistant Construction of Buildings

Agreement for Building Construction is made as of the ……. by and between ……. *Name of Building Owner….* (herein after referred as "Building Owner") resident of …. *Address* …. and …. *Name of Mason……* (herein after referred as "Mason") resident of ……. *Address* ……. for the construction of building at ……. *Location of Building……..*

WHEREAS the Building Owner desires to obtain services for the construction of aforementioned building: and

WHEREAS the Mason desires to provide services for the construction to the "Building Owner"

NOW, THEREFORE, in consideration of the covenants and agreements stated herein, the parties hereto mutually covenant and agree as follows:

1. Obligations of the Mason

1.1 The Mason shall carry out the Construction Works in accordance with the Terms and Conditions mentioned in the attached annexes, immediately after the signing of the Contract and shall complete the civil and finishing works within the stipulated timeframe. The site of the work execution is at ……*Location of Building……*

1.2 The Mason shall execute the construction works (RCC works, Brickworks and Plaster Works all complete) within ……*time period*…. (By …. *Date*….).

1.3 The Mason should cooperate to carry concrete cube tests for each major RCC works (Foundations, Columns, Beam/Slab for each floor) to ensure the design strength of concrete. The cost of cube test shall bore by Building Owner.

1.4 The Mason shall also provide all technical and administrative support needed in order to ensure the timely and satisfactory performance of the Services.

1.5 The Mason shall submit the work schedule showing completion time of major items of works to Building Owner by ……*Date*…….. This shall then constitute part of this contract. The Mason shall strictly adhere to the work schedule during the contract execution.

2. Price and payment

2.1 In full consideration for the complete and satisfactory performance of the Services under this Contract, Building Owner shall pay the Mason the amount as per the Running Bill of competed works.

2.2 The rates of items are not subject to any adjustment or revision because of price or currency fluctuations or the actual costs incurred by the Mason in the performance of the Contract unless otherwise approved by the Building Owner in Writing.

2.3 Building Owner shall affect payments to the Mason after acceptance by Building Owner of the Bills (running bills and Final Bill both) submitted by the Mason upon achievement of the corresponding works as certified by the Supervision Consultant/ Engineer. The Bills shall indicate the works completed and corresponding amount payable.

2.4 The final price of the Contract will be determined on the basis of the actual quantities of work and materials utilized in the complete and satisfactory performance of the Works as certified by the Supervision Consultant/ Engineer and the unit prices contained in the Mason's Quotation. Such unit prices are fixed and are not subject to any variation whatsoever.

3. Special conditions

3.1 The Mason shall work under the direct supervision of Supervision Consultant/ Engineer.

3.2 The Mason shall make every effort to complete the work within the time stipulated in the work schedule and shall maintain the highest quality and workmanship. For this purpose, the Mason shall in good faith inform Building Owner in advance of any kind of support required. Building Owner shall, at its own discretion, provide the requested support.

3.3 The Mason shall surround the site with security fencing to ensure that there is no intrusion of unwanted people.

3.4 The Mason shall at time keep the surroundings of the construction site “broom-clean” to the maximum extent possible.

3.5 The Mason shall supervise laborers to ensure that they take maximum precautionary measures during the construction period so that all the adjoining structures, installations, buildings etc. are kept intact.

3.6 The Building Owner shall manage for electricity and water for the construction works.

3.7 The Mason shall commence and complete this project within the period specified in the Work Schedule. In case of unforeseen situations such as war, natural disasters etc., which are beyond the control and capacity of the Mason and Building Owner, the timing for the completion shall be changed as discussed and agreed by both parties. The approval of the time extension must be obtained from Building Owner in writing.

3.8 The Building Owner may withhold any payment deemed necessary to protect Building Owner from loss due to:

i) Defective Works not satisfactorily repaired by the Mason;

ii) Mason’s failure to make proper payments to laborers;

iii) Any doubt of the Works to be completed within the stipulated period of time.

4. Entry into force and Time limits.

4.1 The Contract shall enter into force immediately upon its signature by both parties.

4.2 The Mason shall commence its contractual obligations on ……*Date*…… The mobilization period will be the 7 **days after agreement date.** The Mason shall complete the entire civil structural and finishing works within …. *Time Period*…. i.e. by ……. *Date*…….

4.3 All time limits contained in this Contract shall be deemed to be of the essence in respect of the performance of the Services.

5. Modifications

5.1 Any modification to this Contract shall require an amendment in writing between both parties duly signed by the Mason and of Building Owner.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date and year first above written.

MASON	BUILDING OWNER
_____	_____
Authorized Signature	Authorized Signature
_____	_____
Printed Name:	Printed Name:
Date:	Date:
Witness (for Mason)	Witness (for Building Owner)

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_____	_____
Printed Name:	Printed Name:
Date:	Date:

Attachment:

Annex I	Negotiated Rates (Labour or with Material) for Items of Civil and Finishing works
Annex II	Construction Work Schedule
Annex III	Working Drawings
Annex IV	Brief Technical Specifications for civil structural and finishing works

A3-4-53

भवन निर्माण कार्यविधि सम्बन्धमा

निर्माणकर्मीका लागि निर्देशिका

भाद्र, २०८०

A3-4-54

निर्माणकर्मीले ध्यान दिनु पर्ने कुराहरू



गाउँपालिका वा नगरपालिकाबाट स्वीकृत भएको डिजाइन र नक्सा अनुसार निर्माण संझौतापत्रमा तोकिएको निर्माण अवधीभित्र निर्माण सुरक्षा समेत कायम गरी भवन निर्माण कार्य गराई सम्पन्न गर्ने दायित्व निर्माण व्यवसायी वा निर्माणकर्मीको हो ।

भवनको वर्गीकरण अनुसार निर्माण व्यवसायीको लागि तोकिएको योग्यता पुगेको हुनुपर्नेछ । साथै निर्माण व्यवसायी सम्बन्धित गाउँपालिका वा नगरपालिकामा सूचीकृत भएको हुनुपर्नेछ ।



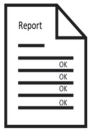
घरधनी

- भवन निर्माण इजाजत प्राप्त गर्न दरखास्त दिनमा सबैभन्दा महत्वपूर्ण भूमिका घरधनीको रहेको हुन्छ । भवनको डिजाइन र निर्माण सम्बन्धमा घरधनीले नै अन्तिम निर्णय गर्दछ ।
- गाउँपालिका वा नगरपालिकामा भवन निर्माण गर्न अनुमतिका लागि दरखास्त दिनका साथै डिजाइनकर्ता, सुपरीवेक्षण परामर्शदाता र निर्माण व्यवसायी नियुक्त गर्ने जस्ता कार्यहरूको जिम्मेवारी घरधनीमा निहित रहेको हुन्छ ।



डिजाइनकर्ता

- भवन निर्माणको लागि घरधनीको आवश्यकता र चाहना अनुसार विद्यमान निर्माण मापदण्ड, भवन संहिता र अन्य प्रचलित कानूनको परिधिभित्र रही डिजाइन र नक्सा तयार गर्ने जिम्मेवारी डिजाइनकर्ताको हो ।
- भवनको वर्गीकरण अनुसार डिजाइनकर्ताको योग्यता पुगेको हुनुपर्नेछ र साथै डिजाइनकर्ता गाउँपालिका वा नगरपालिकामा सूचीकृत भएको हुनु पर्नेछ ।
- डिजाइनकर्ताबाट तयार भएको डिजाइन र नक्सा अनुसार भवनको निर्माण र सुपरीवेक्षण गरिनेछ ।



सुपरीवेक्षण परामर्शदाता

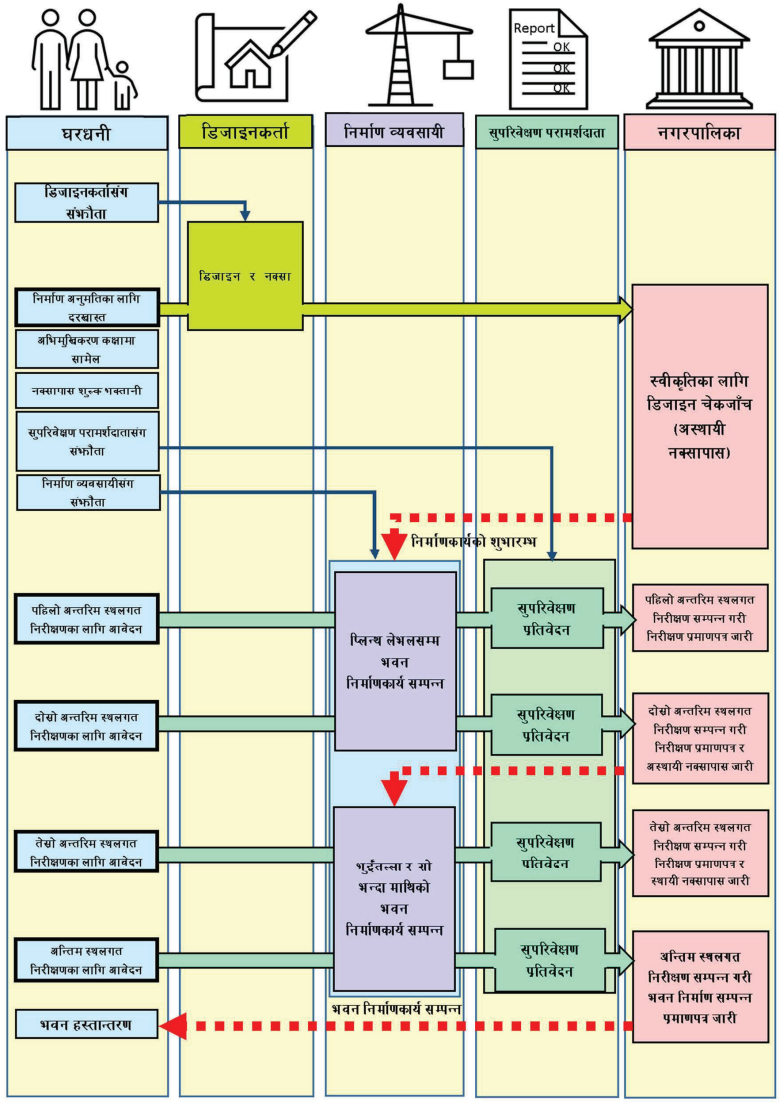
- गाउँपालिका वा नगरपालिकाबाट स्वीकृत भएको नक्सा र डिजाइन अनुसार भवन निर्माण भएको प्रत्याभूत गर्ने जिम्मेवारी सुपरीवेक्षण परामर्शदाताको हो । साथै भवन निर्माण सम्बन्धी प्राविधिक प्रतिवेदनहरू गाउँपालिका वा नगरपालिकामा बुझाउने दायित्व समेत सुपरीवेक्षण परामर्शदाता अन्तर्गत पर्दछ ।
- भवनको वर्गीकरण अनुसार सुपरीवेक्षण परामर्शदाताको योग्यता पुगेको हुनुपर्नेछ । साथै सुपरीवेक्षण परामर्शदाता सम्बन्धित गाउँपालिका वा नगरपालिकामा सूचीकृत भएको हुनुपर्नेछ ।



गाउँपालिका वा नगरपालिका

- शुरुको चरणमा भवन निर्माण गर्नका लागि नक्सा पास गराउन घरधनीहरूबाट प्राप्त दरखास्त स्वीकृत गर्ने जिम्मेवारी गाउँपालिका वा नगरपालिकाको हो ।
- निर्माणकार्य भइरहँदा विभिन्न चरणमा अन्तरिम निरीक्षण प्रमाणपत्र जारी गर्ने र निर्माणकार्य सम्पन्न भएपछि भवन निर्माण सम्पन्न प्रमाणपत्र जारी गर्ने दायित्व सम्बन्धित गाउँपालिका वा नगरपालिका अन्तर्गत पर्दछ ।

भवन निर्माण कार्यविधिको प्रवाहचित्र



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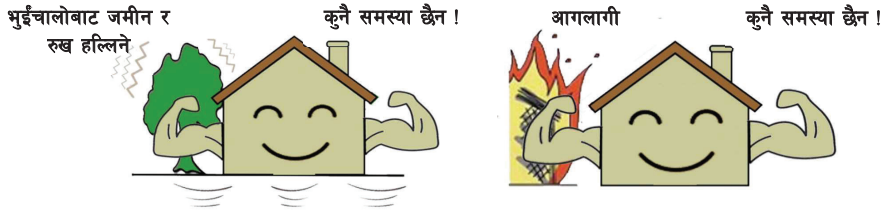
भवन निर्माण कार्यविधि किन आवश्यक छ ?

हामीले निर्माण गरेको भवनमा हामी जिवनभर बस्दछौं । भवनमा बस्दा र यसको प्रयोग गर्दा हाम्रो जीवनको सुरक्षा गर्न, हाम्रो स्वास्थ्य कायम राख्न र साथै हाम्रो सम्पत्तिको रक्षा गर्न राज्यले तपसीलमा उल्लेखित विनियमहरु जारी गरी लागु गरेको छ :



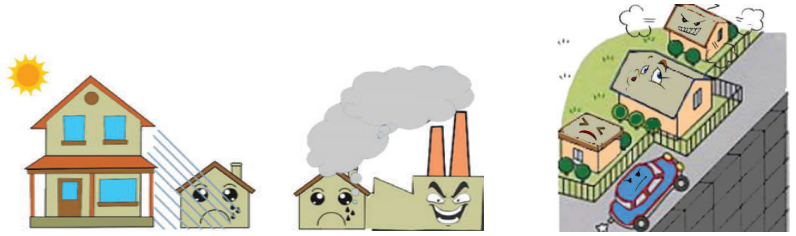
१. राष्ट्रिय भवन संहिता

भूकम्प, बाढी, आगलागी, पहिरो, इत्यादि जस्ता प्राकृतिक प्रकोपहरूबारे सर्वसाधारण नागरिकको जिउज्यान र सम्पत्तिको सुरक्षा गर्न र भवन भित्र बस्ने व्यक्तिको सुविधा र हितको रक्षा गर्न संरचनागत सुरक्षामा विशेष ध्यान दिई भवन निर्माण कार्य गराउनका लागि भवन संहिता जारी गरी लागु गरिएको हो ।



२. भवन निर्माण मापदण्ड

मानव बस्तीमा बसोबास गर्ने सम्पूर्ण जनताको लागि, बसोबास क्षेत्रमा आरामदायक वातावरण कायम गर्न भवन निर्माण मापदण्ड जारी र लागू गरिएको हो ।



उपरोक्त दुई विनियमहरू न्यायोचित र भेदभावरहित ढंगले सबै घरधनीलाई पालन गर्न लगाउनका लागि भवन निर्माण कार्यविधि तयार गरिएको हो ।

भवन निर्माण कार्यविधिबाट निर्माणकर्मीहरुलाई के फाइदा हुन्छ ?

भवन निर्माण कार्यविधिले निर्माणकर्मीलाई निम्नलिखित विषयहरुमा सक्षम बनाउँदछ :

- प्राकृतिक विपद् र आगलागिबाट सुरक्षित हुने गरी भवन निर्माण गर्न ।
- विद्यमान कानूनहरुको प्रावधानहरूको पालना हुने गरी भवन निर्माण कार्य गर्न ।
- सुपरीवेक्षण परामर्शदाताको प्रत्यक्ष सुपरिवेक्षणमा भवन निर्माण कार्य गरिने भएकोले आफूले बनाएको भवन गुणस्तरयुक्त छ भनी विश्वस्त हुन ।
- नगरपालिकाबाट जारी भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिता अनुरूप भवन निर्माण भएको विश्वस्त हुन, जसले गर्दा निर्मित भवनलाई निर्माण सम्पन्न प्रमाणपत्र प्राप्त गर्न कुनै समस्या हुँदैन ।



आरामदायक तथा सुरक्षित जीवन



नगरपालिकाबाट घरधनीको सम्पत्तिको प्रमाणिकरण

भवन निर्माण कार्यविधि अनुसार निर्माणकर्मीले पालना गर्नुपर्ने कुराहरू

भवन निर्माण कार्यविधि अनुसार निर्माणकर्मीले तपसीलमा उल्लेखित कुराहरू पूरा गर्नु पर्दछ :

- भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी ७ दिने तालिम लिने र सो को प्रमाणपत्र प्राप्त गर्ने ।
- आफूले चाहेको काम गर्न चाहेको नगरपालिकामा सूचीकृत हुने ।
- भवन निर्माण कार्य शुरु गर्नु अघि र पछि डिजाइनकर्ता, सुपरिवेक्षण परामर्शदाता र निर्माण व्यवसायीसंग सम्पर्कमा रहने र समन्वय गर्ने ।
- स्वीकृत नक्सा र डिजाइनको बर्खिलाफ हुने गरी कहिले पनि भवन निर्माणकार्य नगर्ने ।
- नगरपालिकाबाट संचालित भूकम्प प्रतिरोधी भवन निर्माण प्रविधिसम्बन्धी पुनर्ताजगी कार्यक्रम र भवन निर्माण सम्बन्धी अन्य कार्यक्रमहरूमा भाग लिने ।
- सुपरिवेक्षण परामर्शदाताबाट गरिने सुपरिवेक्षणको समयमा अनिवार्य उपस्थित हुने र आवश्यक सहयोग पुऱ्याउने । नगरपालिकाका प्राविधिकबाट गरिने अन्तरिम स्थलगत निरिक्षण र अन्तिम स्थलगत निरिक्षण कार्यको समयमा अनिवार्य उपस्थित हुने र सो कार्यमा आवश्यक सहयोग पुऱ्याउने ।
- स्वीकृत नक्सा र डिजाइन विपरित निर्माणकार्य गर्न घरधनीबाट कुनै दबाब आएमा सुपरिवेक्षण परामर्शदाता र नगरपालिकालाई सूचित गर्ने ।









कृपया ध्यान दिनु होला :

- भवन निर्माण कार्यविधि अनुसार भवन निर्माण कार्यको गुणस्तर कायम गर्न निर्माणकार्यको सुपरिवेक्षण अनिवार्य रूपमा सुपरिवेक्षण परामर्शदाताबाट गराउनु पर्दछ ।



निर्माण सुपरिवेक्षण नहुँदा



निर्माण सुपरिवेक्षण हुँदा



निर्माण सुपरिवेक्षण नहुँदा

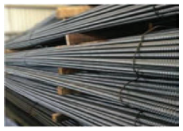


निर्माण सुपरिवेक्षण हुँदा

- भवन निर्माण गर्न आवश्यक निर्माण सामग्रीहरू घरधनी आफैले खरिद गरेर आपूर्ति गर्ने गरी भवन निर्माण गराउने भएमा पनि निर्माण सामग्रीहरूको गुणस्तर परिक्षण र त्यस सम्बन्धी प्रतिवेदन तयार गर्ने कार्य खुपरिवेक्षण परामर्शदाताबाट अनिवार्य रूपमा गराउनु पर्दछ। यसर्थ घरधनीले निर्माणस्थलमा निर्माण सामग्री ल्याउनु अघि सुपरिवेक्षण परामर्शदाताबाट सोको गुणस्तर यकीन गराउनु पर्दछ।















प्रतिवेदन

- भवन निर्माण कार्यविधिको प्रावधान विपरित भवन निर्माण कार्य गरिएमा नगरपालिकाले भवनको प्रयोगमा बन्देज लगाउन सक्दछ। साथै मापदण्ड र संहिता विपरित निर्मित संरचना घरधनीकै खर्चमा नगरपालिकाले भत्काउन सक्दछ।



संक्षिप्त नाम

अंग्रेजी संक्षिप्त नाम	नेपाली संक्षिप्त नाम	संक्षिप्त नामको पूरा रुप
GON	ने.स.	नेपाल सरकार
NRA	रा.पु.प्रा.	राष्ट्रिय पुनर्निर्माण प्राधिकरण
MoUD	श.वि.म.	शहरी विकास मन्त्रालय
MoFAGA	सं.मा. त.सा.प्र.मं	संघीय मामिला तथा सामान्य प्रशासन मन्त्रालय
DUDBC	श.वि.त.भ.नि.वि.	शहरी विकास तथा भवन निर्माण विभाग
KVDA	का.उ.वि.प्रा.	काठमाडौं उपत्यका विकास प्राधिकरण
JICA	जा.अ.स.नि.	जापान अन्तर्राष्ट्रिय सहयोग नियोग
NEC	ने.ई.प.	नेपाल ईन्जिनियरिङ्ग परिषद्
NS	ने.गुण	नेपाल गुण
IS	भा.मानक	भारतीय मानक
BCWP	भ.नि.का.	भवन निर्माण कार्यविधि
RCC	आर.सि.सि.	रेइन्फोर्स्ड सिमेन्ट कंक्रिट
PCC	पि.सि.सि.	प्लेन सिमेन्ट कंक्रिट
NBC	रा.भ.सं.	राष्ट्रिय भवन संहिता
Re-bars	फलामे डण्डी	रेइन्फोर्स्ड कंक्रिटमा प्रयोग गरिने फलामे डण्डी
CAO	प्र.प्र.अ.	प्रमुख प्रशासकीय अधिकृत
ROW	स.अ.क्षे.	सडक अधिकार क्षेत्र
FAR	भु.स.क्षे.	भुई सतहको क्षेत्रफल
OPC	ओ.पि.सि.	अर्डिनरी पोर्टल्याण्ड सिमेन्ट
PPC	पि.पि.सि.	पोज्जोलाना पोर्टल्याण्ड सिमेन्ट
M15	एम् १५	कम्प्रेशिभ स्ट्रेन्थ १५ एम्.पि.ए. भएको कंक्रिट
M20	एम् २०	कम्प्रेशिभ स्ट्रेन्थ २० एम्.पि.ए. भएको कंक्रिट
M25	एम् २५	कम्प्रेशिभ स्ट्रेन्थ २५ एम्.पि.ए. भएको कंक्रिट
TMT Bars	टि.एम्.टि. डण्डी	थर्मोमेकानिकल ट्रिटमेण्ट गरी उत्पादन गरिएको फलामे डण्डी

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१. संक्षिप्त नाम, प्रारम्भ र लागु हुने मिति १

२. परिभाषा १

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२.१ पृष्ठभूमि तथा भवन निर्माण कार्यविधिको उद्देश्य ४

२.२ भवन निर्माण कार्यविधिको प्रवाहचित्र (फ्लो-चार्ट) ५

२.३ भवन निर्माण अनुमति प्रक्रियाका विभिन्न चरणहरु ६

२.४ निर्माणकर्मीहरूका लागि भवन निर्माण कार्यविधि सम्बन्धी महत्वपूर्ण कुराहरु ९

२.५ भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिता सम्बन्धी सामान्य जानकारी १०

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३.१ निर्माणकर्मीको कानूनी दायित्व १६

३.२ नक्सा पास प्रक्रियाको विभिन्न चरणमा निर्माणकर्मीको जिम्मेवारी १८

३.३ दोषीहरूलाई सजाय २३

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४.१ भूकम्पमा भवनहरु किन क्षतिग्रस्त हुन्छन् ? २४

४.२ भवन निर्माण कार्यविधि अन्तर्गत भवन निर्माणकार्यमा नियमनका मुख्य बूँदाहरू ३२

४.३ निर्माणकार्यको अभिलेखिकरण र रिपोर्टिङ कार्य ३३

४.४ पिलर प्रणालीको भवन निर्माण कार्यमा भवन निर्माण कार्यविधि अनुसार आधारभूत गुणस्तरको सुनिश्चितता ३४

४.५ चार चरणमा गरिने स्थलगत निरीक्षण कायहर्रुको विवरण ३५

४.६ निर्माण सामग्रीहरुको गुणस्तरीयता र भण्डारण सम्बन्धी चेक जाँच ४०

४.७. निर्माणस्थलको तैयारी सम्बन्धी चेकजाँच ५०

४.८ कारिगरीपना (Workmanship) ५५

४.९ कंक्रिट ढलान कार्य ५५

४.१० आर. सि. सि. संरचनामा फलामे डण्डी राख्ने विधि ..... टद

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४.१३ ढुंगाको गारो लगाउने कार्य : ७१

४.१४ फिनिशिङ कार्य : ७२

४.१५ निमार्णकार्य सम्पन्न भएको सुनिश्चितता ७३

४.१६ निर्माणकार्यको गुणस्तर नियन्त्रणका लागि प्रयोगशालामा गरिने परीक्षण ७४

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अनुसूची- २ : भूकम्प प्रतिरोधात्मक भवन निर्माण गर्न ध्यान दिनु पर्ने कुराहरु ८०

अनुसूची- ३ : निर्माणकर्मीहरु नगरपालिकामा सूचीकृत हुनका लागि नमूना फाराम ९४

अनुसूची- ४ : भवन निर्माण गर्नका लागि घरधनी र निर्माणकर्मी बिच गर्नुपर्ने सम्झौताको नमूना ९६

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निर्माणकर्मीका लागि भवन निर्माण कार्यविधि सम्बन्धी निर्देशिका

प्रस्तावना

भवन निर्माणकार्यमा सरिक हुने निर्माणकर्मीहरूलाई नगरपालिकाको भवन निर्माण अनुमति वा नकसा पास प्रक्रिया बारे जानकारी दिन र राष्ट्रिय भवन संहिता अनुरूप भूकम्प प्रतिरोधी भवन निर्माण प्रविधिबारे विशेष ध्यान आकर्षित गराउनका लागि भवन निर्माण कार्यविधि सम्बन्धी यो निर्देशिका तयार गरिएको हो । यो निर्देशिकामा गुणस्तरयुक्त भवन निर्माण गर्न निर्माणकर्मीहरुले अपनाउनु पर्ने विधिहरूमा जोड दिइएको छ । निर्माणकर्मीहरूका लागि भवनका विभिन्न खण्डहरूको डिटेलिङ र निर्माणकार्यको गुणस्तर सम्बन्धमा विशेष ज्ञान दिनका लागि निर्देशिकामा आवश्यक चित्र र तस्वीरहरु राखिएका छन् । यो निर्देशिकाको मुख्य उद्देश्य भवन निर्माण कार्याविधि अनुसार भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिताको पालना सम्बन्धमा निर्माणकर्मीहरूलाई बढी जिम्मेवार बनाउनु हो । निर्माणकर्मीहरू सुरक्षित भवन निर्माण प्रक्रियाको अभिन्न अंग भएकोले नगरपालिकाको समग्र नक्सापास प्रक्रियामा यस निर्देशिकाको माध्यमबाट उनीहरूलाई समाविष्ट गराउन खोजिएको छ ।

परिच्छेद - १
प्रारम्भिक

१. संक्षिप्त नाम, प्रारम्भ र लागु हुने मिति

(क) यस निर्देशिकाको नाम **"निर्माणकर्मीहरूका लागि भवन निर्माण कार्यविधि, २०७८ (सन् २०२२) मा आधारित निर्देशिका, २०८०**" रहेको छ ।

(ख) यो निर्देशिका नेपाल अधिराज्य भर लागु हुनेछ ।

(ग) यो निर्देशिका तुरुन्त लागु हुनेछ ।

(घ) पालिकाबाट सबै किसिममा भवन निर्माण कार्यहरू (नयाँ निर्माण, मरम्मत, प्रबलीकरण, पुनर्निर्माण, विस्तार, तल्ला थप, प्रयोजन परिवर्तन, पर्खाल निर्माण) गर्नका लागि भवन निर्माण अनुमति प्रदान गर्ने कार्यमा यो निर्देशिका पालन गर्नु पर्नेछ ।

२. परिभाषा

विषय वा प्रसङ्गले अर्को अर्थ नलागेमा यस निर्देशिकामा

(क) "भवन" भन्नाले मानव बसोबासको लागि प्रयोग हुने वा नहुने, कुनै पनि उद्देश्यको लागि निर्माण हुने र जुनसुकै निर्माण सामग्रीबाट निर्माण गरिने संरचना भन्ने बुझाउँदछ । यसमा तल दिइएका अनुसारका एक वा एकभन्दा बढी संरचनाहरु समावेश हुन सक्छ :

अ) जग, प्लिन्थ, गारो, भुई, छाना, चिम्नी, प्लम्बिङ्ग तथा भवन सेवाहरु, जडान गरिएका प्लेटफर्महरु
आ) बरण्डा, बार्दली, कर्नीस, प्रोजेक्शन आदि ।
इ) भवनको भागहरु र त्यसमा जडान भएका कुनै कुरा
ई) कुनै जग्गा वा ठाउँलाई घेर्नको लागि बनाइएका गारोहरु, स्ट्रक्चरहरु आदि ।

उ) तरल रसायनहरु वा पानी भण्डार गर्न निर्माण गरिएका वा जडान गरिएका ट्याङ्कीहरु, पौडी खेल्ने पोखरीहरु

(ख) "भवन निर्माण" भन्नाले नयाँ भवनको निर्माण, पुरानो भवन भत्काई नयाँ भवनको पुनर्निर्माण, भवनको विस्तार, तल्ला थप, भवनको मोहोडा परिवर्तन,झ्याल-ढोका, प्यारापेट, बार्दली, उचाइ, पोर्टिको इत्यादिको परिवर्तन र अन्य सम्बन्धित निर्माण कार्यलाई बुझाउँदछ ।

(ग) "विद्युतीय, नक्सा पास प्रणाली" भन्नाले नक्सा पास प्रक्रियाको लागि नगरपालिकाबाट बनाइएको अनलाइन प्रणाली भन्ने बुझाउँदछ ।

(घ) "नक्सा" भन्नाले भवन निर्माण संग सम्बधित सबै नक्सा र सम्बधित कागजात बुझाउँछ ।

(ङ) "डिजाइनकर्ता" भन्नाले नगरपालिकामा भवनको डिजाइन र नक्सा तयार गर्न सूचीकृत भएका व्यक्ति वा परामर्श संस्था वा अन्य संस्था भन्ने बुझाउँदछ ।

(च) "सुपरीवेक्षण परामर्शदाता" भन्नाले नगरपालिकामा भवनको निर्माणकार्यको प्राविधिक सुपरिवेक्षण कार्य गर्न सूचीकृत भएका व्यक्ति का परामर्श संस्था वा अन्य संस्था भन्ने बुझाउँदछ ।

(छ) "सर्जमीन मुचुल्का" भन्नाले भवन निर्माणका लागि स्थलगत सर्जमीन गरी प्रस्तावित भवन निर्माण स्थलमा भएका जग्गा, प्रवेश मार्ग, साँध जोडीएका जग्गाहरुको सम्बन्धमा संधियारहरुको उपस्थितिमा उनीहरूको कुनै गुनासो वा उजूर भए सो समेत संकलन गरी वडा अध्यक्ष वा निजको आधिकारिक प्रतिनिधिले तयार गरेको मुचुल्का भन्ने बुझाउँदछ ।

(ज) "तल्ला" भन्नाले भवनका दुई तल्लाको भुई वा कुनै तल्लाको भुई र सिलिङको बीचको भाग भन्ने बुलाउँदछ ।

(झ) "प्लिन्थ" भन्नाले भवनको वरिपरिको जमीनको सतह र भुई भन्दा माथिको सबैभन्दा नजिकको तल्लाको सतह बीचको भाग भन्ने बुझाउँदछ ।

(ञ) "प्लिन्थ तह" भन्नाले वरिपरिको जमीन माथिको सबैभन्दा नजिकको भुईको तह भन्ने बुझाउँदछ ।

(ट) "प्लिन्थ क्षेत्रफल" भन्नाले भवनको प्लिन्थ तहमा निर्माण गरिएको ढाकिएको क्षेत्रफल भन्ने बुझाउँदछ ।

(ठ) "प्रयोजनको किसिम" भन्नाले भवनलाई उपयोग गर्ने किसिमलाई बुझाउँदछ, जस्तै- आवासीय, व्यापारिक, कोल्ड स्टोर, भण्डारगृह, संयुक्त आवास, स्वास्थ्य संस्था, होस्टेल, संस्थागत, इत्यादि ।

(ड) "प्रयोजन परिवर्तन" भन्नाले नक्सा पास गर्दा स्वीकृत भएको भवनको प्रयोजनको किसिमलाई गरिने परिवर्तनलाई बुझाउँदछ ।

(ढ) "भवन संहिता" भन्नाले नेपाल सरकारले लागु गरेको राष्ट्रिय भवन संहितालाई बुझाउँदछ ।

(ण) "भवन निर्माण मापदण्ड" भन्नाले नगरपालिकाले तयार गरी नगरपालिका क्षेत्रभित्र लागु गरेको भवन निर्माण मापदण्ड भन्ने बुझाउँदछ ।

(ट) "नगरपालिका" भन्नाले नेपालको संविधान अनुसार स्थापना भएका नेपालका नगरपालिकाहरू भन्ने बुझाउँदछ र यस अन्तर्गत महानगरपालिका र उपमहानगरपालिका समेत पर्दछन् ।

घ) "नगर प्रमुख" भन्नाले सम्बन्धित नगरपालिकाको प्रमुख भन्ने बुझाउँछ ।

(इ) "प्रमुख प्रशासकीय अधिकृत" भन्नाले सम्बन्धित नगरपालिकाको प्रमुख प्रशासकीय अधिकृत भन्ने बुझाउँदछ ।

(ब) "ऐन" भन्नाले स्थानीय सरकार संचालन ऐन, २०७४ भन्ने बुझाउँदछ ।

(न) "नगरसभा" भन्नाले सम्बन्धित नगरपालिकाको नगरसभा भन्ने बुझाउँदछ ।

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(प) "आर्थिक ऐन" भन्नाले सम्बन्धित नगरपालिकाको नगरसभाबाट हरेक आर्थिक वर्षमा स्वीकृत गरिएको त्यस वर्षको आर्थिक ऐन भन्ने बुझाउँदछ ।

(फ) "घरधनी" भन्नाले भवन निर्माण वा पुनर्निर्माण गर्न वा भवनमा संरचनागत र अन्य परिवर्तनहरु गर्न चाहने व्यक्ति, कम्पनी वा संस्था भन्ने बुझाउँदछ ।

(ब) "निर्माणकर्मी" भन्नाले नगरपालिकामा सूचीकृत भई भवन निर्माण कार्यमा सरिक डकर्मी वा निर्माणकर्मीलाई बुझाउँदछ ।

(भ) "निर्माण व्यवसायी" भन्नाले घरधनीद्वारा निजको भवन निर्माण गर्न नियुक्त गरिएको नगरपालिकामा सूचीकृत भएका निर्माण व्यवसायीलाई बुझाउँदछ ।

(म) "दरखास्त फाराम" भन्नाले "क", "ख", "ग" वा "घ" वर्गका भवनहरूको निर्माण गर्नका लागि नगरपालिकाबाट निर्माण अनुमति प्राप्त गर्न वा नक्सा पास गर्न तोकिएको ढाँचामा तयार गरिएको कागजात भन्ने बुझाउँदछ ।

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परिच्छेद - २
भवन निर्माण कार्यविधि सम्बन्धी सामान्य परिचय

२.१ पृष्ठभूमि तथा भवन निर्माण कार्यविधिको उद्देश्य

हालको दशकमा आएर नेपालमा भवन निर्माण कार्यको अभ्यासमा तिव्र सुधार भइरहेको छ । ठूला र जटिल प्रकृतिका निर्माणकार्यहरू सरजताका साथ र समयबद्ध ढंगले गर्नका लागि निर्माण क्षेत्रमा नयाँ निर्माण सामग्रीहरू उपकरणहरू र प्रविधिहरू भित्राइदै छ । यस्तो कार्य मूलतः बहुतल्ले संयुक्त आवास भवन, सामूहिक आवास, व्यापारिक भवनहरु, ठूला कञ्चनीका कार्यालय भवनहरु जस्ता ठूला र विशाल आयोजनाहरूमा भइरहेको छ । यस्ता ठूला प्रकृतिका आयोजनाहरूमा योग्यताप्राप्त प्राविधिक टोली र अनुभवी तथा दक्ष पेशागत निर्माण व्यवसायीहरु संलग्न भएका हुन्छन् । तर निर्माण लागत र निर्माणकार्यको परिमाणको हिसाबले तुलनात्मक रूपमा साना प्रकृतिका धेरैजसो आवासीय भवनहरूको निर्माणकार्यमा पेशागत योग्यता भएका प्राविधिकहरूको विरलै प्रयोग भएको पाइन्छ । यिनीहरूको निर्माणकार्यको गुणस्तर अनौपचारिक रुपमा काम गर्ने निर्माण व्यवसायी र अर्धदक्ष निर्माणकर्मीको हातमा हुन्छ । यस्तो निर्माणकार्यमा विस्तृत या डिटेल नक्साहरूको प्रयोग गरिदैन । त्यस्तै यस्ता निर्माणकार्यहरुमा नयाँ निर्माण प्रविधि र गुणस्तर परीक्षणको प्रयोग पनि विरलै गरिन्छ ।

भवन ऐन, २०५५ र भवन नियमावली २०६६ मा नेपालमा निर्माण कार्यको प्राविधिक सुपरीवेक्षण तोकिएको योग्यता प्राप्त प्राविधिकहरूबाट गराउनु पर्ने बाध्यात्मक व्यवस्था गरिएको छ । तर नेपालका अधिकांश पालिकाहरुमा यसको कार्यान्वयन हुन सकेको छैन । प्रचलित भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिता अनुसार भवन निर्माण कार्य भए-नभएको निरीक्षण गर्नका लागि उपयुक्त कार्यविधि र निर्देशिकाको कमी देखिन्छ । भवन निर्माण कार्यमा संलग्न हुने मुख्य सरोकारवालाहरूको भूमिका र जिम्मेवारी प्रष्टसंग परिभाषित गरिएको देखिदैन । शहरी तथा ग्रामीण पालिकाहरूमा हुने भवन निर्माण कार्यको नियमन गर्नका लागि तेश्रो पक्षबाट गरिने जाँच र अनुगमनका लागि संयन्त्रको व्यवस्था नरहेको देखिन्छ ।

भवन क्षेत्रमा कार्यरत अनौपचारिक सरोकारवालाहरू तालीम प्राप्त नहुनुका साथै उनीहरुका लागि भवन निर्माण सम्बन्धी नर्मस्, गुणस्तर, डिटेलिङ इत्यादिद्वारा भवनलाई भूकम्प लगायतका प्राकृतिक विपद्बाट कसरी सुरक्षित बनाउने भन्ने सम्बन्धमा क्षमता वृद्धि तथा सचेतनामूलक कार्यक्रमहरू पर्याप्त मात्रामा नियमित संचालन गर्ने प्रचलन छैन । भवन निर्माण क्षेत्रमा भएका प्रतिकूल अवस्थालाई मध्यनजर गरेर शहरी विकास तथा भवन निर्माण विभागले भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिताको प्रभावकारी कार्यान्वयनको लागि पालिकाहरूलाई सहयोग गर्न भवन ऐन २०५५ र भवन नियमावली २०६६ मा आधारित भवन निर्माण कार्यविधि तर्जुमा गर्ने प्रयास गरेको छ । भवन निर्माण कार्यविधिको मुख्य उद्देश्य देशभरीका पालिकाहरुमा पालिकाका प्राविधिकहरुबाट भवन निर्माण कार्यको अन्तरिम स्थलगत निरीक्षण गर्ने व्यवस्था शुरुवात् गरी भवन निर्माण अनुमति र निर्माण सम्पन्न दिने प्रक्रियामा समस्त पालिकाहरुमा एकरुपता ल्याउनु हो । भवन निर्माण कार्यविधि तर्जुमा र कार्यान्वयनमा ल्याउनुका अन्य उद्देश्यहरू निम्नानुसारका छन् :

क) पालिकाहरूको भवन निर्माण अनुमतिको समग्र प्रक्रिया प्रति पालिकाका प्राविधिकहरु, डिजाइनकर्ता, सुपरीवेक्षण परामर्शदाता, निर्माण व्यवसायी, निर्माणकर्मी र घरधनीहरुलाई अझ बढी जिम्मेवार बनाउने ।

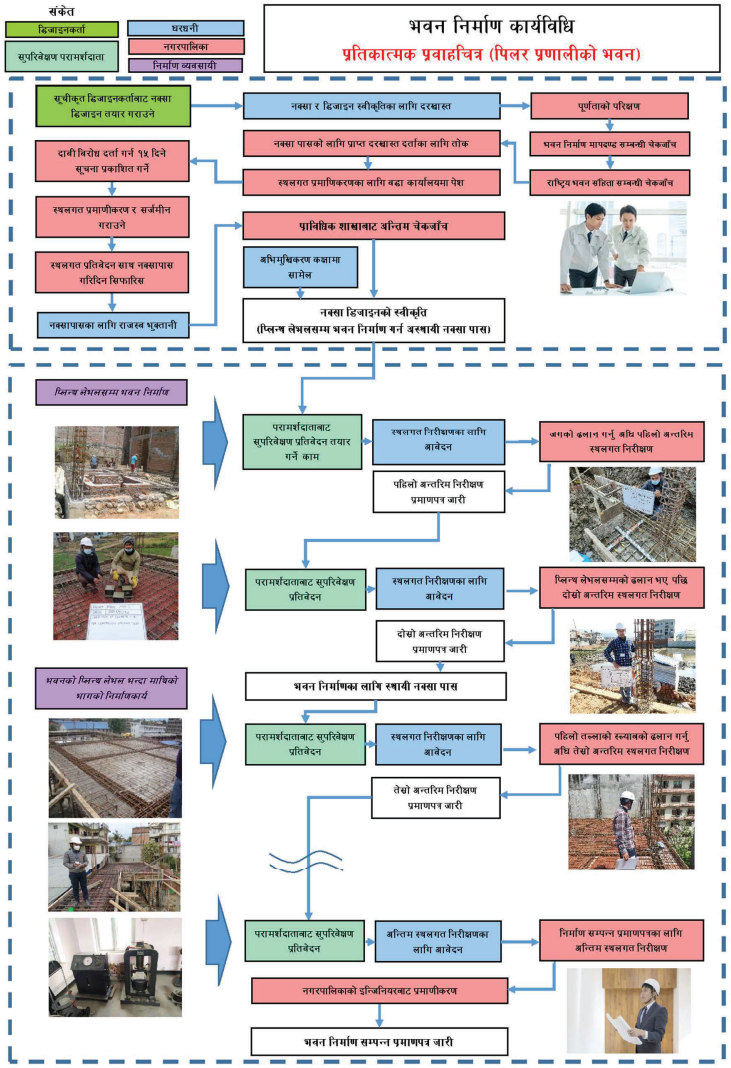
ख) पालिकाहरुमा हुने सबै नयाँ भवन निर्माण कार्यहरूमा प्राविधिक सुपरीवेक्षण अनिवार्य गर्ने ।

ग) निर्माण सामग्री र कंक्रिट ढलान कार्यको अनिवार्य प्रयोगशाला परीक्षण अनिवार्य गराई निर्माणकार्यको गुणस्तरमा सुधार ल्याउने ।

घ) भवन निर्माण मापदण्ड र भवन संहिताको परिपालना सम्बन्धमा सुधार ल्याउने ।

ङ) संभाव्य भूकम्पीय जोखिमबाट देशभरीका शहरी र ग्रामोण क्षेत्रमा रहेका भवनहरूलाई सुरक्षित बनाउने ।

२.२ भवन निर्माण कार्यविधिको प्रवाहचित्र (फ्लो-चार्ट)



२.३ भवन निर्माण अनुमति प्रक्रियाका विभिन्न चरणहरु

नयाँ भवन निर्माण कार्यविधि अनुसार पालिकाहरूमा भवन निर्माण अनुमति प्रक्रियामा हुने विभिन्न चरणहरु तपसीलमा उल्लेख गरिए अनुसार छन् :

पहिलो चरण : पालिकाको वेबसाइटमा प्रकाशित सूचीबाट डिजाइनकर्ता, सुपरीवेक्षण परामर्शदाता, निर्माण व्यवसायी र निर्माणकर्मीको छनोट गर्ने ।

दोश्रो चरण : भवन निर्माण अनुमतिका लागि दरखास्त फाराम, डिजाइन र नक्सा तयार गर्ने र पालिकाको रजिष्ट्रेशन डेस्कमा दर्ता गर्ने ।

- पालिकामा सूचीकृत डिजाइनकर्ताबाट डिजाइन, नक्सा र डिटेल तयार गर्ने ।
- भवन निर्माण अनुमतिको दरखास्त फाराम, डिजाइनरहरू घरधनीले चेकजाँच गर्ने ।
- भवन निर्माण अनुमतिको दरखास्त फाराम, डिजाइन र नक्साहरूमा नाम, ठेगाना र सम्पर्क फोन नं. सहित घरधनी वा निजको अख्तियार प्राप्त व्यक्ति र डिजाइनकर्ताले हस्ताक्षर गर्ने ।
- डिजाइन र नक्सा सहित दरखास्त फाराम पालिकाको राजेष्ट्रेशन डेस्कमा दर्ता गर्ने ।

तेश्रो चरण: प्राप्त भएका डिजाइन, नक्सा र डिटेल स्वीकृत गर्ने

- भवन निर्माण अनुमतिका लागि प्राप्त दरखास्त फाराम, डिजाइन, नक्सा र अन्य कागजातहरूको पूर्णताको परीक्षण गर्ने ।
- पालिकाको भवन निर्माण मापदण्ड इकाईबाट प्रचलित भवन निर्माण आपदण्ड अनुसार डिजाइन र नक्सा तयार भए नभएको जाँच गर्ने ।
- पालिकाको भवन संहिता इकाईबाट राष्ट्रिय भवन संहिता अनुसार पेश भएको डिजाइन र नक्सा तयार भए-नभएको जाँच गर्ने ।
- पेश भएको डिजाइन नक्सा तथा दरखास्तमा कुनै परिमार्जन/ सुधार/ परिवर्तन गर्नु पर्ने भएमा घरधनीलाई सूचित गर्ने ।
- भवन निर्माण अनुमतिको दरखास्त दर्ताको लागि सहमति प्रदान गर्ने ।

चौथो चरण : सर्जमीन र स्थलगत प्रमाणीकरण

- भवन निर्माण अनुमतिको दरखास्त फाराम, डिजाइन र नक्साहरूको फाइल रजिष्ट्रेशन डेस्कबाट वडा कार्यालयमा पठाइदिने ।
- भवन निर्माण कार्यको सम्बन्धमा कुनै गुनासो वा उजूर भए सूचना प्रकाशित भएको पन्ध्रदिनभित्र सो गुनासो/उजूर दर्ता गराउन सूचना प्रकाशित गर्ने ।
- प्राप्त गुनासो/उजूरको सम्बोधन पालिकाको प्राविधिक/कानून शाखाबाट गर्ने ।
- वडा कार्यालयबाट सर्जमीन गर्ने र पालिकाबाट खटिएको प्राविधिकले स्थलगत निरीक्षण प्रतिवेदन तयार गर्ने ।
- पालिकाबाट खटिएको प्राविधिकले स्थलगत निरीक्षण प्रतिवेदन र सर्जमीन मुचुल्का पेश गर्ने ।
- वडा कार्यालयले सर्जमीन मुचुल्का र स्थलगत निरीक्षण प्रतिवेदन सहितको दरखास्त फारामको फाइल प्राविधिक शाखामा पेश गर्ने ।

पाँचौं चरण : भवन निर्माण अनुमतिको राजस्व दस्तूर भुक्तानी गर्ने :



- भवन निर्माण अनुमतिको राजस्व दस्तूर घरधनीबार भुक्तानी लिन प्राविधिक शाखाले राजस्व शाखालाई सिफारिस गर्ने ।
- घरधनीले पालिकाको राजस्व शाखामा अनुमति दस्तूर भुक्तानी गर्ने पालिकाको प्राविधिक शाखाले भवन निर्माण अनुमतिका लागि
- प्राप्त दरखास्त फाराम, आवश्यक कागजात, वक्ता र डिजाइनहरूको अन्तिम चेक गर्ने ।

छेठौं चरण : राष्ट्रिय भवन संहिता र भूकम्प प्रतिरोधात्मक भवन निर्माण सम्बन्धी अभिमुखीकरण कक्षामा घरधनीले भाग लिने ।



- पालिकाको प्राविधिक शाखाबाट संचालित राष्ट्रिय भवन संहिता र भूकम्प प्रतिरोधात्मक भवन निर्माण सम्बन्धी अभिमुखीकरण कक्षामा धराधनीले भाग लिने ।
- अभिमुखीकरण कक्षामा भाग लिएका घरधनीहरूको सूची प्राविधिक शाखामा पढाउने ।

सातौं चरण : प्लिन्थ तहसम्म भवन निर्माण कार्य गर्न अस्थायी निर्माण अनुमति प्रदान गर्ने ।



- प्राविधिक शाखाले डिजाइनको अन्तिम जाँच गर्ने र प्लिन्थ तहसम्मको भवन निर्माण कार्य गर्नका लागि अस्थायी निर्माण अनुमति जारी गर्न प्रमुख प्रशासकीय अधिकृत समक्ष सिफारिस गर्ने ।
- प्रमुख प्रशासकीय अधिकृतले फाइलको जाँच गरी अस्थायी निर्माण स्वीकृतिको निर्णय गर्ने ।
- प्राविधिक शाखाबार स्वीकृत नक्सा र डिजाइन सहित घरधनीलाई अस्थायी निर्माण अनुमतिको प्रमाणपत्र जारी गर्ने ।

आठौं चरण : प्लिन्थ लेभलसम्म निर्माणकार्य गर्ने



- भवन निर्माण कार्य शुरु गर्ने ।
- भवनको जग निर्माणको लागि ले-आउट कार्य गर्ने र जग तथा पिलरको डण्डी बाँध्ने कार्य गर्ने ।
- सुपरीवेक्षण परामर्शदाताद्वारा जग निर्माण सम्बन्धी प्राविधिक प्रतिवेदन तयार गर्ने ।

आठौं (क) चरण : पालिकाबाट पहिलो अन्तरिम स्थलगत निरीक्षण



- जग निर्माणको लागि डण्डी बाँध्ने र पिलरको डण्डी अड्याउने काम सम्पन्न गर्ने ।
- सूचीकृत सुपरीवेक्षण परामर्शदाताद्वारा तयार गरिएको सुपरीवेक्षण प्रतिवेदन सहित घरधनीबाट पालिकाद्वारा प्रथम अन्तरिम स्थलगत निरीक्षणका लागि दरखास्त दर्ता गर्ने ।
- प्लिन्थ लेंसल भन्दा मुनिको ढलान कार्य गर्नु अघि पालिकाबाट खटिएको प्राविधिकद्वारा प्रथम अन्तरिम स्थलगत निरीक्षण कार्य गर्ने ।
- यस सिलसिलामा स्वीकृत नक्सा र डिजाइन अनुसार जग र पिलरहरूको ले-आउट गरिएको र ढलानकार्यको लागि डण्डीहरु तैयारी अवस्थामा बाँधिएको सम्बन्धमा पालिकाबाट खटिएको प्राविधिकले नापजाँच गर्ने ।

- गारो प्रणालीका भवनहरूमा गारोको जग र प्लिन्थ तह भन्दा मुनिका गारोको भागहरूको ले-आउट र बनावटको चेक जाँच गर्नु पर्नेछ ।

आठौं (ख) चरण : प्रथम अन्तरिम निरीक्षण प्रमाणपत्र



- स्वीकृत नक्सा र डिज़ाइन अनुसार प्लिन्थ तह भन्दा मुनिको निर्माणको लागि पिलर सिस्टमको भवनमा जग तथा पिलरको डण्डी बाँध्ने काम सम्पन्न गरिएको भनी पालिकाबाट खटिएको प्राविधिकबाट प्रमाणित भएमा प्रथम अन्तरिम निरीक्षण प्रमाणपत्र पालिकाबाट जारी गरिनेछ ।
- तत्पश्चात् थप निर्माणकार्य जारी राखी प्लिन्थ तहसम्मको निर्माण सम्पन्न गर्न घरधनीलाई सूचित गरिनेछ ।

आठौं (ग) चरण : पालिकाबाट दोश्रो अन्तरिम निरीक्षण प्रमाणपत्र



- भवनको निर्माणकार्य प्लिन्थ तह भन्दा मुनिको ढलान कार्य सम्पन्न गरी प्लिन्थ बिमको डण्डी बाँधेको अवस्थासम्म सम्पन्न गरेको हुनुपर्नेछ ।
- यसपछि घरधनीले सुपरीवेक्षण परामर्शदाताबाट तयार गरिएको सुपरीवेक्षण प्रमाणपत्र संलग्न गरी दोश्रो अन्तरिम निरीक्षण का लागि पालिकामा दरखास्त दिनुपर्नेछ ।
- पालिकाबाट खटिएको प्राविधिकले भवनको प्लिन्थ लेभल भन्दा मुनिको निर्माणकार्य स्वीकृत नक्सा र डिजाइन अनुसार भए-नभएको भनी चेक जाँच गर्नुपर्नेछ ।

आठौं चरण (घ) : दोश्रो अन्तरिम निरीक्षण प्रमाणिकरण



- पालिकाबाट खटिएको प्राविधिकले आवश्यक चेकजाँच गरी स्वीकृत नक्सा र डिजाइन अनुसार प्लिन्थ लेभल भन्दा मुनिको ढलानकार्य भएको देखिएमा दोश्रो अन्तरिम निरीक्षण प्रमाणपत्र र स्थायी निर्माणकार्यको अनुमतिपत्र जारी गर्न सिफारिस गर्नेछ ।

आठौं चरण (ङ) : प्लिन्थ लेभल भन्दा माथिको सुपरस्ट्रक्चर निर्माणका लागि स्थायी निर्माण अनुमतिपत्र (स्थायी नक्सापास)



- प्राविधिक शाखाबाट सिफारिस प्राप्त भएपछि नगरपालिकाको प्रमुख प्रशासकीय अधिकृतले सुपरस्ट्रक्चरको निर्माणकार्यको लागि स्थायी निर्माण अनुमतिपत्र वा स्थायी नक्सा पासको प्रमाणपत्र जारी गर्नेछ ।

नवौं चरण : भवनको सुपरस्ट्रक्चरको निर्माणकार्य



- भवनको प्लिन्थ लेभल भन्दा माथिको भाग वा सुपरस्ट्रक्चरको निर्माणकार्य धरधनीले शुरु गर्ने ।
- सुपरीवेक्षण परामर्शदाताले सुपरीवेक्षण प्रतिवेदन तयार गर्ने ।

दशौं (क) चरण : पालिकाबाट तेश्रो अन्तरिम निरीक्षण



- पहिलो तल्लाको स्ल्याब र बिमको ढलानको लागि फर्मा बाँधी डण्डी बाँध्ने कामसम्म भवनको निर्माणकार्य सम्पन्न गर्ने र सुपरीवेक्षण परामर्शदाताले सो सम्बन्धी सुपरीवेक्षण प्रतिवेदन तयार गर्ने ।

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- घरधनीले सुपरीवेक्षण प्रतिवेदन संलग्न गरी तेश्रो अन्तरिम निरीक्षणका लागि दरखास्त दिने ।
- स्वीकृत नक्सा र डिजाइन अनुसार पहिलो तल्लाको स्ल्याब र बिम तहसम्मको निर्माणकार्य भए-नभएको सम्बन्धमा पालिकाबाट चेकजाँच गरी तेश्रो निरीक्षण प्रमाणपत्र जारी गर्न सिफारिस गर्ने ।
- प्राविधिक शाखाबाट तेश्रो अन्तरिय निरीक्षण प्रमाणपत्र घरधनीको नाममा जारी गर्ने ।
- बहुतल्ले भवनको हकमा भवनका माथिल्ला तल्लाहरू निर्माण स्वीकृत नक्सा र डिजाइन अनुसार भए-नभएको सम्बन्धमा पालिकाबाट निरीक्षण र चेकजाँच गर्न सकिने ।

दशौं (ख) चरण : तेस्रो अन्तरिम निरीक्षण प्रमाणीकरण



- पहिलो तल्लासम्मको भवनको निर्माणकार्य स्वीकृत नक्सा र डिजाइन अनुसार भएको पाइएमा पालिकाबाट खटिएको प्राविधिकले तेश्रो अन्तरिम निरीक्षण प्रमाणपत्र जारी गर्न सिफारिस गर्नेछ ।
- प्राविधिक शाखाबाट घरधनीको नाममा तेश्रो अन्तरिम निरीक्षण प्रमाणपत्र जारी हुनेछ ।

एघारौं चरण : भवन निर्माण सम्पन्न प्रमाणपत्र

एघारौं (क) चरण : भवन निर्माण सम्पन्न प्रमाणपत्रका लागि पालिकाबाट अन्तिम निरीक्षण :



- भवन निर्माण कार्य स्वीकृत नक्सा र डिजाइन अनुसार सम्पन्न गर्ने ।
- सुपरीवेक्षण परामर्शदाताबाट तयार गरिएको सुपरीवेक्षण प्रतिवेदन संलग्न गरी घरधनीले भवन निर्माण सम्पन्न प्रमाणपत्रका लागि दरखास्त पेश गर्ने ।
- पालिकाको प्राविधिकले भवनको अन्तिम निरीक्षण गर्नेछ र स्वीकृत नक्सा र डिजाइन अनुसार भवनको निर्माण भए-नभएको चेकजाँच गर्नेछ । साथै सुपरीवेक्षण प्रतिवेदन समीक्षा गरी सार्वजनिक बाटो, ढल जस्ता पूर्वाधारहरूको मरम्मत भए-नभएको समेत जाँच गर्नेछ । सबै निर्माणकार्यहरु दुरुस्त रहेको पाइएमा प्राविधिक शाखाले प्रमुख प्रशासकीय अधिकृत समक्ष भवन निर्माण सम्पन्न प्रमाणपत्र जारी गर्न सिफारिस गर्नेछ ।

एघारौं (ख) चरण : भवन निर्माण सम्पन्न प्रमाणपत्र जारी गर्ने कार्य



- प्राविधिक शाखाबाट पेश भएको अन्तिम निरीक्षण प्रतिवेदनले सुपरीवेक्षण प्रतिवेदन र स्वीकृत नक्सा डिजाइन अनुसार भवन निर्माणकार्य भएको देखाएमा र साथै भवनको भित्री र बाहिरी सतहहरूमा कम्तीमा एक/एक कोट रंगरोगन भएको र सार्वजनिक पूर्वाधार (सडक, ढल इत्यादि) हरुको मरम्मत गरिएको पाइएमा पालिकाबाट घरधनीको नाममा भवन निर्माण सम्पन्न प्रमाणपत्र जारी गरिनेछ ।



२.४ निर्माणकर्मीहरूका लागि भवन निर्माण कार्यविधि सम्बन्धी महत्वपूर्ण कुराहरु

भवन निर्माण मापदण्ड र भवन संहिताको पालना हुने गरी भवन निर्माण गर्न घरधनीलाई सहयोग पुऱ्याउन निर्माणकर्मीहरुले भवन निर्माण कार्यविधिका तपसीलमा उल्लेखित बूँदाहरूमा विशेष ध्यान पुऱ्याउनु पर्ने हुन्छ:

- घरधनीका लागि भवन निर्माण गरिदिने कार्यमा सरिक हुनका लागि निर्माणकर्मीले सम्बन्धित नगरपालिकामा अनिवार्य रूपमा सूचीकृत वा दर्ता भएको हुनु पर्दछ ।

- भवन निर्माण कार्यमा प्राविधिक सुपरिवेक्षण अनिवार्य रूपमा गराउनु पर्ने भएकोले घरधनीले सुपरिवेक्षण कार्यका लागि सूचीकृत सुपरिवेक्षण परामर्शदाताको सेवा लिनु पर्ने हुन्छ । सुपरिवेक्षण परामर्शदाताको प्रत्यक्ष सुपरिवेक्षणमा निर्माणकर्मीहरुले भवन निर्माण कार्य गर्नुपर्दछ ।
- भवन निर्माण कार्यको डिटेलिङ र गुणस्तर सम्बन्धमा आवश्यक विवरण र प्रमाणहरु संकलन र रेकर्ड गर्न तथा सो सम्बन्धी तस्वीरहरू लिनका लागि निर्माणकर्मीहरुले सुपरिवेक्षण परामर्शदातालाई आवश्यक सहयोग गर्नु पर्दछ । भवन निर्माण कार्यको गुणस्तर कायम गर्न गुणस्तर परीक्षण गरी गुणस्तर प्रमाणपत्र प्राप्त भएका निर्माण सामग्रीहरू मात्र भवन निर्माण कार्यमा प्रयोग गर्नु पर्दछ ।
- भवनको हरेक तल्लाको कंक्रिट ढलान गर्दा आर. सि. सि. ढलान कार्यको गुणस्तर प्रत्याभूत गर्न कंक्रिटको कम्प्रेशिभ भारवहन क्षमता सम्बन्धी परीक्षण अनिवार्य रूपमा गर्नु पर्दछ ।
- भवन निर्माण कार्यमा भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिताका प्रावधानहरूको पालना गरेको सम्बन्धमा चेकजाँच गर्न नगरपालिकाबाट तीन पटक अन्तरिम स्थलगत र एकपटक अन्तिम स्थलगत निरीक्षण गरिनेछ ।
- नगरपालिकाबाट स्थायी नक्सा पास प्रमाणपत्र र भवन निर्माण सम्पन्न प्रमाणपत्र प्राप्त गर्नका लागि अन्तरिम स्थलगत निरीक्षणहरू अनिवार्य गरिएका छन् ।
- स्थलगत निरिक्षणको समयमा भवनको गुणस्तर र डिटेलिङका सम्बन्धमा नगरपालिकाबाट खटिएको प्राविधिकबाट दिइएका निर्देशनहरू निर्माणकर्मीले अनिवार्य रूपमा पालन गर्नु पर्नेछ । भवन निर्माण कार्य गरिरहँदा निर्माणस्थललाई सफा राख्ने र निर्माण सामग्रीहरूलाई व्यवस्थित रुपले राख्ने कार्यहरू गर्नुका साथै निर्माणकर्मीले निर्माण सुरक्षामा पनि विशेष ध्यान दिनु पर्नेछ ।

२.५ भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिता सम्बन्धी सामान्य जानकारी

२.५.१ नेपालमा भूकम्पीय जोखिम

पुरातनकालदेखि नै नेपालमा भूकम्प प्रमुख प्राकृतिक विपद्को रूपमा रहेको पाइन्छ । प्राकृतिक, साँस्कृतिक, जातीय र भाषागत विविधताको हिसाबले नेपाल धनी भएता पनि भारतीय र युरोपेली टेक्टोनिक प्लेटको बिचमा अवस्थित भई सक्रिय भूकम्पीय क्षेत्रमा पर्ने भएकोले नेपालको इतिहासमा थुप्रै विध्वंशकारी भूकम्पहरू समेत गएको देखिन्छ । भवनको संरचना कमजोर भएको कारणले भूकम्पमा थुप्रै भवनहरु भत्किएर मानिसको ज्यान जाने गरेको सर्वविदितै छ । विगतमा गएका भूकम्पहरूको अनुभवलाई मध्येनजर गर्दा भूकम्प प्रतिरोधात्मक भवन निर्माण प्रविधि अनुसार डिजाइन र निर्माण गरिएका भवनहरूले भूकम्पीय भार सजिलै वहन गर्न सक्दछन्, यद्यपि यस्ता भूकम्पबाट भवनहरूमा मर्मत गर्न सकिने खालका सामान्य क्षति भने हुन सक्दछन् । तर भूकम्प प्रतिरोधात्मक भवन निर्माण प्रविधि सम्बन्धी पर्याप्त ज्ञान नभएको कारणले गर्दा मध्यम तिव्रता भएका भूकम्पबाट पनि नेपालका अधिकांश भवनहरू क्षतिग्रस्त हुनसक्ने संभावना देखिन्छ । विगतमा वि.सं. १९९०, २०४५ र २०७२ सालहरुमा गएका भूकम्पहरूबाट नेपालले ठूलो क्षति बेहोर्नु परेको थियो । वि.सं. १९९० मालमा गएको ८.४ रेक्टर स्केलको भूकम्पले नेपालको मध्य र पूर्वी क्षेत्रमा ठूलो क्षति भई ८१,००० भवनहरू पूर्ण रुपमा ध्वस्त भएका थिए । उक्त भूकम्पबाट कूल २,०७,७४० भवनहरुमा क्षति पुग्न गएको थियो । त्यसै गरी वि.सं. २०४५ साल भदौ ५ गतेको ६.७ रेक्टर स्केलको भूकम्पबाट नेपालको पूर्वी भागमा ठूलो क्षति पुग्न गयो । यसबाट करीब ६६,३८२ भवनहरु क्षतिग्रस्त भए भने ७२१ भन्दा बढी व्यक्तिहरुको ज्यान गएको थियो । यो भूकम्पबाट भएको क्षतिबाट देशमा विद्यमान भवन निर्माण सम्बन्धी अभ्यासमा परिवर्तन र सुधार गर्न अब ढिलो गर्न हुँदैन भन्ने नेपाल सरकारलाई महसूस हुन गयो । तसर्थ संयुक्त राष्ट्रसंघीय विकास कार्यक्रम (UNDP) र मानव बसोबासका लागि संयुक्त राष्ट्रसंघीय केन्द्र (UNCHS/UN HABITAT) को प्राविधिक सहयोगमा नेपाल सरकारले तत्कालीन भौतिक योजना तथा निर्माण मन्त्रालय अन्तर्गत "Policy & Technical Support to the Urban Sector" नाम गरेको त्रिवर्षीय कार्यक्रम संचालन ग-यो । यस कार्यक्रम अन्तर्गत "नेपाल भवन संहिता विकास आयोजना" तत्कालीन भवन विभागको मातहतमा संचालन गरियो । यो आयोजनाबाट नेपालको राष्ट्रिय भवन संहिता तर्जुमा गर्ने कार्य

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सम्पन्न भयो । राष्ट्रिय भवन संहितामा शुरुमा २० खण्डहरू थिए । पछि यसमा ३ खण्डहरू थप गरियो र हाल जम्मा २३ खण्डहरू भएको राष्ट्रिय भवन संहिता प्रचलनमा रहेको छ ।



तस्वीर १: वि.सं. २०७२/०१/१२ को भूकम्पमा क्षतिग्रस्त भवनहरु

२.५.२ नेपालको राष्ट्रिय भवन संहिता सम्बन्धी सामान्य जानकारी

भवनहरूको डिजाइन र निर्माण गर्नका लागि प्राविधिकहरुले प्रयोग गर्ने प्राविधिक मापदण्डहरूको संग्रहलाई भवन संहिता भनिन्छ । ऐन कानून मार्फत् यसको पालनालाई बाध्यकारी बनाइएको हुन्छ । भवनहरूको संरचनागत सुरक्षा र भवन प्रयोगकर्ताहरूको हितको प्रत्याभूत गर्नका लागि यो एक इञ्जिनियरिङ माध्यम हो । नेपालको सन्दर्भमा कुरा गर्दा नेपालको हावापानी, माटो सुहाँउदो ढंगले स्थानीय निर्माण सामग्री र प्रविधि सकेसम्म प्रयोग गर्ने गरी भूकम्प र अन्य प्राकृतिक जोखिमहरूबाट सुरक्षित हुने गरी भवन निर्माण गर्नका लागि तयार गरिएको प्राविधिक दस्तावेजहरूको संग्रहलाई राष्ट्रिय भवन संहिता भन्न सकिन्छ। भवन सहिताको मुख्य उद्देश्य सर्वसाधारणको स्वास्थ्य, सुरक्षा र सार्वजनिक हितलाई रक्षा गर्नु हो, जसको सम्बन्ध भवनको निर्माण र प्रयोगसंग रहेको हुन्छ । यसको लागि आवश्यक ऐन नियम तर्जुमा गरी लागु गरिए पछि भवन संहिता कानूनी रुपमा वाध्यकारी हुन्छ । हाम्रो देशको हकमा वि.सं. २०५५ मा जारी भएको "भवन ऐन, २०५५" र वि.सं २०६६ मा जारी भएको "भवन नियमावली, २०६६" मार्फत् भवन संहिताको अनुपालना बाध्यकारी बनाइएको छ। भवन ऐन, २०५५ मा उक्त ऐन "तोकिएको मितिदेखि तोकिएको क्षेत्रमा लागु हुने" भनी उल्लेख भएकोमा मिति २०६०/०४/१२ को नेपाल सरकारको निर्णयबाट सरकारी र सरकारी स्वामित्वमा रहेका संगठित संस्थाहरूको तर्फबाट निर्माण हुने भवनमा लागु गरिएको थियो भने मिति २०६२/११/०१ को राजपत्रमा सूचना प्रकाशित गरी तत्कालीन ५८ वटा नगरपालिकाहरू, २८ वटा जिल्ला सदरमुकाम रहेका तत्कालीन गाविसहरु र ७६ वटा नगरोन्मुख गाविसहरुमा निर्माण हुने भवनहरूमा लागु गरिएको थियो । तत्पश्चात् मिति २०७३/०७/२९ मा राजपत्रमा सूचना प्रकाशित गरी २१७ वटा नगरपालिका र १००० घरधूरी भन्दा बढी घरधूरी भएका गाउँपालिकाहरूमा लागु भएको थियो । हाल स्थानीय सरकार संचालन ऐन, २०७४ को दफा ४३ मार्फत् सबै पालिकाहरुले भवनको "नक्सा पास गर्दा नेपाल सरकारले निर्धारण गरे अनुसारको राष्ट्रिय भवन संहिताको पालना गर्नु गराउनु पर्नेछ" भन्ने व्यवस्था भएबाट सबै पालिकाहरूमा भवन संहिता बाध्यात्मक रहेको मान्न सकिन्छ । नेपालभर बन्ने ठूला साना सबै प्रकारका भवनहरूलाई समेट्ने गरी एउटै भवन संहिता तयार भएकोले देशभित्रका सबै भूगोलहरुमा यो लागु हुन्छ ।

कानूनी रूपमा राष्ट्रिय भवन संहिता सबै पालिकाहरूमा बाध्यात्मक भइसकेको भएता पनि प्राविधिक जनशक्ति र आवश्यक प्रचार प्रसारको अभावले सबै पालिकाहरूले प्रभावकारी रूपमा यसको कार्यान्वयन गरी नसकेको अवस्था विद्यमान रहेता पनि विस्तारै यस स्थितिमा सुधार आइरहेको छ। सरकारी भवनहरूको हकमा शहरी

विकास तथा भवन निर्माण विभागले सरकारी भवनहरूको डिजाइन र निर्माणकार्यमा पूर्णरुपमा कार्यान्वयनमा ल्याएको छ ।

राष्ट्रिय भवन संहिता तयार गर्दा शुरुमा २० भागमा तयार गरिएको भएता पनि शहरी विकास तथा भवन निर्माण विभागले विसं २०६० मा ३ वटा भागहरु - NBC २०६, NBC २०७ र NBC २०८ थप गरेकोले हाल भवन संहिताका जम्मा २३ भागहरु रहेका छन् । वि.सं. २०७२/०१/१२ को विनाशकारी भूकम्प पछि NBC २०२, २०३, २०४ र २०६ खण्डहरू परिमार्जित गरी प्रकाशित भएको छ । साथै भूकम्पीय भार निर्धारण सम्बन्धी खण्ड NBC १०५ को परिमार्जन संशोधित रूपमा प्रकाशित भई मिति २०७७/०८/०८ को राजपत्रमा सूचना प्रकाशित गरी देशभर लागू भइसकेको अवस्था छ । राष्ट्रिय भवन संहिताका विभिन्न खण्डहरूको सूची तपसीलमा दिइएको छ :

NBC ००० : अत्याधुनिक निर्माण प्रविधिमा आधारित भवन निर्माण

NBC १०१ : निर्माण सामग्रीहरूको स्पेशिफिकेशन

NBC १०२ : निर्माण सामग्रीहरुको तौल

NBC १०३ : प्रयोजनीय भार

NBC १०४ : हावाको भार

NBC १०५ : भूकम्पीय मार

NBC १०६ : हिउँको भार

NBC १०७ : अग्नि प्रतिरोधात्मक व्यवस्था

NBC १०८ : भूकम्पीय जोखिमका लागि निर्माणस्थलको छनोट

NBC १०९ : गारो प्रणालीको संरचना

NBC ११० : कंक्रिट प्रयोग हुने संरचना

NBC १११ : स्टिल संरचना

NBC ११२ : काठ प्रयोग गरी बनाइने संरचना

NBC ११३ : आल्मुनियम प्रयोग गरी बनाइने संरचना

NBC ११४ : निर्माणकार्यमा अपनाउनु पर्ने सुरक्षा

NBC २०१ : फ्रेममा गारो भरेर गरिने पिलर प्रणालीको घरको पूर्वनिर्धारित डिजाइन

NBC २०२ : गारो प्रणालीका घरको पूर्वनिर्धारित डिजाइन

NBC २०३ : न्यून भारवहन क्षमता भएका सामग्री प्रयोग गरी गारो प्रणालीको भवन

NBC २०४ : माटोबाट बनाइने घरहरूका लागि भूकम्प प्रतिरोधात्मक व्यवस्था

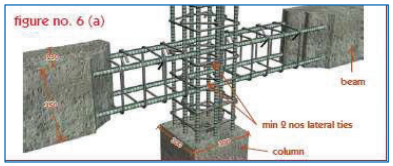
NBC २०५ : फ्रेममा गारोको भारवहन क्षमता नलिई गरिने घरको पूर्वनिर्धारित डिजाइन

NBC २०६ : वास्तुकलात्मक व्यवस्था

NBC २०७ : विद्युतीय प्रणाली सम्बन्धी व्यवस्था

NBC २०८ : खानेपानी तथा ढल निकास सम्बन्धी व्यवस्था

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तस्वीर २ : भवन संहिता अनुसार बिम-पिलरको जोर्नी



तस्वीर ३ : कंक्रिटको कम्प्रेशिभ भारवहन क्षमताको परीक्षण

हालसम्मको अवस्था हेर्दा सिमित संख्याका पालिकाहरूले मात्रै भवन संहिताको कार्यान्वयन गरेको देखिन्छ। सुरक्षित भवन निर्माणका लागि भवन संहिताको प्रभावकारी कार्यान्वयनमा ध्यान दिनुपर्नेमा धेरैजसो पालिकाहरू यसमा पछि परेको देखिन्छ।

२.५.३ भवन निर्माण मापदण्ड सम्बन्धी सामान्य जानकारी

पालिकाहरूले आफ्नो शहरी विकास सम्बन्धी गुरु योजना वा भौतिक विकास योजनामा आत्मसात् गरिएको सोच तथा दूरदृष्टिसंग मिल्दो किसिमले शहरी विकासलाई परिचालित गर्ने तथा भवनको बनावटको सुरक्षा, सरसफाई तथा स्वस्थ्य वातावरण सुनिश्चित गर्ने उद्येश्यले तयार गरिएको नियमहरूको संग्रहलाई भवन निर्माण मापदण्ड भनिन्छ।

शहरी विकास मन्त्रालयले पालिकाहरूको भवन निर्माण मापदण्डमा सहयोग पुगोस भन्ने हेतुले "भवन निर्माणको नमूना मापदण्ड २०७१" बनाई प्रकाशित गरेको छ। आफ्नै भवन निर्माण मापदण्ड नभएका पालिकाहरुलाई नयाँ मापदण्ड तर्जुमा गर्न यसले सन्दर्भ सामग्रीको रूपमा काम गर्दछ।

२०७२ सालको विनाशकारी भूकम्प पछि सो भूकम्पबाट भएको अपार धनजनको क्षतिलाई मध्यनजर गरी भविष्यमा त्यस्तो क्षति दोहोरिन नदिन भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिताको प्रभावकारी कार्यान्वयन गराउनु पर्दछ भन्ने नेपाल सरकारले महसूस गरेकोले शहरी विकास मन्त्रालय र तत्कालीन संघीय मामिला तथा स्थानीय विकासद्वारा संयुक्त रूपमा "बस्ती विकास, शहरी योजना तथा भवन निर्माण सम्बन्धी आधारभूत मापदण्ड, २०७२" तर्जुमा गरियो। यो मापदण्ड नेपाल सरकारबाट मिति २०७२/०६/१३ मा स्वीकृत भई मिति २०७२/११/२६ को राजपत्रमा प्रकाशन भई कार्यान्वयनमा आइसकेको छ।

स्थानीय आवश्यकता, भूगोल र जमीनको बनावट अनुसार तथा भू-उपयोग योजना र सडक अधिकार क्षेत्र अनुसार जग्गा उपयोग प्रतिशत (Ground Coverage Ratio), भुईं क्षेत्रफलको अनुपात (Floor Area Ratio), भवनको स्वरुप र निर्माण गर्न पाइने क्षेत्र र भवनको तल्ला संख्या फरक फरक पालिकाहरूमा फरक फरक हुन सक्दछन्, जसले गर्दा हरेक पालिकाको आ-आफ्नै भवन निर्माण मापदण्ड हुन सक्दछ। तर "बस्ती विकास, शहरी योजना तथा भवन निर्माण सम्बन्धी आधारभूत मापदण्ड, २०७२" मा भएको व्यवस्था भन्दा कमजोर हुने गरी पालिकाले मापदण्ड बनाउन पाउने छैनन्। साथै पहिले नै भवन निर्माण मापदण्ड भएका पालिकाहरुले समेत उक्त आधारभूत मापदण्डको प्रावधान भन्दा कमजोर व्यवस्था विद्यमान भवन निर्माण मापदण्डमा भएमा आधारभूत मापदण्डमा भएको व्यवस्था लाई नै बाध्यकारी मानी कार्यान्वयन गर्नु पर्नेछ।

"काठमाडौं उपत्यका भित्रका नगरपालिकाहरू र नगरोन्मुख गाविस. हकमा गरिने निर्माण सम्बन्धी मापदण्ड, २०६४" नेपाल सरकारबाट मिति २०६४/०१/१८ मा स्वीकृत भई मिति २०६४/०२/०१ देखि लागु भएको हो। यो भवन निर्माण मापदण्ड मिति २०६५/०८/०१ र मिति २०६७/०३/१४ मा गरी दुईपटक संशोधन भएको छ। भवन निर्माण मापदण्ड अन्तर्गत पालन गर्नु पर्ने प्रावधानहरू मध्ये मुख्य प्रावधानहरू सडक अधिकार क्षेत्र, जग्गाको अगाडि वा सडक तर्फ छोड्नु पर्ने सेटब्याक दूरी, संधियारतर्फ छोड्नु पर्ने सेटब्याक दूरी, नदी वा खोलाको किनारबाट छोड्नु पर्ने दूरी, विद्युत् प्रसारण लाइनको तारबाट छोड्नु पर्ने दूरी, जग्गा उपयोग प्रतिशत वा ग्राउण्ड कभरेज अनुपात, भुई क्षेत्रफलको अनुपात, लाइट प्लेनको व्यवस्था, खुल्ला क्षेत्रको

लागि छोड्नु पर्ने भाग इत्यादि संग सम्बन्धित छन्। भवन निर्माण मापदण्डसंग सम्बन्धित मुख्य मुख्य प्रावधानहरूको विवरण अनुसूची -३ मा दिइएको छ।

भवन निर्माण मापदण्डमा भएको प्रावधानको बर्खिलाप हुने गरी नक्सा डिजाइन तयार गरिएमा पालिकाबाट भवन निर्माण अनुमति पत्रको दरखास्तको चेकजाँचको दौरानमा त्यस्तो नक्सा डिजाइन फिर्ता गरिने वा संशोधन गर्न लगाइनेछ। त्यस्तै गरी भवन निर्माण कार्य भइरहदा भवन निर्माण मापदण्डको विपरित हुने गरी निर्माणकार्य भएको पाइएमा त्यस्तो भाग पूरै वा आंशिक भत्काउन लगाउनुका साथै प्रचलित कानून अनुसार दण्ड जरिवाना समेत हुनेछ। साथै मापदण्ड विपरित निर्माण भएको भवनको निर्माण सम्पन्न प्रमाणपत्र समेत जारी हुनेछैन।

भवन निर्माण मापदण्डको अलावा घरधनीले राष्ट्रिय भवन संहिताका प्रावधानहरूको समेत पालना गर्नुपर्नेछ। घरधनीले भवन निर्माण अनुमति प्राप्त गर्नका लागि पेश गरेको नक्सा डिजाइन भवन संहिता अनुरूप तयार गरिएको हुनुपर्नेछ। त्यस्तै भवन निर्माण कार्य समेत स्वीकृत ना डिजाइन अनुसार राष्ट्रिय भवन संहिताको पालना हुने गरी गर्नु पर्नेछ।

सबै घरधनीहरूले के बुझ्नु आवश्यक छ भने भवन निर्माण मापदण्ड र भवन संहितालाई नजर अंदाज गर्नु वा उल्लंघन गर्नु देशको कानून उल्लंघन गर्नु हो। त्यतिमात्र होइन, भवन संहिता पालन नगरी बनाइएको भवन भूकम्पीय हिसाबले कमजोर हुने भई भूकम्पमा क्षतिग्रस्त हुने वा भत्किने संभावना हुन्छ र यसबाट त्यस्तो कमजोर भवनमा बस्ने व्यक्तिहरूको ज्यानै जान पनि सक्दछ। यसर्थ भवन संहिताको पालना नगर्नुको अर्थ भूकम्प र अन्य विपद्बाट हुन सक्ने जोखिमलाई निम्त्याउनु हो भन्ने कुरा घरधनीले बुझ्नु आवश्यक छ।

तसर्थ घरधनीले आफ्नो भवनको नक्सा डिजाइन बनाउँदा र भवन निर्माण गर्दा भवन निर्माण मापदण्ड र राष्ट्रिय भवन संहिता दुवैको अनिवार्य पालना गर्नुपर्दछ र यसको लागि भवन निर्माण कार्यविधिको अनुपालना गर्नु आवश्यक छ।

२.५.४ नेपालमा बन्ने भवनहरूको वर्गीकरण

भवन संहिताको तर्जुमा तथा कार्यान्वयन गर्ने प्रयोजनका लागि नेपालमा बन्ने भवनहरुलाई भवन ऐन, २०५५ तथा राष्ट्रिय भवन संहिताको खण्ड NBC: ००० अनुसार चार वर्गहरुमा वर्गीकरण गरिएका छन् :

वर्ग	राष्ट्रिय भवन संहिताको किसिम	उद्येश्य
"क "वर्ग	अत्याधुनिक प्रविधि अपनाई निर्माण गरिने भवनहरू	विकसित मुलुकटकमा अपनाइएका भवन संहिताको अनुसरण गरी उच्चतम तथा अत्याधुनिक प्रविधि (state–of–art) मा आधारित हुने गरी बनाइने अत्याधुनिक भवनहरू। 

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		यसमा प्रयोग हुने भवन संहिताको खण्ड : NBC: ०००
"ख" वर्ग	पेशागत डिजाइन वा इञ्जिनियरहरुबाट डिजाइन गर्नु पर्ने भवनहरू	प्लिन्थ एरिया एक हजार वर्गफीट भन्दा बढी, भुईतल्ला सहित तीन तल्ला भन्दा बढी तल्ला भएका वा स्ट्रक्चरल स्पान ४.५ मीटर भन्दा बढी भएका भवनहरू । यस्ता भवनहरू नेपाल इञ्जिनियरिङ परिषदमा दर्ता भएका इन्जिनियर वा आर्किटेक्टहरूबाट डिजाइन गराउनु पर्नेछ ।  यसमा प्रयोग हुने भवन संहिताका खण्डहरू : NBC १०१ देखि NBC ११४ सम्म, NBC २०६, NBC २०७ तथा NBC २०८
"ग" वर्ग	पूर्वनिर्धारित डिजाइन अनुसारका भवनहरू	प्लिन्थ एरिया एक हजार वर्गफीट सम्म, भुईतल्ला सहित तीन तल्लासम्म वा स्ट्रक्चरल स्पान ४.५ मीटरसम्म भएका भवनहरु यस वर्ग अन्तर्गत पर्दछन् । यस्ता भवनहरूको नक्सा डिजाइन सिभिल इञ्जिनियरिङ वा आर्किटेक्चर विषयमा कम्तीमा प्रमाणपत्र तह उत्तीर्ण गरेका व्यक्तिहरु अर्थात् सब-इञ्जिनियरहरूले गर्न सक्दछन् ।  यसमा प्रयोग हुने भवन संहिताका खण्डहरू : NBC ११०, NBC २०१, NBC २०२, NBC २०५

"घ" वर्ग	ग्रामिण क्षेत्रमा निर्माण हुने सामान्य भवनहरू	माथि उल्लेखित "क", "ख" वा "ग" वर्गका भवनहरू बाहेकका काँचो वा पाको इँटा, ढुंगा, माटो, बाँस, खर आदि प्रयोग गरी दुई तल्लासम्म बनाइने साना घर र छाप्राहरू यस वर्ग अन्तर्गत पर्दछन् ।  यसमा प्रयोग हुने भवन संहिताका खण्डहरू: NBC २०३, NBC २०४

परिच्छेद -३
भवन निर्माण इजाजत प्रक्रियामा निर्माणकर्माको सामान्य भूमिका र जिम्मेवारी

३.१ निर्माणकर्मीको कानूनी दायित्व

क) बस्ती विकास, शहरी योजना तथा भवन निर्माण सम्बन्धी आधारभूत मापदण्ड, २०७२

दफा १३.२१ : भवन निर्माण कार्यमा निर्माणकर्मीहरु संलग्न हुनाको लागि निर्माणकर्मी या निर्माण व्यवसायीहरूले अनिवार्य रुपमा भूकम्प प्रतिरोधी भवन निर्माण प्रविधि सम्बन्धी कम्तीमा पाँच दिने तालिम लिएको हुनु पर्नेछ र सुपरिवेक्षण परामर्शदातावाट भवन निर्माण कार्यको सुपरिवेक्षण गराउनु पर्नेछ ।

(ख) भवन ऐन २०५५

दफा १४ सजाय :

उपदफा (१) : कसैले यस ऐन बमोजिम नक्सा स्वीकृत नगराई वा त्यस्तो स्वीकृत नक्सा वा भवन संहितामा उल्लिखित मापदण्ड विपरीत हुने गरी भवन निर्माण गरेमा नगरपालिका क्षेत्रभित्रको हकमा नगरपालिकाले र गाउँपालिका क्षेत्रभित्रको हकमा शहरी विकास कार्यालयले त्यस्तो निर्माण कार्य तुरुन्त रोक्न आदेश दिनु पर्नेछ ।

उपदफा (२) : कसैले यस ऐन बमोजिम नक्सा स्वीकृत नगराई वा त्यस्तो स्वीकृत नक्सा वा भवन संहितामा उल्लिखित मापदण्ड विपरीत हुने गरी भवन निर्माण गरेमा नगरपालिका वा शहरी विकास कार्यालयले त्यस्तो भवन वा त्यसको कुनै भाग भत्काउन आदेश दिई त्यस्तो कार्य गर्ने व्यक्ति वा संस्थालाई पचास हजार रुपैयाँसम्म जरिवाना गर्न सक्नेछ ।

A3-4-66

उपदफा (३) : उपदफा (२) बमोजिम नगरपालिका वा शहरी विकास कार्यालयले भवन निर्माणको कुनै भाग भत्काउने आदेश दिएकोमा सो भाग नभत्काएसम्म त्यस्तो सम्पत्ति कसैलाई पनि कुनै व्यहोराले हक छाडी दिन वा धितो बन्धकी दिन नपाउने गरी रोक्का राख्न, त्यस्तो निर्माण भएको भवनमा धारा, बिजुली, टेलिफोन आदि वितरण गर्न नलगाउन तथा वितरण गरिसकेको भए पनि त्यस्तो धारा, बिजुली, टेलिफोन आदिको लाइन काट्न समेत नगरपालिका वा शहरी विकास कार्यालयले सम्बन्धित कार्यालयहरुमा लेखी पठाउनु पर्नेछ र सम्बन्धित कार्यालयले पनि लेखी आए बमोजिम गरी दिनु पर्नेछ ।

(ग) भवन निर्माण कार्यविधिको पालना

निर्माणकर्मीहरु सूचीकृत भई घरधनीको लागि भवन निर्माण कार्यमा सरिक भएपछि अनिवार्य रूपमा भवन निर्माण कार्यविधिका प्रावधानहरू पालन गर्नु पर्ने हुन्छ। अनौपचारिक निर्माण व्यवसायीको भूमिकामा समेत काम गर्नु पर्ने निर्माणकर्मीहरुले निर्वाह गर्नु पर्ने कानूनी दायित्व निम्नानुसारका छन् :-

- निर्माणकर्माहरूले आफ्नो सीप र दक्षता प्रयोग गरी स्वीकृत नक्सा र डिजाइन अनुसार निर्माण कार्य गरिदिने र सम्पन्न गर्ने कार्य गर्नुपर्दछ र निर्माणकार्यमा कुनै त्रुटि भएमा सोको मरम्मत गरिदिनु पर्नेछ ।
- भवन निर्माण कार्य गर्दा निर्माण कार्यको पर्याप्तता, बलियोपना र सुरक्षा र निर्माण कार्यको विधिको जिम्मेवारी निर्माणकर्मीले लिनु पर्नेछ ।
- भवन निर्माण कार्य स्वीकृत नक्सा र डिजाइन अनुसार गराउँदा कुनै त्रुटि वा छुट भएको देखिएमा निर्माणकर्मीले अविलम्ब सुपरिवेक्षण परामर्शदातालाई सूचित गर्नु पर्नेछ र यसको जानकारी घरधनीलाई पनि दिनु पर्नेछ ।
- भवन निर्माण कार्य स्वीकृत नक्सा र डिजाइन अनुसार गराउँदा गुणस्तर कायम गरिएको प्रमाणित गर्न गुणस्तर सम्बन्धी अभिलेखहरू सुपरिवेक्षण परामर्शदातालाई उपलब्ध गराउन निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ ।
- निर्माणकर्मीहरूले नक्सा डिजाइन बुझ्न सक्ने र भूकम्प प्रतिरोधी भवन निर्माण प्रविधिका बारेमा जानकार हुनाको साथै सो प्रविधि भवन निर्माण कार्यमा प्रयोग गर्न सक्ने हुनु पर्नेछ ।
- भवन निर्माण कार्यमा नगरपालिकाको भवन निर्माण मापदण्डलाई निर्माणकर्मीले अक्षरंश पालना गर्नु पर्नेछ ।
- स्वीकृत नक्सा र डिजाइनमा देखाइएका डिटेलिङहरू निर्माणकर्मीले भवन निर्माण कार्यमा प्रयोग गर्नु पर्नेछ । नगरपालिकाबाट गरिने अन्तरिम र अन्तिम स्थलगत निरीक्षणका लागि उपयुक्त समयमा निर्माणस्थललाई तैयारी अवस्थामा राख्ने जिम्मेवारी निर्माणकर्मीको हुनेछ ।
- भवन निर्माण कार्य भइरहँदा सुपरिवेक्षण परामर्शदाताले दिएका निर्देशनहरू निर्माणकर्मीले पालना गर्नु पर्नेछ । स्थलगत निरीक्षणको समयमा नगरपालिकाका प्राविधिकहरूबाट दिइने निर्देशनहरूको पनि निर्माणकर्मीले पालना गर्नुपर्नेछ ।

(घ) श्रम ऐन, २०१७ अनुसार निर्माणकर्मीका जिम्मेवारीहरु

अनौपचारिक निर्माण व्यवसायीको रुपमा भवन निर्माणकार्यमा निर्माणकर्मी सरिक भएमा निजले रोजगारदाताको भूमिका पनि निभाउनु पर्ने हुन्छ। श्रम ऐन, २०१७ अनुसार रोजगारदाता (employor) ले निर्माणकार्य गराउँदा श्रमिकहरूको पेशागत सुरक्षा र स्वास्थ्य सम्बन्धी तपसीलमा उल्लेखित कुराहरू सम्बोधन गर्नु पर्नेछ।

दफा ६९ : रोजगारदाताको श्रमिक प्रतिको जिम्मेवारी

क) निर्माणस्थलमा आवश्यक सुरक्षा र स्वास्थ्यको उचित व्यवस्था गरी कार्यक्षेत्रमा सुरक्षित वातावरण कायम गर्ने ।

ख) रासायनिक, भौतिक वा जैविक, पदार्थ तथा उपकरणहरूको प्रयोग, संचालन, भण्डारण र ओसारपसार गर्दा स्वास्थ्य र सुरक्षामा प्रतिकूल असर नपरोस भन्नका लागि आवश्यक व्यवस्था गर्ने ।

ग) आवश्यकता अनुसार श्रमिकहरूको सुरक्षा र स्वास्थ्यका लागि आवश्यक जानकारी, सूचना र तालिमहरू प्रदान गर्ने ।

घ) रासायनिक, भौतिक र जैविक सामग्रीहरूको उपयोग के संचालन सम्बन्धमा उपयुक्त भाषामा श्रमिकहरूको लागि आवश्यक जानकारी दिने र तालिम कार्यक्रम संचालन गर्ने ।

ङ) निर्माणस्थलबाट सुरक्षित तवरले आगमन र निर्गमन गर्न सक्ने बनाउनका लागि आवश्यक व्यवस्था गर्ने ।

च) आवश्यकता अनुसार श्रमिकटकलाई व्यक्तिगत सुरक्षाका उपकरणहरू उपलब्ध गराउने ।

दफा ७०: अन्य व्यक्ति प्रतिको रोजगारदाताको जिम्मेवारी

क) निर्माणस्थल भित्र प्रवेश गर्ने र बाहिर जाने वा भएर जाने अन्य व्यक्तिहरूको स्वास्थ्य र सुरक्षाको लागि आवश्यक व्यवस्था गर्ने ।

ख) निर्माणस्थलमा गरिने कुनै क्रियाकलापले कुनै पनि व्यक्तिको सुख्खा र स्वास्थ्यमा कुनै प्रतिकूल असर पर्ने संभावना देखिएमा सो सम्बन्धी सूचना दिन र संकेत चिन्ह राख्न आवश्यक व्यवस्था गर्नु पर्नेछ

३.२ नक्सा पास प्रक्रियाको विभिन्न चरणमा निर्माणकर्मीको जिम्मेवारी :

३.२.१ नक्सा पासको लागि आवेदन दिने चरणमा निर्माणकर्मीको सामान्य जिम्मेवारीहरु

क) भूकम्प प्रतिरोधी भवन निर्माण प्रविधि सम्बन्धी तालिम कार्यक्रममा सहभागी हुने :

- भवन निर्माण कार्यविधिमा व्यवस्था भए अनुसार नगरपालिकाले निर्माणकर्मीहरूका लागि नियमित रुपमा तालिम कार्यक्रम संचालन गर्नुपर्दछ ।
- यस्ता तालिम कार्यक्रमहरू निशुल्क रूपमा संचालन गर्नु पर्नेछ। स्थानीय निर्माणकर्मीहरूले यस्ता तालिम कार्यक्रममा अनिवार्य रूपमा भाग लिनु पर्नेछ ।
- भवन निर्माणमा अनौपचारिक रूपमा संलग्न निर्माणकर्मीहरुले नगरपालिका, शहरी विकास तथा भवन निर्माण विभाग, रेडक्रस जस्ता आधिकारिक निकायहरूबाट तालिम लिनु पर्दछ ।
- निर्माणकर्मीहरूले पर्याप्त अनुभव र सिकाइ हासिल गरेको हुनु पर्नेछ ।
- निर्माणकर्मीहरुमा निर्माण सामग्री र कारिगरिता सम्बन्धमा केही मात्रामा सैद्धान्तिक ज्ञान हुनु पर्दछ ।
- भूकम्प प्रतिरोधी भवन निर्माण प्रविधि सम्बन्धमा निर्माणकर्मीहरुलाई आधारभूत तालिम दिनुपर्नेछ ।

निर्माणकर्मीहरूको लागि गरिने तालिमका उद्देश्यहरु :

- स्थानीय निर्माणकर्मीहरुलाई नेपालको भूकम्पीय जोखिम बारेज्ञ. जानकार बनाउने र उनीहरुलाई यस क्षेत्रमा भूकम्प जानु सामान्य हो भन्ने कुरा बुझाउनु ।
- भवन निर्माण गर्दा भूकम्प प्रतिरोधी भवन निर्माण प्रविधि अपनाउनु पर्दछ भन्ने कुरा महसूस गराउनु ।
- डकर्मी, नकर्मी, सिकर्मी लगायतका स्थानीय दक्ष निर्माणकर्मीहरूको ज्ञान र सिपका अभिवृद्धि गर्नु । यसमा खास गरी प्रचलित निर्माण प्रविधि जस्तै ढुंगा वा ईंटाको गारो प्रणाली र पिलर प्रणालीका भवनहरु निर्माण गर्दा अपनाउनु पर्ने भूकम्प प्रतिरोधी प्रविधिहरू सम्बन्धी ज्ञान र सिप अभिवृद्धिमा जोड दिने ।
- विद्यमान असुरक्षित भवनहरूको मरम्मत र प्रबलीकरणका लागि संभाव्य विकल्पहरूको बारेमा निर्माणकर्मीहरुलाई जानकार बनाउनु ।
- प्रभावकारी रुपमा प्रविधि हस्तान्तरणका लागि विभिन्न सामाजिक पक्षहरू बुझ्न निर्माणकर्मीहरुलाई सहयोग गर्नु र यस्तो प्रविधि हस्तान्तरणमा निर्माणकर्मीहरूको भूमिकाको सम्बन्धमा बुझ्न मद्दत गर्नु ।

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- नगरपालिकामा सुरक्षित भवन निर्माण सम्बन्धी अभ्यास तर्फ निर्माणकर्मीहरुलाई योगदान दिन र प्रोत्साहन गर्न उत्प्रेरित गर्नु ।

(ख) नगरपालिकाहरूमा निर्माणकर्मीहरु सूचीकृत हुने :

- निर्माणस्थलमा भवन संहिताको वास्तविक रुपमा कार्यान्वयनका लागि अनौपचारिक तवरले काम गरिरहेका निर्माणकर्मीहरूले तालिम लिनु आवश्यक हुन्छ । त्यसपछि मात्रै घरधनीहरूले भवन निर्माण कार्यका लागि तालिम प्राप्त निर्माणकर्मीहरु प्राप्त गर्न सक्दछन् ।
- भवन निर्माण कार्यविधि अनुसार अब आयन्दादेखि नगरपालिकाहरूले निर्माणकर्मीहरुको निशुल्क दर्ता गर्ने वा सूचीकृत गर्ने प्रक्रिया शुरु गर्नु पर्दछ । त्यसपछि नगरपालिकाले तालिम प्राप्त भई सूचीकृत भएका निर्माणकर्मीहरूको सूची प्रकाशन गर्नु पर्नेछ ।
- यसर्थ स्थानीय स्तरमा कार्यरत सबै निर्माणकर्मीकाले सर्वप्रथम नगरपालिका वा अन्य निकायबाट संचालन गरिएको भूकम्प प्रतिरोधी भवन निर्माण प्रविधि सम्बन्धी सात दिने तालिममा सहभागी भई प्रमाणपत्र हासिल गर्नु पर्नेछ र तत्पश्चात् आफूले काम गर्न चाहेको क्षेत्रको नगरपालिकामा सूचीकृत हुनु पर्नेछ ।
- सूचीकृत हुनका लागि नगरपालिकाले सातदिने तालिमको प्रमाणपत्र, अनुभवको प्रमाणपत्र र यदि छ भने शैक्षिक योग्यताको प्रमाणपत्र माग गर्न सक्दछ ।
- नगरपालिकाले तालिमप्राप्त निर्माणकर्माहरूको सूची तयार गरेर राख्नु पर्नेछ र यस्तो सूचीलाई भवन निर्माणकार्यको लागि सार्वजनिक गर्नु पर्नेछ ।
- नगरपालिकामा सूचीकृत हुनका लागि निर्माणकर्मीले पेश गर्नु पर्ने दरखास्तको नमूना परिशिष्ट -३ मा दिइएको छ ।

(ग) निर्माणकर्मीले घरधनीसंग संझौता गर्नुपर्ने :

- भवन निर्माण कार्यविधि अनुसार भवन निर्माण कार्यको लागि घरधनीले तालिम प्राप्त तथा नगरपालिकामा सूचीकृत भएका निर्माणकर्मीहरू मात्रै प्रयोग गर्नु पर्ने हुन्छ ।
- नगरपालिकाबाट प्रकाशित तालिम प्राप्त तथा दर्ता भएका निर्माणकमीहरूको सूचीमध्येबाट घरधनीले आफूले भवन निर्माण कार्यमा प्रयोग गर्ने निर्माणकर्मीहरू छनोट गर्नु पर्नेछ ।
- भवन निर्माण गर्ने समयमा वा निर्माण कार्य भइरहँदा घरधनीले पहिले छनोट गरिएको भन्दा फरक निर्माणकर्मी राख्न चाहेमा वा निर्माणकर्मी परिवर्तन गर्नु परेमा सो सम्बन्धी लिखित जानकारी नगरपालिकाको प्राविधिक शाखालाई दिएर मात्रै घरधनीले निर्माणकर्मी परिवर्तन गर्नु पर्नेछ ।
- नयाँ भवन निर्माण गर्दा अनिवार्य रूपमा भूकम्प प्रतिरोधी भवन निर्माण प्रविधि प्रयोग होस् र साथै निर्माणकार्यको गुणस्तर अभिवृद्धि होस् भन्ने अभिप्रायले नेपाल सरकारले उपरोक्त प्रावधान कार्यान्वयनमा ल्याएको हो ।
- निर्माणकर्मीहरुबाट निर्माण गरिने स-साना स्तरका निजी भवनहरूको निर्माणका लागि घरधनी र निर्माणकर्मी बिचमा औपचारिक संझौता गर्नु पर्नेछ र यस्तो संझौता नगरपालिकाको प्राविधिक शाखा वा वडा कार्यालयको रोहबरमा भवन निर्माण कार्य शुरु गर्नु भन्दा अघि गर्नु पर्नेछ ।
- घरधनी र निर्माणकर्मी बिच गरिने संझौतापत्रमा संझौताका न्यूनतम शर्तहरू र भवन निर्माण कार्यको संक्षिप्त स्पेशिफिकेशन पनि उल्लेख गर्नु पर्नेछ ।
- संझौतापत्रमा घरधनीको भवन निर्माण गर्न आफू संलग्न हुने कुरामा निर्माणकर्मी सहमत भएको र भवनको सिभिल तथा फिनिशिङ कार्य गर्न तय भएको दररेट उल्लेख भएको हुनु पर्नेछ ।

- निर्माणकर्मीले भवन निर्माण गर्दा अनिवार्य रुपमा नगरपालिकाको भवन निर्माण मापदण्ड, राष्ट्रिय भवन संहिता र अन्य प्रचलित ऐन नियमको पालना गर्नेछु भनी कबुलियतनामामा समेत हस्ताक्षर गर्नु पर्नेछ ।
- घरधनी र निर्माणकर्मी बीच गर्नुपर्ने भूकम्प प्रतिरोधी भवन निर्माण कार्य गर्नका लागि गरिने संझौतापत्रको नमूना अनुसूची- ४ मा दिइएको छ ।

३.२.२ भवन निर्माणका चरणमा निर्माणकर्मीहरूको सामान्य जिम्मेवारीहरु :

क) नक्सा पास भएको कुराको यकीन गर्ने

निर्माणकर्मीले भवन निर्माण कार्य शुरु गर्नु अघि उक्त भवन निर्माण गर्नका लागि घरधनीले नगरपालिकाबाट अस्थायी भवन निर्माण इजाजतपत्र वा अस्थायी नक्सा पास प्राप्त गरेको छ भन्ने यकीन गर्नु पर्दछ । अस्थायी नक्सा पास भइनसकेको भएमा निर्माणकर्मीले भवन निर्माणकार्य शुरु गर्नु हुँदैन ।

ख) नक्सा-डिजाइन यकीन गर्ने

निर्माण गरिन लागिएको भवनको नक्सा डिजाइन नगरपालिकाबाट स्वीकृत भएको हो होइन भन्ने सम्बन्धी जाँच पनि निर्माणकर्मीले गर्नु पर्ने हुन्छ । भवन निर्माण कार्य शुरु गर्नु अघि निर्माणकर्मीले भवन निर्माणको प्राविधिक पक्ष र स्पेशिफिकेशन पनि अध्ययन गर्नु पर्दछ । यसरी नक्सा, डिजाइन, प्राविधिक पक्ष र स्पेशिफिकेशन अध्ययन गर्दा कुनै त्रुटि देखिएमा वा कुनै कुरा प्रष्ट नभएमा निर्माणकर्मीले घरधनी र सुपरिवेक्षण परामर्शदातालाई सूचित गर्नु पर्नेछ । त्रुटि सुधार भइसकेपछि र प्रष्ट नभएको विषयमा स्पष्ट गरिएपछि मात्रै निर्माणकर्मीले निर्माणकार्य शुरु गर्नु पर्नेछ ।

ग) भवन निर्माण मापदण्डको पालना डिजाइन नक्सामा भएको सम्बन्धमा यकीन गर्ने ।

- **भवनको अवस्थिति र ले-आउट**

नगरपालिकाको प्रचलित भवन निर्माण मापदण्ड अनुसार भवनको अवस्थिति र ले-आउट मिल्छ-मिल्दैन भन्ने सम्बन्धमा निर्माणकर्मीले आवश्यक चेकजाँच गर्नु पर्नेछ । ले-आउट गर्दा र भवनको जग, पिलर र गारोको अवस्थिति यकीन गर्दा पालन गर्नु पर्ने प्रावधानहरूको सम्बन्धमा निर्माणकर्मीले नगरपालिकाका प्राविधिक र सुपरिवेक्षण परामर्शदातासंग आवश्यक परामर्श गर्न सक्नेछ । सडक अधिकार क्षेत्र र सेटब्याक सम्बन्धी नियमहरूको पूर्ण पालना गर्नु पर्दछ भन्ने कुरामा निर्माणकर्मी सचेत हुनु पर्दछ । साथै सडक अधिकार क्षेत्र र सेटब्याक रेखाभित्र च्याम्प, भऱ्याङ्ग, पखाल जस्ता स्थायी संरचनाहरू बनाउनु हुँदैन भन्ने कुरामा निर्माणकर्मी जानकार हुनु पर्दछ । कोठाको बाहिर निकालिएको भाग र बार्दलीहरू पनि सेटब्याक क्षेत्रभित्र बनाउन नहुने सम्बन्धमा पनि निर्माणकर्मीले जाँच गर्नु पर्दछ ।

- **भवनको साइज र उचाइ**

स्वीकृत नक्सा र डिजाइनमा देखाइएको भवनको साइज र उचाई भवन निर्माण मापदण्ड अनुसार भए-नभएको सम्बन्धमा निर्माणकर्मीले जाँच गर्नु पर्दछ । नगरपालिकाबाट तोकिएको साइज र उचाइ सम्बन्धमा कुनै दोधार भएमा नगरपालिकाको प्राविधिक वा सुपरिवेक्षण परामर्शदातासंग परामर्श गरी शंका निवारण गर्नु पर्दछ । भवन निर्माण गर्दा अधिकतम कति साइजसम्म र के कति उचाइसम्म निर्माण गर्न पाइन्छ भन्ने कुरा नगरपालिकाबाट तोकिएको भू-उपयोग योजना र. सो अनुसारको क्षेत्रको किसिममा भर पर्दछ । यसर्थ निर्माण मापदण्डका प्रावधानहरूको बारेमा जानकार हुन निर्माणकर्मीले नगरपालिकाको निर्माण मापदण्डको अध्ययन गर्नु उपयुक्त हुन्छ ।

घ) राष्ट्रिय भवन संहिताका प्रावधानहरूको पालना भएको यकीन गर्ने

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- **निर्माण सामग्रीहरूको गुणस्तर**

सिमेन्ट, बालुवा, गिटी, फलामे डण्डी, ईंटा, ढुंगा, काठ इत्यादि जस्ता निर्माण सामग्री प्रयोग गर्नु अघि निर्माणकर्मीले सुपरिवेक्षण परामर्शदाताबाट गुणस्तरको जाँच गराउनु पर्नेछ र निजबाट स्वीकृत भएपछि मात्र निर्माणकार्यमा प्रयोग गर्नु पर्नेछ। घरधनीबाट प्रस्तावित निर्माण सामग्रीहरू उपयुक्त गुणस्तरका छ-छैन र भारवहन क्षमताको हिसाबले भवन निर्माण कार्यमा प्रयोग गर्न सकिन्छ-सकिदैन भन्ने कुरा यकीन गर्न सुपरिवेक्षण परामर्शदातालाई निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ। निर्माण सामग्रीहरूको तथा निर्मित संरचनाहरूको गुणस्तर यकीन गर्न गुणस्तर परिक्षण गर्नु आवश्यक छ भन्ने कुरा निर्माणकर्मीले बुझ्न आवश्यक छ। यसका लागि सामान्य निरिक्षण र प्रयोगशाला परिक्षण गराउनका लागि निर्माणकर्मीले आवश्यक सहयोग र समन्वय गर्नु पर्नेछ। निर्माणकार्यको संझौतापत्रमा उल्लेख भए अनुसारका गुणस्तर मापदण्डहरू पालना भए-नभएको सम्बन्धमा जाँच गर्न सुपरिवेक्षण परामर्शदातालाई निर्माणकर्मीले आवश्यक सहयोग गर्नुपर्नेछ। निर्माण सामग्रीहरूको गुणस्तर नेपाल गुणस्तर अनुरूप हुनु पर्नेछ।

- **निर्माण कार्य गर्ने तरिका**

मुख्य मुख्य निर्माणकार्य गर्दा अपनाउनु पर्ने निर्माण कार्य गर्ने तरिकाको सम्बन्धमा निर्माणकर्मीले सुपरिवेक्षण परामर्शदातासंग परामर्श गरी सहमति प्राप्त गर्नु पर्नेछ। निर्माणकार्यको उत्कृष्ट गुणस्तर प्राप्त होस् भन्नाको लागि निर्माणकर्मीले बजारमा उपलब्ध अत्याधुनिक उपकरण, मेशीन र प्रविधि प्रयोग गर्नु पर्नेछ। निर्माणकार्यमा प्रयोग गरिएको निर्माण गर्ने तरिका भवन निर्माणको संझौतापत्रमा उल्लेखित स्पेशिफिकेशनमा तोकिए अनुसार भएको भन्ने यकीन गर्नु पर्नेछ।

- **निर्माणकार्यको कारिगरीपनाको गुणस्तर**

भवन निर्माण कार्यमा प्रयोग गरिएका निर्माण सामग्रीहरु र निर्माणकार्यको कारिगरीपना स्पेशिफिकेशन अनुसार हुनुपर्नेछ। निर्माणकार्यको ठेक्का संझौता अनुसार सम्पूर्ण निर्माणकार्यको गुणस्तरका लागि निर्माणकर्मी जिम्मेवार हुनेछ। मध्यम तथा ठूला भवन निर्माण कार्यका लागि निर्माण अवधीभर निर्माण सामग्रीहरुको गुणस्तर परिक्षण र नियमन गर्नका लागि निर्माणस्थलमा नै गुणस्तर परिक्षण गर्न आवश्यक सामग्री र उपकरण सहितको प्रयोगशाला खडा गरी संचालनमा ल्याउन घरधनीसंग निर्माणकर्मीले आवश्यक समन्वय गर्नु पर्नेछ।

(ङ) निर्माणकार्यमा त्रुटि देखिएमा

भवन निर्माण कार्य गर्दा निर्माणकर्मीले सुपरिवेक्षण परामर्शदाताबाट दिइएका निर्देशनहरूको पालना गर्नु पर्नेछ। सम्पन्न गरिएका हरेक निर्माणकार्य त्रुटिरहित भई लाइन र लेभल मिलेको हुनु पर्नेछ। सम्पन्न निर्माण कार्य घरधनी र सुपरिवेक्षण परामर्शदाताको लागि चित्तबुझ्दो हुनु पर्नेछ।

स्थलगत निरीक्षणको क्रममा निर्माणकार्यमा कुनै त्रुटि देखिएमा सुपरिवेक्षण परामर्शदाताको निर्देशन अनुसार निर्माणकर्मीले सच्याउनु पर्नेछ।

(च) चार तहको स्थलगत निरिक्षणका लागि अभिलेख तयार गर्ने र सुपरिवेक्षण परामर्शदाता समक्ष रिपोर्ट गर्ने

सुपरिवेक्षण परामर्शदाताको निर्देशन अनुसार निर्माणकर्मीले आफूले गरेका निर्माणकार्यहरूको अभिलेख राख्ने, तिनीहरूको तस्वीर लिने र सो को रिपोर्ट गर्ने कार्य गर्नु पर्नेछ। तस्वीरहरुले निर्माणकार्यको प्रगति प्रतिबिम्बित गर्ने हुनुपर्नेछ र यी तस्वीरहरू चार चरणमा गरिने स्थलगत निरीक्षणका लागि दरखास्त दिँदा सो साथ संलग्न गर्नुपर्ने प्राविधिक प्रतिवेदनमा समावेश गरिनेछ। मुख्य मुख्य निर्माणकार्यहरुको र प्रमुख डिटेलहरूको तस्वीर लिने कार्यका लागि सुपरिवेक्षण परामर्शदातालाई निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ। यसको आधारमा स्वीकृत नक्सा डिजाइन र भवन संहिता अनुरूप भवनको संरचना निर्माण गरिएको हो भन्ने यकीन गरिनेछ।

(छ) नगरपालिकाबाट गरिने अन्तरिम स्थलगत निरीक्षणमा उपस्थिति

नगरपालिकाबाट अन्तरिम स्थलगत निरीक्षणका लागि प्राविधिकहरु भवन निर्माण स्थलमा खटीइ आउँदा निर्माणकर्मी अनिवार्य रूपमा उपस्थित हुनु पर्नेछ। नगरपालिकाका प्राविधिकबाट दिइएको मौखिक र लिखित निर्देशनहरूको अभिलेख राख्न निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ। अन्तरिम स्थलगत निरीक्षणको समयमा नगरपालिकाको प्राविधिकबाट निर्माणकार्यको त्रुटि सच्याउन कुनै निर्देशन दिएको भए सो अविलम्ब सच्याउने जिम्मेवारी निर्माणकर्मीको हुनेछ।

(ज) नगरपालिकाबाट नक्सा पास गरिएको यकीन गर्ने

भवनको प्लिन्थ तह भन्दा माथि अर्थात् सुपरस्ट्रक्चरको निर्माणकार्य शुरु गर्नु अघि निर्माणकर्मीले भवनको स्थायी नक्सा पास भइसकेको कुराको यकीन गर्नु पर्नेछ। स्थायी नक्सा पास नभइकन निर्माणकर्मीले सुपरस्ट्रक्चरको निर्माणकार्य शुरु गर्नु हुँदैन। भवन निर्माण कार्य गर्दा स्वीकृत नक्सा र डिजाइन अनुसार भूकम्प प्रतिरोधी भवन निर्माण प्रविधि र डिटेलिङ पालन गर्नका लागि धरधनीलाई प्रेरित गर्ने जिम्मेवारी निर्माणकर्मीको हुनेछ। राष्ट्रिय भवन संहिताका प्रावधानहरूको अनुपालनाका लागि निर्माणकर्मीले सुपरिवेक्षण परामर्शदातासंग समन्वय गर्नु पर्नेछ। भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी बूँदाहरू अनुसूची - २ मा दिइएका छन्।

३.२.३ भवन निर्माण सम्पन्न गर्दाको चरणमा निर्माणकर्मीको जिम्मेवारी

क) भवन निर्माण सम्पन्नताको लागि चेकजाँच गर्ने

स्वीकृत नक्सा डिजाइन अनुसार भवन निर्माण कार्य सम्पन्न भएपछि सो को जानकारी निर्माणकर्मीले घरधनीलाई दिनु पर्नेछ। निर्माणकर्मीबाट निर्माण सम्पन्न भएको जानकारी प्राप्त भएपछि घरधनी, सुपरिवेक्षण परामर्शदाता र निर्माणकर्मीले संयुक्त रुपमा निरीक्षण गरी यसको यकीन गर्नु पर्नेछ। यस्तो निरीक्षणको क्रममा निर्माणकार्यमा कुनै त्रुटि वा छुट देखिएमा त्रुटि वा छुट निर्माणकार्यका आइटमहरूको सूची तयार गर्नु पर्नेछ र निर्माणकर्मीले आफ्नै लागतमा त्रुटि सच्याउने कार्य गर्नुपर्नेछ। साथै छुट भएका आइटमहरू पूरा गर्नु पर्नेछ।

(ख) अन्तिम स्थलगत निरीक्षणका लागि निर्माणकार्यको अभिलेख राख्ने र सूचित गर्ने

भवन निर्माण कार्य सम्पन्न भए लगत्तै भवनका सम्पन्न भएका सबै आइटम र भागहरु, मुख्य-मुख्य निर्माणकार्यका तस्वीरहरू, कंक्रिटको कम्प्रेशन भार वहन परीक्षण प्रतिवेदनहरु, अन्य प्रमुख निर्माण सामग्रीहरूको उत्पादन गुणस्तर प्रतिवेदन र निर्माणस्थलमा गरिएका गुणस्तर परीक्षण प्रतिवेदनहरूको अभिलेख सुरक्षित राख्नका लागि सुपरिवेक्षण परामर्शदातालाई निर्माणकर्मीले सहयोग गर्नु पर्नेछ। भवनको अन्तिम स्थलगत निरीक्षणका लागि यी अभिलेख र प्रतिवेदनहरू आवश्यक हुन्छन्। यी अभिलेख र प्रतिवेदनहरूका आधारमा भवनको निर्माणकार्य भवन निर्माण मापदण्ड तथा राष्ट्रिय भवन संहिता अनुरूप भएको भन्ने यकीन सुपरिवेक्षण परामर्शदाताबाट गरिन्छ र नगरपालिकामा पेश गर्नु पर्ने निर्माण सम्पन्न सम्बन्धी प्राविधिक प्रतिवेदन तयार गरिन्छ।

(ग) नगरपालिकाबाट गरिने अन्तिम स्थलगत निरीक्षणमा उपस्थिति

नगरपालिकाका प्राविधिकबाट गरिने अन्तिम स्थलगत निरीक्षणमा निर्माणकर्मी अनिवार्य रूपले उपस्थित हुनु पर्नेछ। भवन निर्माण कार्यको सिलसिलामा सडक, पेटी, खानेपानीको लाइन, वर्षात्को पानी बग्ने ढल, ढल निकास प्रणाली, सडकको सतह ढल, इत्यादि जस्ता सार्वजनिक पूर्वाधारहरूमा कुनै क्षति पुग्न गएको भएमा ती पूर्वाधारहरुको मर्मत संभार गरी पूर्ववत् अवस्थामा ल्याउन घरधनीलाई निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ। भवनको परिसरभित्र भवन निर्माण कार्यको सिलसिलामा बाँकी भएका निर्माण सामग्रीहरू र काम नलाग्ने अन्य पदार्थहरू हटाई सफा गर्न निर्माणकर्मीले घरधनीलाई आवश्यक सहयोग गर्नु पर्नेछ। अन्तिम स्थलगत निरीक्षणको समयमा नगरपालिकाका प्राविधिकबाट दिइएको मौखिक र लिखित

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निर्देशनहरूको अभिलेख राख्ने कार्यमा निर्माणकर्माले सहयोग गर्नु पर्नेछ। साथै नगरपालिकाका प्राविधिकबाट अन्तिम स्थलगत निरीक्षणको समयमा निर्माणकार्य सच्याउन कुनै निर्देशन दिइएको भए सो अनुरूप सच्याउने कार्य गर्ने जिम्मेवारी पनि निर्माणकर्मीको हुनेछ।

(घ) नगरपालिकाबाट भवन निर्माण सम्पन्न प्रमाणपत्र जारी भएको यकीन गर्ने

नगरपालिकाबाट खटिएको प्राविधिकबाट अन्तिम स्थलगत निरीक्षण सम्पन्न भए पछि नगरपालिकाबाट घरधनीको नाममा भवन निर्माण सम्पन्न प्रमाणपत्र जारी भएको कुराको यकीन गर्नु पर्नेछ। नगरपालिकाबाट निर्माण सम्पन्न प्रमाणपत्र प्राप्त गरेपछि घरधनीले निर्माणकर्मीलाई निर्माण सम्पन्न भएको पत्र प्रदान गर्न सक्नेछ।

३.३ दोषीहरूलाई सजाय

क) घरधनीबाट कार्यवाही

निर्माणकर्मीबाट गरिएको निर्माणकार्य सन्तोषजनक नदेखिएमा वा निर्माण सामग्रीहरूको गुणस्तर नपुगेको देखिएमा वा निर्माणकार्यको कारिगरीपना सन्तोषजनक नपाइएमा घरधनीले निर्माणकर्मीसंग गरिएको ठेक्का संझौताको आधारमा निर्माणका लागि गरिएको संझौता भंग गर्न सक्नेछ र निर्माणकर्मीलाई भवन निर्माणकार्यबाट हटाउन सक्नेछ।

- निर्माणकार्यको सिलसिलामा सुपरिवेक्षण परामर्शदाताले दिएका निर्देशनहरूको पालना यदि निर्माणकर्मीबाट नभएको पाइएमा वा सुपरिवेक्षण परामर्शदाताले निर्माणकर्मीको कार्य सन्तोष जनक नभएको भनी घरधनीलाई सूचित गरेमा निर्माणकर्मीसंग गरिएको संझौताको आधारमा घरधनीले संझौता भंग गरी निर्माणकार्यबाट निर्माणकर्मीलाई हटाउन सक्नेछ।
- भवन निर्माण कार्यमा सरिक गराइएको निर्माणकर्मी हटाई घरधनीबाट नयाँ निर्माणकर्मी राखिएमा सो को लिखित जानकारी घरधनीले नगरपालिकालाई दिनु पर्नेछ।

(ख) नगरपालिकाबाट गरिने कार्यवाहीहरु

१) पहिलो पटक अनुचित कार्य गरेकोमा चेतावनी पत्र

निर्माणस्थलमा स्वीकृत नक्सा डिजाइनको बर्खिलाफ हुने गरी निर्माण गरेको वा निर्माणकर्मीको काम सन्तोषजनक नभएको वा निर्माणकार्यमा गम्भीर त्रुटि गरेको भन्ने पहिलो पटक जानकारी प्राप्त भएको खण्डमा नगरपालिकाले निर्माणकर्मीलाई त्यस्तो कार्य पुनः नदोहोऱ्याउन र दोश्रो पटक पुनः दोहोऱ्याइएको पाइएमा नगरपालिका क्षेत्रभित्र निजबाट सेवा प्रदान गर्न बन्देज लगाइन सकिने भनी सम्बन्धित निर्माणकर्मीको नाममा चेतावनी पत्र जारी गर्नेछ।

२) दोश्रो पटक अनुचित कार्य गरेकामा निर्माणकार्यबाट बन्देज

पहिलो पटक अनुचित कार्य गरी चेतावनी पत्र जारी भइसकेपछि पनि पुनः दोश्रो पटक निर्माणकर्मीले सोही प्रकृतिको कार्य गरेको जानकारी प्राप्त भएमा नगरपालिकाले निज निर्माणकर्मीलाई ६ महिनाको अवधीका लागि नगरपालिका क्षेत्रभित्र निर्माणकार्य गर्न नपाउने गरी कालो सूचीमा राख्न सक्नेछ।

३) तेश्रो पटक अनुचित कार्य गरेकोमा कालो सूचीमा राखिने

निर्माणकर्मीले तेश्रो पटक पनि अनुचित कार्य गरेको जानकारीमा आएमा नगरपालिकाले उक्त निर्माणकर्मीलाई कालो सूचीमा राख्नेछ र निजलाई नगरपालिकाको सूचीबाट हटाई नगरपालिका क्षेत्रभित्र निर्माणकर्मीको सेवा प्रदान गर्नबाट बन्देज लगाउनेछ। यसरी बन्देज लगाइएका निर्माणकर्मीहरूको नाम र ठेगाना नगरपालिकाको

वेभसाइट र सूचना पाटीमा प्रकाशित गरिनेछ। यसका साथै नगरपालिकामा सूचीकृत निर्माणकर्मीहरुको विवरणबाट निजको नाम हटाइनेछ।

परिच्छेद- ४

निर्माणकर्मीले गर्नु पर्ने कामहरूको प्राविधिक विवरण

भवन निर्माण कार्यविधि अनुसार निर्माणकर्मीहरूबाट गरिनुपर्ने प्राविधिक विषयहरु तपसीलमा उल्लेख गरिएका छन्

४.१ भूकम्पमा भवनहरु किन क्षतिग्रस्त हुन्छन् ?

भवनको भारवहन क्षमता र लचकता पर्याप्त भएन भने भूकम्पमा भवनहरू क्षतिग्रस्त हुन्छन्। यस्तो हुनुको पछाडि निम्नलिखित कारणहरु छन् :

- **डिजाइनमा कमजोरी :** भवनको डिजाइन गर्दा भूकम्पमा भवन कसरी क्षतिग्रस्त हुन सक्छ भन्ने नबुझ्नु, भवन संहिताका प्रावधानहरूको पालना नगर्नु वा भूकम्पीय भार नलिइकन डिजाइन गर्नु।
- **निर्माणमा कमजोरी :** भवन निर्माण गर्दा गुणस्तरीय निर्माण सामग्री प्रयोग नगर्नु, निर्माणकार्यको गुणस्तर कायम नगर्नु वा लापरवाही गर्नु, डिटेलिङमा ध्यान नदिनु।

(क) पिलर प्रणालीका भवनहरु भूकम्पमा क्षति

पिलर प्रणालीका भवनहरु निम्नलिखित कारणहरूले क्षतिग्रस्त हुन्छन्

- जग, पिलर र बिमको साइज पर्याप्त नहुनु
- डिटेलिङमा लापरवाही, जस्तै- बिम-पिलरको जोर्नी, फलामे डण्डीको गाँस, पिलर र बिममा रिङ वा चूरीहरूको दूरी, पिलर-बिम बिचको गारोमा तेर्सो बन्धन राख्दा भवन संहिता डिटेलिङ नगर्नु।
- भवनमा नरम तल्ला (Soft Storey) पैदा हुनु।
- भवनमा छोटो पिलर प्रभाव (Short Column Effect) पैदा हुनु।
- कंक्रिट ढलान कार्य गुणस्तरयुक्त नहुनु

भार प्रवाह पथ अनिश्चित हुनु

- चित्रमा भूकम्पबाट बिम-पिलर जोर्नीमा भूकम्पबाट भएको क्षति देखाइएको छ ।
- पहिलो चित्रमा एउटा बिम अर्को बिममा अड्याइएको छ तर जोर्नीमा कुनै पिलर छैन । यसले गर्दा पहिलो बिममा अत्यधिक Torsion उत्पन्न भई बिम क्षतिग्रस्त हुन गएको हो । दोश्रो तस्वीरमा एउटा बिम अर्को बिमसँग जोडिएको र यो दोस्रो बिम फेरि अर्को बिमसंग जोडिएको देखाइएको छ तर बिमहरूको जोर्नीमा कुनै पिलर एक छैन । पिलर प्रणालीको भवनको संरचनामा मुख्य बिमलाई पिलरसंग जोड्नु पर्छ । मुख्य बिमलाई पिलरमा नजोडी सिधै अर्को बिममा टेकाउँदा भारप्रवाह पथ राम्रो नभई बिमहरु क्षतिग्रस्त हुन सक्दछन् ।





पिलर प्रणालीको भवनमा नरम तल्ला प्रभाव उत्पन्न हुनु

- पिलर प्रणालीको संरचना भएको भवनमा कुनै तल्ला अर्को तल्लाको तुलनामा कमजोर वा less stiff भएमा नरम तल्ला प्रभाव उत्पन्न हुन्छ ।
- उदाहरणको लागि कुनै भवनको भुईं तल्लामा पसल राख्न वा पार्किङ गर्न गारो नलगाई खुल्ला राखी माथिका तल्लाहरूमा गारो लगाइएमा भुईं तल्ला नरम तल्ला बन्न सक्दछ ।
- भवनको कुनै माथिल्लो तल्लामा बढी खुल्ला भाग राखी त्यस तल्लाभन्दा माथि र तलका तल्लाहरूमा बढी गारो लगाइएमा उक्त माथिल्लो तल्ला पनि नरम तल्ला बन्न गई भुकम्पमा क्षतिग्रस्त हुन सक्दछ ।





बिम र पिलर सकेन्द्रीय (concentric) रूपमा नजोडिनु

- पहिलो तस्वीरमा बिम र पिलरको जोर्नी सकेन्द्रीय नबनाई जोडिएको देख्न सकिन्छ ।
- दोश्रो तस्वीरमा बिम र पिलरको जोर्नी सकेन्द्रीय नहुँदा भूकम्पमा क्षतिग्रस्त भएको देख्न सकिन्छ ।





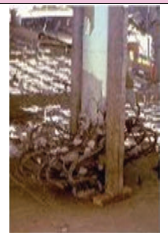
चटामरीको खात जस्तै क्षति

- यस तस्वीरमा पिलर प्रणालीको भवन चटामरी खात लगाए जस्तै गरी क्षति भएको देख्न सकिन्छ ।
- वि.सं. २०७२ साल वैशाख १२ गतेको गोरखा भूकम्पको समयमा काठमाडौंको डल्लुस्थित यो भवन क्षतिग्रस्त भएको हो ।
- पिलर प्रणालीका भवनहरू पनि भूकम्प प्रतिरोधात्मक हिसाबले डिजाइन र निर्माण गरिएन भने भूकम्पमा क्षतिग्रस्त हुन सक्दछ भन्ने कुरा यस तस्वीरले देखाउँदछ ।



पिलरमा उचित मात्रा र दूरीमा रिङ वा चूरीहरु नराख्दा हुने क्षति

- यी तस्वीरहरूमा पर्याप्त संख्यामा पिलरमा रिङ वा चूरी नराख्दा पिलर क्षतिग्रस्त भएको देख्न सकिन्छ ।
- पिलरमा रिङ वा चूरीहरू भूई भन्दा माथि र सिलिङ मुनिका क्षेत्रहरूमा नजीक - नजीकमा र पर्याप्त संख्यामा राख्नु पर्नेमा सो नहुँदा पिलर क्षतिग्रस्त भएको हो ।
- तेस्रो तस्वीरमा गोलो पिलरमा एकापट्टि एकदमै बढी र अर्कोपट्टि लगभग कभर नै नहुने गरी ढलान भएको देख्न सकिन्छ ।
- दुवै पिलरहरूमा पर्याप्त मात्रामा ठाडो फलामे डण्डीहरु राखिएको भएता पनि चूरी वा रिङ पर्याप्त नहुँदा पिलर क्षतिग्रस्त हुन गएको हो ।



- यसर्थ पिलरको भारवहन क्षमताको लागि ठाडो राखिने फलामे डण्डीहरु मात्र पर्याप्त हुँदैन । ठाडो फलामे डण्डीहरुका साथै पर्याप्त मात्रा र स्थानमा रिङ र चूरीहरु पनि राख्नु पर्ने हुन्छ ।
- तेश्रो तस्वीरमा पिलरका ठाडो राखिने फलामे डण्डीहरुको गाँस पिलरको फेदमा शाखिएको र साथै सबै डण्डीहरूको गाँस एकै ठाउँमा परेको कारणले पनि पिलर थप क्षतिग्रस्त हुन गएको हो ।





छोटो पिलर प्रभाव (Short Column Effect) को कारणले हुने क्षति

- तस्वीरमा पिलरको भ्याल वा खुल्ला भागमा पर्ने खण्डमा क्षति हुन गएको देख्न सकिन्छ ।
- पिलरको खुल्ला भाग रहेको खण्ड र त्यस भन्दा मुनिको खण्डमा उही मात्रामा ठाडो फलामे डण्डीहरु राखिएका छन् । तर खुल्ला भागसंग टाँसिएको खण्डमा चूरी वा रिङहरू तल्लो खण्डमा भन्दा बढी नजिक- नजिक राख्नु पर्नेमा सो नगरिंदा पिलर क्षतिग्रस्त हुन पुगेको हो ।





Source: Training Manual for Urban Masons, DUDBC

अपर्याप्त गाँसाइको कारणले हुने क्षति

- यी तस्वीरहरूमा पिलरमा राखिएको माथिल्लो भागको ठाडो फलामे डण्डी र तल्लो भागमा भएका ठाडो फलामे डण्डीको गाँसको लम्बाइ पर्याप्त नभएको र गाँस गरिएको खण्डमा चूरी वा रिङहरु नजिक नजिक राख्नु पर्नेमा सो नराखिएकोले गाँस गरिएको भागमा पिलर क्षतिग्रस्त भएको हो ।
- पिलरमा राखिएका ठाडो फलामे डण्डीहरु गाँस्दा सिलिङ नजिक र भुई नजिक नगाँसिकन तल्लाको विचतिर गाँस्नु पर्दछ ।
- साथै फलामे डण्डीको गाँस गर्दा खप्ट्याइएको भागको लम्बाइ डण्डीको व्यासको ६० गुणा भन्दा कम हुनु हुँदैन ।
- यसको साथै पिलरका सबै डण्डीहरु एकै स्थानमा गाँस्नु हुँदैन । बढीमा ५० प्रतिशत डण्डीहरु मात्रै एक स्थानमा गाँस्नु पर्दछ ।





भऱ्याङको क्षति

- भऱ्याङ भवनको संवदेनशिल खण्ड मध्ये एक हो ।
- बहुतल्ले भवनहरूमा मानिसहरू आपद्कालिन अवस्थामा घरबाट भाग्दा भऱ्याङ अनिवार्य रुपमा प्रयोग गर्नु पर्ने हुन्छ । तर यदि भऱ्याङ क्षतिग्रस्त भएको छ भने भवनबाट निस्कन वा भाग्न समस्या पर्दछ ।
- यसर्थ कुनै पनि भवनको डिजाइन गर्दा भऱ्याङको डिजाइनलाई विशेष महत्व दिनु पर्दछ ।



(ख) लोड बियरिङ वा गारो प्रणालीका भवनमा क्षति

- गारो-गारो, गारो र भुई वा गारो र छाना बिचको बन्धन कमजोर भएको कारणले ।
- गारो सतहको लम्बवत् दिशामा भारवहन क्षमता कमजोर हुनाले ।
- गारोको सतहको समानान्तर दिशामा भारवहन क्षमता कम हुनाले ।
- भुई वा छानाको आफ्नै सतहसँग समानान्तर दिशामा भारवहन क्षमता कम हुनाको कारणले ।
- कमजोर विन्यास वा stiffness को वितरण असमान हुनु ।
- गारोमा ठूला-ठूला खुल्ला भागहरू हुनु ।

- गारो जोडाइको मसला कमजोर हुनु ।
- कारिगरीपना गुणस्तरीय नहुनु ।

भयाल-ढोका जस्ता खुल्ला भागहरूको कुनाबाट छड्के चिरा पर्नु

- यस तस्वीरमा गारो प्रणालीको भवनमा भयालको कुनाबाट शुरु भई छड्के चिरा परेको देख्न सकिन्छ ।
- गारो प्रणालीको भवनमा गारोको सतह संग समानान्तर दिशामा भूकम्पले हल्लाउँदा गारो सर्ने, हल्लिने वा छड्के चिरा पर्ने इत्यादि जस्ता विभिन्न क्षतिहरु हुन सक्दछ ।



चूलीगारो (Gable Wall) को क्षति

- दुई पाखे वा दुईतिर स्लोप भएका छानाहरूमा सामान्यतया: चूलीगारो क्षतिग्रस्त हुन्छ ।
- गारो प्रणालीको भवनमा चूलीगारोको उचाइ सबैभन्दा बढी हुन्छ । भूकम्पले भवनलाई हल्लाउँदा गारोको फेदको तुलनामा चूलीगारोको हल्लाइ सबैभन्दा बढी हुन्छ ।
- प्राय:जसो चूलीगारोको माथिल्लो भागलाई अन्य गारोसंग बाँधिएको वा कसिएको हुँदैन । यसैले भूकम्प जाँदा चूलीगारो सजिलै ढल्न सक्छ ।



गारो लम्बवत् दिशामा ढल्नु (Out-of-plane failure)

- गारोको मोटाइ यसको लम्बाइ र उचाइको तुलनामा पर्याप्त नभएमा गारोको सतहको लम्बवत् दिशामा चिरा पर्न जानुका साथै गारो ढल्न वा भत्किन पनि सक्दछ ।
- यी तस्वीरहरूमा भूकम्पमा भवनका गारोहरु गारोको लम्बवत् दिशामा भत्किएको देख्न सकिन्छ ।



आड नदिइएको (unsupported) लामो गारो भत्किई हुने क्षति

- गारो प्रणालीको भवनमा गारोको मोटाइको तुलनामा लम्बाइ अत्यधिक छ भने र गारोलाई आड दिने लम्बवत् दिशाका आड गारोहरू (cross wall) को दूरी धेरै छ भने भूकम्पको समयमा यस्ता गाराहरु सजिलै ढल्न सक्दछन् ।
- आड गारोसंगको बन्धन मजबूत छैन भने सामान्य अवस्थामा पनि यी गारोहरु भत्कन सक्दछन् ।
- भूकम्पको समयमा गारोमा जमीनसंग समानान्तर दिशामा अर्थात् तेर्सो दिशामा भूकम्पीय बल लाग्दछ । यस्तो अवस्थामा गारोको मोटाइको तुलनामा लम्बाइ निकै धेरै छ भने वा उचाई निकै धेरै छ भने गारो भत्किने संभावना धेरै हुन्छ ।



छानाको क्षति

- गारो प्रणालीको भवनमा छानालाई गारोसंग राम्ररी कसिएको छैन भने वा छानाका भागहरु एक आपसमा बलियोसँग बाँधी गारोसंग बलियो गरी कसिएको छैन भने तस्वीरमा देखाइए जस्तै भवनको छाना भूकम्पमा क्षतिग्रस्त हुन सक्दछ ।



गारोका जोर्नीहरू एउटै ठाडो लाइनमा हुँदा हुने क्षति

- गारो प्रणालीका भवनमा गारो गारोका जोर्नीहरू कमजोर भागहरु हुन् ।
- गारो बनाउँदा दुईवटा गारोहरु वा मुख्य गारो र आड गारोको बीचको जोर्नी एउटै ठाडो लाइनमा पर्ने गरी निर्माण गरिएमा गारो गारो बीचको बन्धन बलियो हुँदैन। समर्थ भूकम्पको समयमा यस्तो जोर्नी छुट्टिन गई गारोहरु भत्किने र यसबाट पूरै भवन क्षतिग्रस्त हुने संभावना रहन्छ ।





गारोमा राखिने खुल्ला भाग गारोको कुनाको नजिक हुँदा हुने क्षति

- तस्वीरमा गारोलाई आड नपुग्दा गारो भत्किन गएको देख्न सकिन्छ । भवनको ढोका गारोको कुनामै जोडेर राख्दा गारोलाई आड पुग्न सकेन । यसर्थ गारो प्रणालीका भवनमा भ्याल-ढोका जस्ता खुल्ला भागहरु राख्दा कुनामै जोडेर नराखी कुनाबाट गारोको उचाइको १/४ दूरीमा वा ४५० मिमि जुन धेरै हुन्छ, सोही अनुसारको दूरीमा राख्नु पर्दछ ।



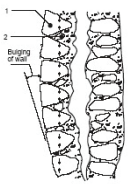
गारोका जोर्नीहरुमा क्षति

- तस्वीरमा भित्री र बाहिरी गारो बीचको जोडाइ वा बन्धन बलियो नभएको कारणले बाहिरी गारो ढल्न गई क्षति भएको देख्न सकिन्छ ।
- यस तस्वीरमा गारोमा निकै ठूला खुल्ला भागहरु वा भ्यालहरू राखिएको र साथै यी खुल्ला भागहरु गारोको कुनासंग जोडिएर बनाएको देख्न सकिन्छ, जसले गर्दा गारो कमजोर हुन पुग्यो ।
- भूकम्पको समयमा गारोका जोर्नी र कुनाहरूमा सबैभन्दा बढी भार पर्न जान्छ । त्यसैले भूकम्पको समयमा गारोहरु जोर्नी वा कुनाबाट छुट्टिई भत्किन थाल्छन् । अन्ततः पूरै भवन पनि भत्किन सक्दछ ।



गारोका भित्री र बाहिरी पत्रहरू छुट्टिई हुने क्षति

- गारो बनाउँदा गारोका भित्री र बाहिरी पत्रहरू बीचको जोहार वा बन्धन बलियो छैन भने भूकम्पको समयमा ती पत्रहरू छुट्टिन गई पूरै गारो भत्किन सक्दछ ।





४.२ भवन निर्माण कार्यविधि अन्तर्गत भवन निर्माणकार्यमा नियमनका मुख्य बूँदाहरू

भवनमा भूकम्पको समयमा हुन सक्ने माथि दफा ३.१ मा उल्लेखित क्षतिहरू हुन नदिनका लागि भवन निर्माण कार्यविधिले संरचनागत निर्माण कार्यको गुणस्तर कायम गर्नमा विशेष जोड दिएको छ, जस अन्तर्गत आर.सि.सि. निर्माणकार्यमा राखिने फलामे डण्डीको डिटेलिङ र कंक्रिट ढलानको भार वहन क्षमतामा विशेष ध्यान दिनु पर्ने हुन्छ । उपरोक्त कार्यको गुणस्तर नियन्त्रण गर्न भवन निर्माण कार्यविधिमा तपसीलमा उल्लेखित दुई निरीक्षण र परीक्षण विधिहरु उल्लेख गरिएका छन् :

क) कंक्रिट ढलान कार्य गर्नु अघि नगरपालिकाबाट अन्तरिम निरीक्षणको समयमा फलामे डण्डीको अवस्थिति सम्बन्धी स्थलगत निरीक्षण

अन्तरिम स्थलगत निरीक्षणको समयमा निर्माणकर्मीले फलामे डण्डीको डिटेलिङ नगरपालिकाबाट खटिई आउने प्राविधिकलाई देखाउनु पर्नेछ । कुनै विशेष कारणवश: निर्माणकर्मीले कुनै भागको फलामे डण्डीको डिटेलिङ निरीक्षण गराउने नसकेमा त्यस्तो भागको खिचिएको तस्वीरलाई प्रमाणको रूपमा लिन सकिनेछ । यस्तो परिस्थिति आउने भएमा निर्माणकर्मीले शुरुमै सुपरीवेक्षण परामर्शदातासंग परामर्श गर्नु पर्नेछ ।




तस्वीर -४ : जग तथा स्ट्राप बिमका लागि डण्डीको अवस्थितिको जाँच

(ख) हरेक तल्लाको कंक्रिट ढलान कार्यको कम्प्रेशिभ भारवहन क्षमताको परीक्षण

- पिलर प्रणालीको भवन निर्माणको सिलसिलामा कंक्रिट ढलान कार्य गर्दा कंक्रिटको परिमाण अनुसार कंक्रिटको कम्प्रेसिभ भारवहन क्षमताको परिक्षण गर्न आवश्यक कंक्रिट क्युबहरू निर्माणकर्मीले तयार गरी सुपरिवेक्षण परामर्शदातालाई उपलब्ध गराउनु पर्दछ । क्युब टेष्ट परीक्षण पश्चात् कंक्रिटको भारवहन क्षमता पर्याप्त नभएको देखिएमा सुपरिवेक्षण परामर्शदाताले ढलान भैसकेको भाग भत्काउन लगाउन पनि सक्नेछ । यसर्थ कंक्रिट ढलान कार्य गर्नु अघि कंक्रिट तयार गर्न आवश्यक निर्माण सामग्रीहरू, जस्तै - सिमेन्ट, गिट्टी, बालुवा र पानी इत्यादिको गुणस्तरमा र कंक्रिट मिश्रण तयार गर्दा र राख्दा अपनाउनु पर्ने सावधानीहरुको सम्बन्धमा निर्माणकर्मीले विशेष ध्यान दिनु पर्ने हुन्छ । अन्यथा पछि गएर क्युब टेष्टमा कंक्रिटको भारवहन क्षमता अपर्याप्त देखिएमा बनाइसकेको संरचना भत्काउनुपर्ने अवस्था आउन सक्दछ ।




तस्वीर -५ : कंक्रिटको कम्प्रेशिभ भारवहन क्षमता परीक्षणका लागि नमूना संकलन र परीक्षणकार्य

४.३ निर्माणकार्यको अभिलेखिकरण र रिपोर्टिङ कार्य

भवन निर्माण कार्यको गुणस्तरीयता सुनिश्चित गर्न सुपरिवेक्षण परामर्शदाताबाट पूर्णकालिन (full-time) स्थलगत निरीक्षण गर्नु सबैभन्दा उत्तम उपाय हो । तर सुपरिवेक्षण कार्यका लागि परामर्शदाताको पूर्णकालिन

सेवा लिन नसकिने अवस्थामा अन्य वैकल्पिक प्रमाणहरू, जस्तै निर्माणकार्यको तस्वीर, इत्यादिलाई पनि स्वीकार गर्न सकिन्छ तर यस्तो तस्वीरले निर्माणकार्यको डिटेल सूक्ष्मरूपमा देखाउन सक्ने हुनु पर्दछ ।

सुपरिवेक्षण परामर्शदातालाई पेश गर्न सकिने तस्वीरजन्य प्रमाणको नमूना तल देखाइएका छन् :





तस्वीर -६ : पिलर, बिम र स्ल्याबमा आर. सि. सि. कार्यका लागि राखिएका फलामे डण्डीहरुको डिटेलिङ





तस्वीर -७ : कंक्रिट ढलान कार्य

तस्वीर -८ : कम्प्रेशिभ भारवहन क्षमताको परीक्षणको तस्वीर

तस्वीर -९ : कम्प्रेशिभ भारवहन क्षमता परीक्षणमा क्युब फुटेपछि

४.४ पिलर प्रणालीको भवन निर्माण कार्यमा भवन निर्माण कार्यविधि अनुसार आधारभूत गुणस्तरको सुनिश्चितता

भवन निर्माण कार्यविधि अनुसार भवन निर्माण कार्यमा कम्तीमा पनि तपसीलमा उल्लेखित अनुक्रम अपनाउनु पर्दछ :

क्र.सं.	परीक्षण कार्यको विवरण	परीक्षण विधि
१.	**तैयारी**	
१.१	नक्सा डिजाइनको स्वीकृति	कागजातको जाँच

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१.२	निर्माणकार्यको ठेक्का संझौता	कागजातको जाँच
२.	**स्थलगत तैयारी (प्रारम्भिक कार्य)**	
२.१	भवनको सेटिङ आउट	निर्माणस्थलमा नापजाँच
२.२	जगको लागि खाडल खन्ने कार्य	निरीक्षण र नापजाँच
२.३	माटोको भारवहन क्षमता	निरीक्षण र नापजाँच
२.४	जगको लागि माटो तयार गर्ने कार्य	निरीक्षण
२.५	माटो पुर्ने कार्य	निरीक्षण
३.	**आर.सि.सि. निर्माणकार्य**	
३.१	फलामे डण्डी काट्ने, बंग्याउने र राख्ने कार्य	कागजात र निरीक्षण
३.२	कंक्रिट ढलान कार्यको सामग्री	कागजात र निरीक्षण
३.३	फलामे डण्डीको अवस्थिति	कागजात र निरीक्षण
३.३.१	**जग**	कागजात र निरीक्षण
३.३.२	**पिलर**	कागजात र निरीक्षण
३.३.३	**बिम**	कागजात र निरीक्षण
३.३.४	**बिम र पिलरको जोर्नी**	कागजात र निरीक्षण
३.३.५	**स्ल्याब**	कागजात र निरीक्षण
३.३.६	**डण्डीको गाँस**	कागजात र निरीक्षण
३.४	**प्लिन्थ तहसम्मको फर्माको काम**	कागजात र निरीक्षण
३.५	**कंक्रिट ढलानका लागि मिश्रणको अनुपात र मिश्रण गर्ने कार्य**	कागजात र निरीक्षण
३.६	**कंक्रिट ढलान कार्य**	निरीक्षण
३.७	**कंक्रिटको कम्प्रेशिभ भारवहन क्षमताको परीक्षण**	परीक्षण प्रतिवेदन
३.८	**कंक्रिट ढलानको क्युरिड गर्ने कार्य**	कागजात जाँच र निरीक्षण

४.५ चार चरणमा गरिने स्थलगत निरीक्षण कायहरुको विवरण

नगरपालिकाबाट गरिने चार चरणको निरीक्षणहरुको विवरण

भवन निर्माण कार्यविधि अनुसार नगरपालिकाका प्राविधिकबाट भवन निर्माण कार्यको चार चरणमा स्थलगत निरीक्षण गरिनु पर्दछ, जुन निम्नानुसार छन् :-

- जगको ढलान गर्नु अघि जग तहमा
- प्लिन्थ बिमको ढलान गर्नु अघि प्लिन्थ तहमा
- पहिलो तल्लाको बिम र स्ल्याबको ढलान गर्नु अघि पहिलो तल्लाको लेभलमा
- भवनको निर्माणकार्य सम्पन्न भइसकेपछि



तस्वीर -१० : नगरपालिकाबाट गरिने चार चरणको निरीक्षणहरु

निर्माणकर्मीले उपरोक्त अनुसारको निरीक्षण कार्यका लागि सुपरिवेक्षण परामशंदाताको आदेशानुसार निर्माणस्थलको तैयारी गर्नु पर्नेछ ।

- पहिलो अन्तरिम स्थलगत निरीक्षणका लागि, निर्माणकर्मीले पिलर प्रणालीको भवनमा जगको फलामे डण्डीहरु बाँध्ने, पिलरका ठाडो डण्डीहरु बाँधी जगमा उभ्याउने र जगमा टाई बिम भएको खण्डमा टाई बिमका फलामे डण्डीहरु पनि नक्सा र डिजाइन अनुसार बाँध्ने काम सम्पन्न गरेको हुनु पर्दछ । गारो प्रणालीका भवनको लागि ढुंगा वा इँटाको स्टेप मिलाई तयार गरिएको जग, गारोको हरेक कुना र गारो-गारोको जोर्नीमा पर्ने गरी जगदेखि ठाडो डण्डी उठाएको हुनु पर्नेछ ।



तस्वीर -११ : जगको लागि फलामे डण्डी बाँध्ने काम

- दोश्रो अन्तरिम स्थलगत निरीक्षणका लागि पिलर प्रणालीको भवनमा निर्माणकर्मीले प्लिन्थतहको टाई बिम भन्दा मुनिको सम्पूर्ण ढलान कार्य सम्पन्न गरी टाईबिमको डण्डी बाँधेर ढलान कार्यको लागि तैयारी अवस्थामा राखेको हुनु पर्नेछ । त्यस्तै गरी गारो प्रणालीको भवनमा प्लिन्थ बिम भन्दा मुनिको जग र गारोको निर्माण कार्य सम्पन्न गरी प्लिन्थ बिमको डण्डी बाँधेर ढलान कार्यको लागि तैयारी अवस्थामा राखिएको हुनु पर्नेछ ।




तस्वीर -१२ : भवनको प्लिन्थ लेभलमा टाई बिम तयार हुँदै



तस्वीर -१३ : कंक्रिट ढलानको लागि मिश्रण तयार गर्ने कार्य



तस्वीर -१४ : जमीन मुनि जगमा कंक्रिट ढलान गर्ने



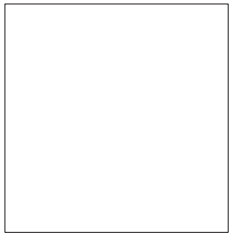
तस्वीर -१५ : जगमा माटो पुर्नु अघिको अवस्था

- तेश्रो अन्तरिम स्थलगत निरीक्षणको लागि निर्माणकर्मीले भवनको पहिलो तल्लाको स्ल्याब र बिमको ढलानको लागि फर्मा राख्ने काम सम्पन्न गरी स्ल्याब र बिमको फलामे डण्डी बाँध्ने काम पूरा गरी ढलानका लागि तैयारी अवस्थामा राखेको हुनु पर्नेछ । यस अवस्थामा आइपुग्दा पहिलो तल्ला भन्दा मुनिका संरचनाहरु, जस्तै प्लिन्थ तहको टाइ बिम र पिलर तथा भ्याङको आर. सि. सि. निर्माण कार्य सम्पन्न भइसकेको हुनु पर्नेछ । पहिलो तल्लाको बिम र स्ल्याबका मुख्य फलामे डण्डीहरु, रिङ वा चूरीहरु, डण्डीको गाँस गर्दा गाँसको लम्बाइ र गाँसको अवस्थिति इत्यादि जस्ता डिटेलिङसंग सम्बन्धित पक्षहरू भवन संहिताका प्रावधान अनुरूप हुनु पर्नेछ ।




तस्वीर -१६ : पहिलो तल्लाको स्ल्याबको फलामे डण्डी

तस्वीर -१७ : पहिलो तल्लाको स्ल्याबको फलामे डण्डी राखेपछि पिलरको डण्डी बाँधिदै



तस्वीर -१८ : कम्प्रेसिभ भारवहन क्षमताको परीक्षणको प्रमाणपत्र



तस्वीर -१९ : पहिलो तल्लाको पिलरको फलामे डण्डी



तस्वीर -२० : पिलरको कंक्रिट ढलान कार्य

- अन्तिम स्थलगत निरीक्षणका लागि स्वीकृत नक्सा र डिजाइन अनुसार भवनका सम्पूर्ण संरचनागत तथा फिनिशिङका कार्यहरू सम्पन्न भई भ्याल ढोका जडान कार्य, भित्ता, सिलिङ र भुईमा प्लाष्टर गर्ने कार्य, बिजुली र स्यानिटरी जडान कार्य पूरा गरी भवनको भित्री र बाहिरी सतहहरूमा कम्तीमा एक कोट रंगरोगन गरिएको हुनुपर्नेछ । भवनको निर्माण पूरा हुँदा स्वीकृत नक्सा र डिजाइन अनुसार भवन निर्माण मापदण्ड र भवन संहिताका प्रावधान अनुरूप तयार भएको हुनु पर्नेछ ।




तस्वीर -२१ : भवन निर्माणकार्य सम्पन्न हुँदै



तस्वीर -२२ : फलामे डण्डीको स्थलगत निरीक्षणको अभिलेख



तस्वीर -२३ : कम्प्रेशिभ भारवहन क्षमता परीक्षणका लागि क्युब तयार गरिदै



तस्वीर -२४ : कम्प्रेशिभ भारवहन क्षमता परीक्षण गरिदै

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- निर्माणकर्मीले भवन निर्माणसंग सम्बन्धित अभिलेख तयार गर्न गुणस्तर परीक्षण प्रतिवेदन र निर्माणकार्यका विभिन्न अवस्थाका तस्वीरहरु सहितका विवरणहरू संकलन गर्न सुपरिवेक्षण परामर्शदाता र घरधनीलाई सहयोग गरिदिनु पर्नेछ ।

क्र.सं.	निरीक्षण	निरीक्षणको समय	चेकजाँच गर्नुपर्ने मुख्य मुख्य विषयहरू
१.	**पहिलो अन्तरिम स्थलगत निरीक्षण**	जगको ढलान गर्नु अघि	• भवनको ले-आउट • पिलरहरूको अवस्थिति जगको माटोको किसिम • जगको गहिराइ • पाइलिङ गर्नुपर्ने भए सो को अभिलेख • जग र पिलरको फलामे डण्डीको अवस्था • सुपरिवेक्षण परामर्शदाताको प्राविधिक प्रतिवेदन
२.	**दोश्रो अन्तरिम स्थलगत निरीक्षण**	प्लिन्थ तहमा टाइबिमको डण्डी बाँधिसके पछि	• भवनको पिलरहरूको अवस्थिति • भवनको साइज • भवनको चारै मोहडामा सेट ब्याक दूरीहरुको नाप, • जगमा पुर्नका लागि प्रयोग गरिएको माटोको अवस्था • पिलरहरूको डण्डीको अवस्था र डिटेलिङ • सुपरिवेक्षण परामर्शदाताबाट तयार गरिएको प्राविधिक प्रतिवेदन
३.	**तेस्रो अन्तरिम स्थलगत निरीक्षण**	पहिलो तल्लाको स्ल्याब र बिमको ढलान गर्नु अघि	• बिम र स्ल्यावमा बाँधिएका रेइनफोर्समेन्ट उण्डीहरुको अवस्था र डिटेलिङ • पहिलो तल्लाका पिलरहरूको फलामे डण्डीको अवस्था • सुपरिवेक्षण परामर्शबाट तयार गरिएको प्राविधिक प्रतिवेदन
४.	**अन्तिम स्थलगत निरीक्षण**	भवनको सम्पूर्ण निर्माणकार्य सम्पन्न भइसकेपछि	• भवन निर्माण सम्पन्न हुँदा भवनको साइज र उचाई, • सेटब्याक दुरीहरू • सुपरिवेक्षण परामर्शदाताबाट तयार गरिएको प्राविधिक प्रतिवेदन

४.६ निर्माण सामग्रीहरुको गुणस्तरीयता र भण्डारण सम्बन्धी चेक जाँच

- निर्माणकार्यमा प्रयोग गरिने निर्माण सामग्रीहरूको गुणस्तर र किसिम स्पेशिफिकेशनमा तोकिए अनुसारको हुनु पर्नेछ ।
- भवनको निर्माण गुणस्तरयुक्त बनाउनका लागि निर्माणसामग्रीहरूको छनोट गर्दा नै उपयुक्तता र गुणस्तरमा विशेष ध्यान दिनु पर्ने हुन्छ ।
- निर्माण कार्य शुरु हुनु अघि निर्माणस्थलमा आवश्यक निर्माण सामग्रीहरूको आपूर्ति भइसकेको हुनु पर्नेछ । यसरी आपूर्ति गर्दा सुपरिवेक्षण परामर्शदातालाई निर्माण सामग्रीहरूको नमूना संकलन गर्ने, परीक्षण गर्ने र स्वीकृत गर्ने कार्यको लागि आवश्यक पर्ने समयलाई समेत विचार गरी निर्माणकार्य शुरु गर्नु अगावै ती सामग्रीहरु पुऱ्याइएको हुनु पर्नेछ ।

(क) सिमेन्ट

- पानीको सम्पर्कमा आएपछि सिमेन्ट जम्न वा सेट हुन थाल्छ र कडा हुन थाल्छ । यसले बालुवा, गिटी, ईंटा, ढुंगा आदि अन्य निर्माण सामग्रीलाई जोड्ने र बाँध्ने काम गर्दछ ।
- सिमेन्टको मुख्य प्रयोग गारोको जोडाइको लागि मसला बनाउन र कंक्रिट ढलान कार्यमा गरिन्छ । बालुवा, चून वा सुर्खीसंगको सम्मिश्रणमा मसला तयार गर्दा सिमेन्टले गारो प्रणालीका भवनमा गारो बनाउन प्रयोग हुने ढुंगा वा ईंटालाई जोड्ने काम गर्दछ । त्यस्तै गरी बालुवा, गिटी र पानीसंगको सम्मिश्रणमा कंक्रिट तयार गरी ढलान कार्य गरिन्छ । ढलानबाट बन्ने जग, पिलर.



तस्वीर -२५ : सिमेन्टका बोराहरु

- बिम, स्ल्याब इत्यादिले भवनको भार वहन गर्दछ र साथै भवनलाई बाहिरी वातावरणीय असरबाट जोगाउँदछ ।
- सिमेन्ट विभिन्न प्रकारका हुन्छन्, जस्तै -सामान्य पोर्टल्याण्ड सिमेण्ट वा ओ.पि.सि. सिमेन्ट, पोज्जोलाना पोर्टल्याण्ड सिमेन्ट वा पि.पि.सि. सिमेन्ट, कम ताप उत्सर्जन हुने सिमेन्ट, तिव्र गतिमा कडा हुने सिमेन्ट, विस्तार हुने सिमेन्ट, सेतो सिमेन्ट, इत्यादि । यस मध्ये सामान्यतया : ओ.पि.सि. र पि.पि.सि. सिमेन्ट निर्माणकार्यमा बढी प्रयोग गरिन्छन् ।



तस्वीर -२६ : नेपालमा उत्पादन हुने सिमेन्टका विभिन्न ब्राण्डहरु

- भवन निर्माण कार्यमा प्रयोग गरिने सिमेन्ट नेपाल गुणस्तर चिन्ह प्राप्त भएको हुनु पर्नेछ । यसको लागि नेपाल गुणस्तर तथा नापतौल विभागले NS 49–2041 तथा NS 572–2076 नामक मापदण्ड जारी गरेको छ ।
- निर्माणस्थलमा सिमेन्ट भण्डारण गर्दा चिस्यानबाट जोगिने गरी सुरक्षित राख्नु पर्दछ र यसलाई बिग्रन र जम्नबाट बचाउन आवश्यक उपायहरु अपनाउनु पर्दछ ।
- सिमेन्टलाई ६ हप्ता भन्दा बढी अवधीसम्म भण्डारण गर्नु हुँदैन ।

सिमेन्टको ग्रेड :

- सिमेन्टको ग्रेडले सिमेन्टको कम्प्रेशिभ भारवहन क्षमतालाई दर्शाउँदछ । सिमेन्टको ग्रेड जति बढी भयो, त्यति नै यसको गुणस्तर र भारवहन क्षमता बढी हुन्छ । सिमेन्टको ग्रेडले त्यसबाट तयार गरिने कंक्रिटको कम्प्रेशिभ भारवहन क्षमतामा प्रत्यक्ष असर पार्दछ । कँक्रिट तयार गर्न चाहिने पदार्थहरु मध्ये सिमेन्ट एक अत्यन्त महत्वपूर्ण अवयव हो, जसले कंक्रिटका अन्य अवयवहरुलाई बाँध्ने काम गर्दछ र सेट भइसकेपछि ठोस, कडा र बलियो संरचनालाई जन्म दिन्छ ।
- सिमेन्टको कम्प्रेशिभ भारवहन क्षमतालाई यसको ग्रेडले रङ्गित गर्दछ । बजारमा मुख्यत: ३ ग्रेडका सिमेन्टहरू उपलब्ध छन् जुन भवन निर्माण कार्यमा प्रयोग गरिन्छन् । सिमेन्टका विभिन्न ग्रेडहरु निम्नानुसारका छन् :-
  - ❖ ५३ ग्रेड :२८ दिनको क्युरिङपछि गरिएको कम्प्रेशिभ भारवहन क्षमता ३३ एम्. पि.ए. भएको
  - ❖ ४३ ग्रेड :२८ दिनको क्युरिङपछि गरिएको कम्प्रेशिभ भारवहन क्षमता ४३ एम्. पि.ए. भएको
  - ❖ ५३ ग्रेड :२८ दिनको क्युरिङपछि गरिएको कम्प्रेशिभ भारवहन क्षमता ३३ एम्. पि.ए. भएको

सिमेन्टका प्रकारहरु :

सिमेन्टका विभिन्न प्रकारहरु मध्ये मुख्य मुख्य निम्नानुसारका छन् :-

- ○ ओ.पि.सि. ५३ ग्रेड
- ○ ओ.पि.सि. ४३ ग्रेड
- ○ ओ.पि.सि. ३३ ग्रेड
- ○ पि.पि.सि. ग्रेड
- ○ पि.एस् .सि. ग्रेड
- ○ सुपर ग्रेड

ओ.पि.सि. ३३ ग्रेड

- ओपिसि ३३ ग्रेड सिमेन्ट भन्नाले ३३ ग्रेडको सामान्य पोर्टल्याण्ड सिमेन्ट भन्ने बुझाउँदछ । यसमा ३३ संख्याले २८ दिनको क्युरिङपछि गरिएको कम्प्रेशिभ भारवहन क्षमता ३३ एम्. पि.ए. भएको भन्ने जनाउँदछ । परीक्षणका लागि सिमेन्टलाई बालुवासँग मिसाई तयार गरिएको मसलाबाट क्युब तयार गरी सो क्युबको कम्प्रेशन टेष्टिङ मेशीनमा परीक्षण गरिन्छ र यसरी परीक्षण गर्दा यसको भारवहन क्षमता ३३ एम्. पि. ए. भन्दा बढी हुनु पर्दछ ।

ओ.पि.सि. ४३ ग्रेड

- ओ.पि.सि.४३ ग्रेड सिमेन्टको कम्प्रेशिभ भार वहन क्षमता ४३.एम्.पि.ए.हुन्छ । यो सिमेन्ट M 30 सम्मको ग्रेडको कंक्रिट तयार पार्न प्रयोग गरिन्छ ।

ओ.पि.सि. ५३ ग्रेड

- यो ग्रेड भवन निर्माणकार्यमा बढी प्रचलित ग्रेड हो । त्यस्तै गरी पुल, सडक, बाँध, पानी ट्यांकी इत्यादिको निर्माण कार्यमा पनि यो ग्रेडको सिमेन्ट प्रयोग गर्ने गरेको पाइन्छ । २८ दिन पछिको कम्प्रेशन भारवहन क्षमता परीक्षणमा यो ग्रेडको सिमेन्टको क्षमता न्यूनतम ५३ एम्.पि.ए. हुनुपर्दछ ।



तस्वीर -२७ : नेपालमा उत्पादन हुने ओ.पि.सि.सिमेन्टका विभिन्न ब्राण्डहरु



तस्वीर -२८ : नेपालमा उत्पादन हुने ओ.पि.सि.सिमेन्टका विभिन्न ब्राण्डहरु

पि.पि.सि. सिमेन्ट

- पि.पि.सि. भनेको पोर्टल्याण्ड पोज्जोलाना सिमेन्टको संक्षिप्त रूप हो । यो सिमेन्ट बनाउँदा ओ.पि.सि. सिमेन्टमा Fly Ash नाम गरेको खरानीको धूलो मिसाइन्छ, जुन कोइला बालेर विद्युत उत्पादन गर्ने केन्द्रमा खेर जाने पदार्थको रूपमा निस्कन्छ । कंक्रिट जम्ने प्रक्रियामा कम ताप उत्सर्जन गर्ने खालको सिमेन्ट आवश्यक भएमा यस प्रकारको सिमेन्ट प्रयोग गरिन्छ । पुल र बाँधको ढलान कार्यमा यो सिमेन्ट बढी उपयुक्त हुन्छ । यो सिमेन्ट प्रयोग गर्दा कंक्रिटको बाहिरी सतहमा राम्रो फिनिशिङ आउँदछ । पि.पि.सि. सिमेन्ट ३३ ग्रेडमा मात्र उपलब्ध छ ।



तस्वीर -२८ : नेपालमा उत्पादन हुने पि.पि.सि.सिमेन्टका विभिन्न ब्राण्डहरु



तस्वीर -२९ : नेपालमा उत्पादन हुने पि.पि.सि.सिमेन्टका विभिन्न ब्राण्डहरु

पि.एस्.सि. सिमेन्ट

- पि.एस्.सि. भनेको पोर्टल्याण्ड स्ल्याग सिमेन्टको संक्षिप्त रूप हो । यो सिमेन्ट बनाउँदा ओपिसि सिमेन्टमा स्ल्याग मिसाइन्छ । स्ल्याग भनेको फलाम तयार गर्ने भट्टीबाट निस्कने खेर जान पदार्थ हो तर सिमेन्टमा यसलाई मिसाउँदा यसले वातावरण प्रदूषण हुनबाट बचाउनुका साथै क्लोराइड, सल्फेट जस्तो रसायनबाट प्रतिरोधी हुने कंक्रिट तयार गर्न मद्दत गर्दछ । यस सिमेन्टले पनि जम्ने प्रक्रियामा कम ताप उत्सर्जन गर्दछ । पि.एस्.सि. सिमेन्ट ३३ ग्रेडमा मात्र उपलब्ध छ ।



तस्वीर -३० : नेपालमा उत्पादन हुने पि.एस्.सि.सिमेन्टका विभिन्न ब्राण्डहरु



तस्वीर -३१ : नेपालमा उत्पादन हुने पि.एस्.सि.सिमेन्टका विभिन्न ब्राण्डहरु

(ख) गिट्टी



- ढलान कार्यको लागि प्रयोग गरिने गिट्टी कड्रा ढुंगाबाट बनेको हुनु पर्दछ । यस्तो गिट्टी नदी नालाको ग्राभेलबाट या हात वा मेशीनले कुटी तयार गरिएको हुन सक्दछ । नरम वा कमजोर ढुंगाबाट तयार गरिएको गिट्टी ढलानको लागि उपयुक्त हुँदैन ।
- ढलान कार्यमा प्रयोग गरिने गिट्टी सफा हुनु पर्दछ र यसमा ढुंगा बाहेक अन्य पदार्थहरु नमिसिएको हुनु पर्दछ ।
- गिट्टीमा माटो, फोहोर, जैविक वा अजैविक पदार्थहरू मिसिएको हुनु हुँदैन ।

- नदी वा खोला किनारबाट जम्मा गरिएको ग्राभेल र खानीबाट उत्खनन गरी ढुंगा निकालेर हातले वा क्रशर मेशीनमा कुटेर तयार गरिएका गिटीहरू ढलान कार्यमा प्रयोग गरिन्छ ।

(ग) बालुवा

- बालुवा नदी वा खोला किनारबाट जम्मा गरिएको वा बालुवा खानीबाट उत्खनन गरी निकालिएको हुन सक्दछ ।
- गारोको जोडाइको लागि तयार गरिने मसलाको लागि वा कंक्रिट ढलान कार्यको लागि प्रयोग गरिने बालुवा सफा हुनु पर्दछ ।
- यसमा माटो, धूलो र अन्य जैविक वा अजैविक पदार्थहरु मिसिएको हुनु हुँदैन । माटो मिसिएको अवस्थामा बालुवालाई पखालेर सफा गरेपछि मात्रै प्रयोगमा ल्याइनु पर्दछ ।

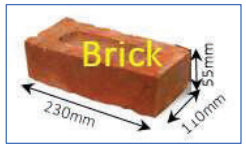


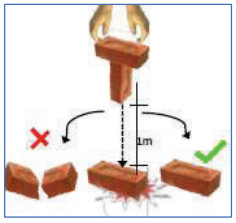
- कंक्रिट ढलान कार्यमा खस्रो प्रकारको बालुवा प्रयोग गरिन्छ । यस्तो बालुवा खोला/नदी किनारबाट निकालिएको वा खानीबाट उत्खनन गरी निकालिएको हुन सक्दछ । ठूला र महत्वपूर्ण संरचनामा कंक्रिट ढलानको लागि प्रयोग गरिने बालुवाको स्पेशिफिकेशन प्राविधिकबाट सो प्रयोजनको लागि तोकिएका अनुसारको हुनु पर्नेछ ।
- बालुवा रासायनिक हिसाबले निस्क्रिय प्रकृतिको हुनुपर्नेछ ।

(घ) इँटा

- निर्माण कार्यमा प्रयोग गरिने इँटा चिरा नपरेको, खराबीहरु नभएको र यसका चून, फलाम वा अन्य नूनजन्य पदार्थ नमिसिएको हुनु पर्दछ ।
- इँटा राम्ररी पोलिएको, खराबी नभएको र कडा प्रकृतिको हुनु पर्दछ र यसका धारहरु तिखो हुनु पर्नेछ । साथै यसलाई हिर्काउदा धातुलाई हिर्काउदा आउने खालको आवाज निस्कनु पर्दछ ।
- इँटालाई पानीमा एक घण्टासम्म डुबाएर राखी भिजाएर निकाल्दा यसले आफ्नो सुख्खा तौलको १ भागको ६ भाग भन्दा बढी पानी सोसेको हुनु हुँदैन ।







(ङ) आर.सि.सि. ढलानमा प्रयोग गरिने फलामे डण्डी

- आर.सि.सि. संरचनाको ढलानकार्यमा प्रयोग गरिने फलामे डण्डीमा बढी खिया लागी प्वाल परेको, पाप्रा निस्किएको, अन्य पदार्थ टाँसिएको हुनु हुँदैन । यसमा रंगरोगन, तैलीय पदार्थ, ग्रिज, माटो जस्ता पदार्थहरु टाँसिएको हुनु हुँदैन । यस्ता पदाथहरु टाँसिएको फलामे डण्डी प्रयोग गर्दा कंक्रिटसंगको टाँसिने गुण वा बण्ड कमजोर भई संरचनाको भारवहन क्षमता कम

हुनाको साथै खिया छिटो लाग्ने भई ढलानमा पछि चिराहरू देखिन सक्दछ । ढलान कार्यको लागि प्रयोग गरिने फलामे डण्डी किन्दा नेपाल गुणस्तर चिन्ह प्राप्त ब्राण्डहरु मध्येबाट खरिद गर्नु पर्दछ ।





- फलामे डण्डी खरिद गर्दा गुणस्तरमा ध्यान दिनुका साथै खरिद् गरिसकेपछि यसको भण्डारणमा पनि विशेष ध्यान दिनु पर्दछ । संभव भए सम्म फलामे डण्डीको भण्डारण खुल्ला स्थानमा नगरी ओत उपलब्ध हुने ठहरा वा भण्डारमा गरिनु पर्दछ ।
- नेपाल गुणस्तर तथा नापतौल विभागले आर.सि.सि. निर्माण कार्यमा प्रयोग गरिने फलामे डण्डीको लागि NS 191-2046 नामक मापदण्ड जारी गरेको छ ।
- ठूला र महत्वपूर्ण निर्माणकार्यमा फलामे डण्डी प्रयोग गर्नु अघि यसको तन्किने क्षमता (yield strength, tensile strength, minimum elongation), बंग्याइने क्षमता र बण्ड हुने क्षमताका परिक्षणहरु प्रयोगशालामा गरिन्छन् ।
- फलामे डण्डीको न्यूनतम प्रुफ भारवहन क्षमता (yield strength) Fe 415 तथा Fe 500 ग्रेडको डण्डीको लागि क्रमशः ४१५ एम्.पि.ए. र ५०० एम्.पि.ए. भन्दा कम हुनु हुँदैन ।
- फलामे डण्डीको तन्काइमा भारवहन क्षमता (tensile strength) Fe 415 तथा Fe 500 ग्रेडको डण्डीको लागि प्रुफ भारवहन क्षमता भन्दा न्यूनतम क्रमशः १० र ८ प्रतिशतले बढी हुनाको साथै ४८५ र ५४५ एम्.पि.ए. भन्दा कम हुनु हुँदैन ।
- फलामे डण्डीको न्यूनतम तन्काइ क्षमता (minimum elongation length) Fe 415 तथा Fe 500 ग्रेडको डण्डीको लागि क्रमशः १४.५ प्रतिशत र १२.० प्रतिशत भन्दा कम हुनु हुँदैन ।
- यसमा चिरा परेको, पत्र टाँसिएको वा बढी नै खिया लागेको हुनु हुँदैन ।
- रेइनफोर्समेन्टको लागि फलामे डण्डीहरु बाँध्दा प्रयोग गरिने बाँध्ने तार २० गेज मोटाइको हुनुका साथै ग्याल्भानाइज र अनिलिङ गरिएको हुनु पर्नेछ ।





A3-4-81

(च) खट तथा फर्मा (scaffolding & formwork)







- सामान्यतया: ढलान कार्यको लागि प्रयोग गरिने खट तथा फर्मा बनाउन काठ प्रयोग गरिन्छ । यसका लागि काठको फल्याक, दलिन र खाँबोहरु प्रयोग हुन्छ ।
- फर्माको लागि प्रयोग गरिने फल्याक, दलिन र खाँबोहरु जडान गर्नु अघि पर्याप्त मजबुती भए-नभएको, बढी बाँगिएको वा मक्किएको भए-नभएको जाँच गर्नु पर्दछ । फर्मा जडान गर्दा बलियो र नहल्लिने गरी निर्माण गर्नु पर्दछ ।
- फलामको खट तथा फर्मा पनि हाल प्रचलनमा आइरहेको छ । यस्ता फर्माहरु कारखाना वा वर्कशपबाट तयार गरिएका हुन्छन् ।
- प्लाष्टर र रंग रोगन कार्यका लागि खट तयार गर्दा बलियो र नहल्लिने गरी फल्याकहरु जडान गर्नु पर्दछ । खटले भवनको भित्तामा नछुने गरी जडान गर्नु पर्दछ ।
- भऱ्याङ प्रयोग गर्दा भुईमा अड्याइएको ठाउँमा नचिप्लियोस् भन्नाको लागि बालुवा भरिएको बोरा भऱ्याङको फेदमा राख्न उपयुक्त हुन्छ ।

(६) ढुंगा :

- निर्माणकार्यमा प्रयोग गरिने ढुंगा कडा र टिकाउ हुने किसिमको हुनु पर्दछ । गारोमा ढुंगा प्रयोग गर्दा यसलाई ताछेर बाहिरी सतह खस्रो बनाएर मात्र प्रयोग गर्नु पर्दछ ।



- गारोमा प्रयोग गरिने ढुंगा सकेसम्म एउटै साइजको र नियमित आकारको हुनु उपयुक्त हुन्छ ।
- गारोको बाहिरी मोहोडामा प्रयोग गरिने ढुंगा तुलनात्मक रूपले ठूला, नियमित आकारका र एकै रंगका हुनु पर्दछ, जसले गर्दा गारोको बाहिरी रुप आकर्षक देखियोस् ।

(ज) काठ :

- निर्माणकार्यमा प्रयोग गरिने काठ सामान्यतया: साल प्रजातिको हुनुपर्दछ। साल प्रजातिको काठ उपलब्ध हुन नसकेमा कडा प्रकारका अन्य काठहरु प्रयोग गर्न सकिन्छ ।



- काठमा twist, sapwood, shakes, dead & loose knots, worm holes जस्ता खराबीहरू हुनु हुँदैन ।
- निर्माण कार्यमा सिजनिङ गरिएको काठ मात्र प्रयोग गर्नु पर्दछ । यो मक्किएको वा किरा लागेको हुनु हुँदैन । प्रयोग भई सकेपछि खराबी आई कमजोर हुने वा टिकाउ नहुने प्रकारका खराबी देखिएका काठहरु प्रयोगमा ल्याउनु हुँदैन ।
- काठको न्यूनतम कम्प्रेशन भारवहन क्षमता ७० केजी प्रति वर्ग से.मी. हुनु पर्नेछ ।

(झ) पानी :

- निर्माण कार्यमा प्रयोग गरिने पानी स्वच्छ हुनु पर्दछ र यसमा तैलीय, अम्लीय, क्षारीय, जैविक वा अन्य अजैविक पदार्थहरू मिसिएको हुनु हुँदैन ।
- पानी प्रयोग गरेपछि यसले मसला वा कंक्रिट ढलानमा कुनै दाग उत्पन्न गर्ने वा दाग छोड्ने हुनु हुँदैन ।
- सामान्यतया: पिउन योग्य पानी निर्माणकार्यको लागि उपयुक्त हुन्छ ।



४.६.२. निर्माण सामग्रीको भण्डारण

(क) सिमेन्टको भण्डारण

- सिमेन्टलाई भण्डारण गर्दा सुख्खा र हावा नलाग्ने ठाउँमा एक चाङमा बढीमा १० बोराको खात लगाई भण्डारण गर्नु पर्दछ ।
- भण्डारण गर्दा ओस वा पानीबाट जोगाउनु पर्दछ, जसले गर्दा सिमेन्ट जम्ने र डल्ला पर्ने हुन नपाओस् । सिमेन्टको खातलाई भण्डारको पर्खालबाट कम्तीमा ४५० मिमि को दूरीमा राख्नु पर्दछ । सिमेन्टको चाङ यसको उत्पादन मिति अनुसार छुट्टिने गरी फरक फरक चाङमा भण्डारण गर्नु पर्दछ । साथै भण्डारबाट सिमेन्ट निकाल्दा पहिले ल्याइएको वा पुरानो उत्पादन मिति भएको सिमेन्टलाई पहिलो प्रयोग गर्ने विधि अपनाउनु पर्दछ ।



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- लामो समयसम्म भण्डारण गरिएको सिमेन्टको भारबहन क्षमता कम हुने हुँदा सामान्यतया: छ हफ्ता भन्दा लामो अवधीसम्म सिमेन्ट भण्डारण गर्नु हुँदैन र यसलाई सकेसम्म छिटो प्रयोगमा ल्याइहाल्नु पर्दछ ।

(ख) फलामे डण्डीको भण्डारण

- फलामे डण्डोको भण्डारण गर्दा यसलाई बांगिन, कुच्चिन र खिया लाग्नबाट बचाउने कुरामा ध्यान दिनु पर्दछ । खुल्ला ठाउँमा भण्डारण गर्दा सजिलै खिया लाग्न सक्ने भएकोले टहरा वा ओत भएको ठाउँमा मात्र यसको भण्डारण गर्नु पर्दछ ।




(ग) काठको भण्डारण

- भर्खरै चिरिएको ताजा काठमा चोप र चिस्यान हुन्छ, जसले गर्दा यसमा छिटै किरा लाग्ने र काठ बाँगिने संभावना हुन्छ । यसर्थ काठलाई प्रयोगमा ल्याउनु अघि यसलाई राम्ररी सुक्न दिनु पर्दछ । काठको चिस्यान हटाउन सुकाउने विधिलाई सिजनिङ भनिन्छ, जसमा नियन्त्रित प्रक्रिया मार्फत् काठभित्रको चोप र चिस्यानलाई कम गर्ने काम गरिन्छ ।

काठको खात लगाउने विधि

- काठलाई खात लगाउँदा जमीनबाट न्यूनतम १५० मिमि. माथि हुने गरी राख्नु पर्दछ ।
- खातको उचाई जमीनबाट १.५ देखि २ मीटरसम्म हुनुपर्दछ । खातको माथिको सतहमा गहुँगो वस्तुले थिच्नु पर्दछ, जसले गर्दा यो बांगिन नपाओस् ।

४.७. निर्माणस्थलको तैयारी सम्बन्धी चेकजाँच

४.७.१ निर्माणस्थलको सुरक्षा

- निर्माणकार्यमा सरिक हुने कामदार, सुपरिवेक्षक र तेस्रो पक्षका व्यक्तिहरूको सुरक्षाको व्यवस्था मिलाउन निर्माणकर्मीले घरधनीसंग आवश्यक समन्वय गर्नु पर्दछ ।
- निर्माणस्थलमा आगलागीबाट बच्न तथा विद्युत लिक भई करेन्ट लाग्न सक्ने संभावनाबाट बच्न आवश्यक व्यवस्था निर्माणकर्मीले गर्नुपर्नेछ ।
- घरधनीसंग समन्वय गरी निर्माणकर्मीले कामदारहरुलाई हेल्मेट, पंजा, बुट, सुरक्षा पेटी जस्ता व्यक्तिगत सुरक्षाका उपकरणहरु अलब्ध गराउनु पर्नेछ ।
- निर्माणस्थलमा पर्याप्त उज्यालोपनाका लागि निर्माणकर्मीले बत्तीको आवश्यक व्यवस्था गर्नु पर्नेछ ।
- भवनको वरिपरि निर्माणाधीन भागलाई घेर्ने गरी सुरक्षा जाली लगाउने व्यवस्था गर्नु पर्नेछ ।
- घरधनीसँग समन्वय गरी निर्माणकर्मीले निर्माणस्थलमा आवश्यक संकेत पाटीहरू राख्नु पर्नेछ । साथै निर्माणस्थलमा अस्थायी घेराबार लगाई अनधिकृत व्यक्तिलाई प्रवेश गर्न नदिने व्यवस्था गर्नु पर्नेछ ।
- निर्माणकर्मीले सार्वजनिक सडक, विद्युत् प्रसारण लाइन, भूमिगत विद्युत केबल लाइन, टेलिफोन र नेटवोर्क लाइन, वर्षाद्को पानी बग्ने ढल, फोहरपानी बग्ने ढल, इत्यादि जस्ता सार्वजनिक पूर्वाधारमा क्षति नपुगोस भन्नाको लागि आवश्यक व्यवस्था मिलाउनु पर्नेछ ।

४.७.२ निर्माणस्थलमा भवनको अवस्थिति यकीन गर्ने कार्य

भवनको ले-आउट गर्ने कार्य

- भवन निर्माण कार्यमा भवनको ले-आउट गर्ने कार्य अत्यन्त महत्वपूर्ण कार्य हो ।
- स्वीकृत नक्सा र डिजाइन अनुसार जमीनमा भवनका पिलरहरुको अवस्थिति देखाउने ग्रिड लाइनहरू चिन्ह लगाउनु पर्दछ ।
- ग्रिड लाइनको केन्द्र रेखाहरू जमीनमा चिन्ह लगाउँदा x र y दुवै दिशाका रेखाहरु समकोण हुने गरी लगाउनु पर्दछ । यसरी चिन्ह लगाइसकेपछि समकोण भए-नभएको यकीन गर्न आयतहरूको विकर्णहरु बराबर भए नभएको जाँच गर्न सकिन्छ ।
- जगको लागि खाडल खन्दा केन्द्र रेखाहरू मेटिने भएकोले खाडल खन्नु अघि केन्द्र रेखाको अन्तिम विन्दुहरुमा ढुंगा वा ईंटाको गारो बनाई किलाले चिन्ह लगाउनु पर्दछ । यी गारोहरु खाडल खन्दा नभत्किने गरी खाडलबाट पर्याप्त दूरीमा निर्माण गर्नु पर्दछ ।
- ग्रिड लाइनले पिलर र गारोहरूको अवस्थिति देखाउँदछ ।

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- निर्माणकार्य शुरु गर्नु अघि निर्माणकर्मीले निर्माणस्थलका विभिन्न भागहरूको लेभल यकीन गर्न सर्वेक्षण गर्नु पर्दछ । यसको आधारमा हालको जमीन लेभलबाट कति तलसम्मको गहिराइमा जग निर्माण गर्ने र साथै भवनको प्लिन्थ लेभल कति उचाइमा निर्माण गर्ने भन्ने कुरा विषय यकीन गर्नु पर्दछ । निर्माणस्थलको वास्तविक अवस्था अनुसार जगको गहिराइमा वा प्लिन्थको उचाइमा परिवर्तन गर्नु पर्ने देखिएमा सुपरिवेक्षण परामर्शदातालाई सूचित गरी घरधनीसँग समेत परामर्श गरी परिवर्तन गर्न सकिनेछ ।
- सर्वेक्षणको सिलसिलामा सन्दर्भ विन्दु र लेभल यकीन गर्न बेञ्चमार्क विन्दु अंकन गर्न परेमा सुपरिवेक्षण परामर्शदातासंग परामर्श गरी ती विन्दुहरु निर्माणस्थलमा अंकित गर्नु पर्नेछ ।
- सर्वेक्षणको स्टेशन विन्दु र सन्दर्भ विन्दुहरु स्पष्ट देखिने र सुरक्षित हुने गरी राख्नु पर्नेछ ।
- निर्माणस्थलको हस्तान्तरण प्राप्त गर्ने वित्तिकै निर्माणकर्मीले नापी विभागबाट स्थापित सन्दर्भ विन्दुको आधारमा निर्माणस्थलमा बेन्चमार्क विन्दु स्थापना गर्नु पर्नेछ। नापी विभागबाट स्थापित सन्दर्भ विन्दुका नियामकहरू सुपरिवेक्षण परामर्शदाताको सहयोगमा प्राप्त गर्नु पर्नेछ । निर्माण गरिने संरचनाहरूको नजिकमा सहायक बेञ्चमार्क विन्दुहरु स्थापना गर्नु पर्नेछ । समय समयमा यी सहायक बेञ्चमार्कहरुको लेभल चेकजाँच गर्नु पर्नेछ र आवश्यक परेमा लेभल मिलान कार्य गर्नुपर्नेछ ।
- स्वीकृत नक्सा र डिजाइन अनुसार निर्माण गरिने भवनको केन्द्र रेखाहरू जमीनमा अंकित गर्ने जिम्मेवारी निर्माणकर्मीको हुनेछ । यसको लागि विस्तृत नक्सा तयार गरी निर्माणकर्मीलाई उपलब्ध गराउने जिम्मेवारी सुपरिवेक्षण परामर्शदाताको हुनेछ ।
- जमीनको हाल विद्यमान स्वरूप र क्रश-सेक्सन सम्बन्धी तथ्यांक लिने कार्य निर्माणकर्मी र सुपरिवेक्षण परामर्शदाताले संयुक्त रूपमा मिलेर गर्नु पर्नेछ। यसैको आधारमा निर्माणकर्मावाट गरिएको माटो खन्ने पुर्ने काम लगायतका निर्माणकार्यको नाप कायम गरिने र बिल भुक्तानी हुनेछ ।



४.७.३ जगको लेभलमा माटोको भारवहन क्षमता यकीन गर्ने कार्य

भवन निर्माण स्थलमा जगको तहमा माटोको भार वहन क्षमता डिजाइन प्रतिवेदनमा उल्लेख भए अनुरूपको भए-नभएको यकीन गर्न निर्माणकर्मीले सुपरिवेक्षण परामर्शदातासंग छलफल गर्नु पर्नेछ। कुनै कारणवश डिजाइन प्रतिवेदनमा उल्लेख भएको भन्दा फरक प्रकृतिको माटोको बनोट वा स्थिति देखिएमा जग निर्माण शुरु गर्नु अघि नै निर्माणकर्मीले सुपरिवेक्षण परामर्शदातालाई सूचित गर्नुपर्नेछ र निजको निर्देशन पालना गरेर मात्रै जग निर्माणकार्य शुरु गर्नु पर्नेछ ।

(क) माटोको भारवहन क्षमता यकीन गर्ने कार्य

- निर्माण कार्य गर्नु अघि जगको तहमा माटोको भारवहन क्षमता यकीन गर्नु अत्यन्त महत्वपूर्ण हुन्छ । भारवहन क्षमता यकीन नगरी काम अघि बढाउँदा पछि कुनै समस्या आएमा त्यसको निराकरण गर्न अत्यन्त कठिन हुन्छ ।
- वास्तवमा भू-प्राविधिक अध्ययनबाट मात्रै माटोको भारवहन क्षमता यकीन हुन्छ र यसले कुन प्रकारको जग राख्ने भन्ने सम्बन्धमा दिशा निर्देश गर्दछ ।
- तर कम लागतमा बनाइने मध्यम तल्ला संख्या भएका निजी आवासीय भवनहरूको हकमा सामान्यतया : भू-प्राविधिक अध्ययन गर्ने गरेको पाइदैन । यस्ता भवनहरूको डिजाइन तयार गर्दा माटोको भारवहन क्षमता अनुमान गरेर लिइएको हुन्छ । यस्तो अवस्थामा सुपरिवेक्षण परामर्शदाताले भवनको डिजाइन प्रतिवेदनमा उल्लेखित माटोको भारवहन क्षमता जगको लागि खाडल खनिसकेपछि देखिएको माटोको किसिमको आधारमा यकीन गर्नु पर्दछ ।
- डिजाइन प्रतिवेदनमा उल्लेखित माटोको भारवहन क्षमता स्थलगत रूपमा यकीन गर्न निम्नानुसारको विधि अपनाउन सकिन्छ ।
  - ❖ जगको तह भन्दा मुनि १ मी लम्बाइ x १मी चौडाइका दुईवटा खाल्टोहरू ०.५ मी को गहिराइसम्म खन्ने र सो गहिराइमा भएका माटोको प्रकृतिको अध्ययन गर्ने । जमीन मुनिको पानीको सतह कुन लेभलमा छ भनी अध्ययन गर्ने ।
  - ❖ उपरोक्त खाल्डोको फेदमा भएका माटोको वर्गीकरण NBC २०५ मा दिइएको तालिका अनुसार अध्ययन गर्ने ।
- कडा, मध्यम र नरम प्रकारको माटो भएको स्थानमा भवन निर्माण गर्न सकिन्छ तर धेरै कमजोर प्रकारको माटो भएमा सो माटोको तह हटाएर वा माटोको भारवहन क्षमता सुधार गरेर मात्र भवन निर्माण गर्नु पर्दछ ।
- जग तहमा देखिएको माटोको प्रकार भवनको डिजाइन प्रतिवेदनमा दिइएको माटोको प्रकारसंग मिल्ने हुनुपर्दछ । उपरोक्त माटोको भारवहन क्षमता शंकास्पद देखिएमा घरधनीलाई डिजाइनकर्तालाई सूचित गर्न अनुरोध गर्नु पर्दछ । जग तहको माटोको गुणस्तरको सम्बन्धमा निम्नानुसारको सामान्य परीक्षणबाट यकीन गर्न सकिन्छ :
  - ❖ १मी x १ मी x १ मी को खाल्डो खन्ने ।
  - ❖ खनेर निस्किएको माटोले सोही खाल्डो सामान्य रूपमा खाँदेर पुर्ने ।
  - ❖ यदि निकालेको माटोले यसरी भर्दा खाल्डो पूरै भरिएन भने माटो कमजोर रहेछ भन्ने थाहा हुन्छ । यदि निकालिएको माटोले भर्दा खाल्डो पूरै भरियो भने माटो मध्यम प्रकारको रहेछ भन्ने थाहा हुन्छ । त्यस्तै गरी खाल्डो भर्दा माटो बाँकी रहन गएमा माटो कडा प्रकृतिको रहेछ भन्ने जानकारी प्राप्त हुन्छ ।

माटोको वर्गीकरण :

क्र.सं.	जगको तह भन्दा मुनिको माटोको किसिम	माटोको वर्गीकरण
१.	खिइएको चट्टान, बोल्डर भएको माटो, ग्राभेल, बालुवा मिसिएको ग्रामेल, बालुवा -ग्राभेलको मिश्रण, खँदिलो वा खुकुलो खस्रो वा मध्यम खालको बालुवा जसमा खन्ने उपकरणले खन्दा खन्न निकै गाह्रो हुन्छ, साह्रो वा मध्यम साह्रो खालको चिम्ट्याइलो माटो जसमा हातले किल्ला पसाउन सकिन्छ ।	-कडा
२.	मिहिन बालुवा र सिल्ट (सुख्खा डल्ला हातले सजिलै फुटाउन सकिने), भिजेको चिम्ट्याइलो माटो र बालुवा - चिम्ट्याइलो	-मध्यम

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	माटोको मिश्रण, जसमा बूढी औंलाले जोडले थिनेर चिन्ह लगाउन सकिन्छ ।	
३.	मिहिन बालुवा, खुकुलो र सुख्खा, नरम चिम्ट्याइलो माटो, जसमा मध्यम शक्तिले बूढी औंलाले थिचेर चिन्ह लगाउन सकिन्छ ।	-नरम
४.	अत्यन्त नरम चिम्ट्याइलो माटो जसमा बूढी औंलाले थिच्दा केही सेन्टिमिटरसम्म गहिरो छाप बस्छ, भिजेको चिम्ट्याइलो माटो ,	- कमजोर

(ख) पाइल गाड्ने काम (Piling Work)

निर्माण गर्ने तरिका अनुसार पाइल दुई किसिमका हुन सक्दछन :

१) ठोकेर गाड्ने पाइल (Driven Pile)

२) बोरिङ गरेर ढलान गरिने पाइल (Bored/Drilled & Cast-in-situ Pile)

- ठोकेर गाड्ने पाइलको लागि यान्त्रिक उपकरणको आवश्यकता हुन्छ र यसको लागि स्ट्याण्डर्ड स्पेशिफिकेशनमा उल्लेख गरिएको विधि अपनाउनु पर्दछ
- ड्रिलिङ वा बोरिङ कार्य शुरु गर्नु अघि पाइलको लागि आवश्यक निर्माण सामग्रीहरू - फलामे डण्डीको जाली, कंक्रिट ढलानको लागि सुख्खा मिश्रण, भाइब्रेटर इत्यादि तैयारी अवस्थामा राख्नु पर्दछ ।
- माटोको माथिल्लो भाग (Top Soil) काटेर फ्याँकी सतह समतल बनाउनु पर्दछ, जसले गर्दा निर्माणस्थलमा ड्रिलिङ गर्ने गहिराइ सबै ठाउँमा एकनासको होस् ।
- ड्रिलिङ कार्य मेशीनको प्रयोग गरी वा हाते उपकरण प्रयोग गरी गर्न सकिन्छ । ड्रिलिङ कार्यमा स्पेशिफिकेशन अनुसारको विधि प्रयोग गर्नु पर्दछ । ड्रिलिङ कार्य सकिए पछि केसिङ पाइप (Casing pipe) निकाल्नु पर्दछ ।
- ड्रिलिङ गर्दा कडा चट्टान फेला पर्ने जस्ता अवरोधहरू देखा परेमा सुपरिवेक्षण परामर्शदातासंग परामर्श गरी कसरी अघि बढ्ने भनी विचार गर्नु पर्ने हुन्छ । त्यस्तै गरी जमीन मुनिको पानी पम्प गर्नु पर्ने, खाल्डो भित्र माटो भासिने जस्ता अन्य समस्याहरू पनि आइपर्न सक्दछ ।
- पाइल गाड्ने कार्य शुरु गर्नु अघि सुपरिवेक्षण परामर्शदातासंग सल्लाह गरी निर्माणस्थल वरिपरिका संरचनाहरू र जमीनको अवस्था थाहा पाउन निर्माणपूर्वको सर्वेक्षण कार्य गर्नु पर्दछ ।
- निर्माणस्थलसँग साँध जोडिएका जग्गाधनी वा घरधनीहरुलाई निर्माणपूर्व गरिएको सर्वेक्षण प्रतिवेदनको प्रतिलिपि उपलब्ध गराउनु उपयुक्त हुन्छ, जसले पछि संधियारहरूबाट गरिने गुनासो वा दावी सम्बोधन गर्न मदत गर्दछ । सुपरिवेक्षण परामर्शदाताले पाइल निर्माणकार्यको सूक्ष्म रूपमा अनुगमन गर्नु पर्दछ र कथंकदाचित कुनै अवांछित घटना घट्न सक्ने देखिएमा निर्माणकार्यमा तुरुन्त रोक लगाउनु पर्दछ । यस्तो अवस्था आइपरेमा वैकल्पिक प्रविधि वा थप रोकथामको उपाय अवलम्बन गर्नु पर्ने हुन्छ ।
- ड्रिलिङ कार्य सकिने बित्तिकै तुरुन्तै खाल्डोमा फलामे डण्डीको जाली राखी कंक्रिट ढलान कार्य सम्पन्न गर्नु पर्दछ ।
- पाइल गाड्ने काम सकिने बित्तिकै साइटलाई सफा गरेर थप निर्माणकार्यको लागि तैयारी अवस्थामा राख्नु पर्दछ ।
- स्पेशिफिकेशन अनुसार पाइलको भारवहन क्षमता (Pile Load Test) को परीक्षण गरेर मात्रै थप निर्माणकार्य गर्नु पर्दछ ।

(ग) जग तयार गर्ने कार्य

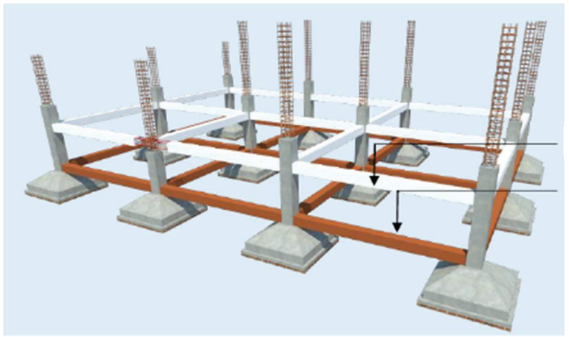
- जग निर्माण गर्ने तहमा खुकुलो वा पुरुवा माटो हुनु हुँदैन । खुकुलो वा पुरुवा माटो भेटिएमा कडा माटोसम्मको गहिराइमा खनेर जग निर्माण गर्नु पर्दछ ।
- संभव भएसम्म सबै जगहरू एउटै लेभलमा पर्ने गरी निर्माण गर्नु पर्दछ ।

- जग निर्माण गर्ने तहमा कमजोर माटो भेटिएमा प्राविधिक परामर्शदातासंग परामर्श गरी माटो प्रबलीकरणका उपायहरु अवलम्बन गर्नु पर्ने हुन्छ ।
- पानी जमेको धापिलो जमीनमा जग निर्माण गर्नु हुँदैन । जग निर्माण गर्नु अघि पानीलाई पम्प गरेर बाहिर फ्याँक्नु पर्दछ । त्यसपछि माटोको अवस्था हेरी ढुंगा सोलिङ वा ग्राभेल भर्ने जस्ता प्रविधि अपनाएर सुक्खा व बलियो सतह तैयार भएपछि जग निर्माण कार्य गर्नु पर्दछ ।

(घ) माटोको भारवहन क्षमता अभिवृद्धि गर्ने विधि

माटोको भारवहन क्षमता अभिवृद्धि गर्न निम्नलिखित उपायहरू अपनाउन सकिन्छ :

- जगको निर्माण गर्ने सतहको गहिराइ बढाएर । तर बढी गहिराइमा जाँदा जमीन मुनिको पानीको सतह भेटिएमा माटोको भारवहन क्षमता नबढ्न सक्ने संभावना रहन्छ ।
- माटोलाई हातले या यान्त्रिक विधिले खँदिर ।
- बालुवा, ग्राभेल, मूरम, फुटाइएको ढुंगा वा इँटको टुका इत्यादि भरेर खँदिपछि पनि भारवहन क्षमता बढ्न जान्छ ।
- कमजोर माटो निकालेर त्यसको साटो बालुवा, ढुंगा, ग्राभेल वा अन्य कडा पदार्थ भरेर खँदिमा पनि भारवहन क्षमता बढाउन सकिन्छ । यो प्रविधि खास गरेर कालो चिम्ट्याइलो माटो (Black Cotton Soil) भएको ठाउँको लागि उपयुक्त हुन्छ ।
- जमीन मुनिको पानीको सतह (Ground Water Table) जमीनबाट कम गहिराइमै छ भने त्यसलाई पम्प गरी वा अन्य प्रविधिबाट निकास गरिएमा भार वहन क्षमता बढ्न जान्छ ।
- काठ वा कंक्रिटको पाइल ठोकेर । यस्तै पाइल ठोकेर निकाल्ने र यसरी निकाल्दा बनेको प्वालमा बालुवा वा कंक्रिट भरेर पनि भारवहन क्षमता बढाउन सकिन्छ । यसबाट माटोको घनत्व बढ्न गई भारवहन क्षमता बढ्न जान्छ ।
- अन्य उच्चस्तरीय प्रविधिहरूमा जगभन्दा मुनिको तहमा सिमेन्ट ग्राउट (Cement grout) पम्प गरेर गर्ने जस्ता प्रविधिहरु पनि छन्, जुन खर्चिलो र प्राविधिक सुपरिवेक्षणमा मात्र गर्नु पर्ने हुन्छ।



४.८ कारिगरीपना (Workmanship)

- गुणस्तरयुक्त निर्माणकार्यका लागि उत्कृष्ट कारिगारीपना अपनाउनु पर्दछ । हामीकहाँ निर्माणकार्यमा मेशीनको प्रयोग भन्दा पनि श्रम बढी प्रयोग हुने हुँदा कारिगरीपना धेरै महत्वपूर्ण हुन आउँदछ । गारो प्रणाली र पिलर प्रणालीको भवन निर्माणको लागि पर्याप्त अनुभव र राम्रो कारिगरीपना भएका निर्माणकर्मीहरुको टोली आवश्यक हुन्छ
- निर्माणकर्ताहरुले राम्रोसंग र समयबद्ध ढंगले आफ्नो काम गर्न सकुन् भन्नाको लागि निर्माणकार्यको हरेक खण्डहरु र तिनीहरुलाई लाग्ने समय प्रष्ट देखिने गरी क्रमबद्ध ढंगल समय तालिका तयार गर्नु पर्दछ ।
- निर्माणकार्य गराउँदा नक्सा र डिजाइन अनुसार फिल्डमा उतार्न सकियोस् भन्नाको लागि त्यस्तो डिजाइन वास्तविक रुपमा निर्माण गर्न सकिने (constructible) र सजिलै बुझ्न सकिने हुनु पर्दछ । यसर्थ यस्तो डिजाइन र नक्सा तयार गर्नमा डिजाइनकर्ता र आर्किटेक्टको अहम भूमिका हुन्छ ।
- डिजाइनकर्ताबाट उत्कृष्ट भवनको डिजाइन तयार गरिएको भएता पनि त्यस अनुसारकै भवन निर्माण गरी मूर्त रूप दिनमा निर्माणकर्मीको कारिगरीपना र सिपको महत्वपूर्ण भूमिका हुन्छ । डिजाइनकर्ताको सोच अनुरूप निर्माणस्थलमा भवन तयार गर्नमा निर्माणकर्मीको भूमिका अहम रहन्छ । भूकम्पीय भारवहन क्षमताको हिसाबले डिजाइनकर्ताले भवनको विन्यास (configuration) र अन्य डिटेलहरु सकेसम्म नियमित (regular) आकारको बनाउनु उपयुक्त हुन्छ ।
- भवन निर्माणकार्यमा प्रयोग हुने संरचनात्मक भागहरुको डिटेलिङ गर्दा संभव भएसम्म एकैनाशको र डिटेलिङ मापदण्ड अनुरूप तयार गर्नु पर्दछ । फरक-फरक संरचनात्मक भागमा फरक फरक डिटेलिङ गरिएमा निर्माणकार्य गर्न झटिलो र खर्चिलो हुन जान्छ ।
- नक्सा र डिजाइन अनुरुप समयबद्ध ढंगले तोकिएको गुणस्तर अनुसारको भवन तयार गर्न डिजाइनकर्ता, आर्किटेक्ट, स्ट्रक्चरल इंजिनियर, सुपरिवेक्षण परामर्शदाता देखि निर्माणकर्मी र निर्माण व्यवसायीसम्म सबैको योगदान रहन्छ ।
- गारो प्रणाली र पिलर प्रणालीका भवनहरुको निर्माणकार्यमा हुनुपर्ने कारिगरीपना तपम्बीलमा उल्लेख गरिएको छ :

४.९ कंक्रिट ढलान कार्य

क) कंक्रिट मिश्रण कार्य

- ढलान कार्यको लागि कंक्रिट तयार गर्दा सिमेन्ट, गिटी, बालुवा र पानीलाई तोकिएको अनुपातमा कंक्रिट मिक्स्चर मेशीनमा राम्रोसंग फेट्नु पर्दछ ।
- कंक्रिट मिक्स्चर मेशीन प्रयोग गर्न नसकिने ठाउँमा हातले फेटेर कंक्रिट मिश्रण तयार गरिन्छ ।

अ) हातले फेटेर कंक्रिट मिश्रण लागि निम्नानुसारको विधि अपनाउनु पर्दछ :

१. कंक्रिट मिश्रण गर्ने ठाउँ बनाउनका लागि सफा ईंटा वा ढुंगा बिच्छ्याई वा फलामे / जस्तापाता ओच्छ्याई पानी नचुहिने समतल सतह तयार गर्नु पर्दछ । ईंट वा ढुंगाको बिचमा मसला खाँदी नचुहिने जोर्नी बनाउनु पर्दछ ।

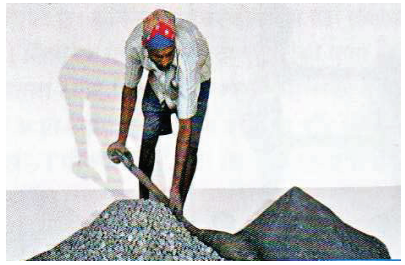


२. पहिलो चरणमा आवश्यक अनुपातको बालुवा मिश्रणस्थलमा एकनास हुने गरी फिजाउनु पर्दछ ।

३. दोस्रो चरणमा आवश्यक अनुपातको सिमेन्ट बालुवाको तहमाथि एकनासको मोटाइमा फिजाउनु पर्दछ । त्यसपछि बालुवा र सिमेन्टको मिश्रण एकैनासको रंगको नदेखिए सम्म राम्री शाभेलले फेट्नु पर्दछ । राम्री फेट्ने काम सम्पन्न भएपछि एकनासको मोटाइ हुने गरी मिश्रणस्थलमा मिश्रणलाई फिजाउनु पर्दछ ।



४. तेस्रो चरण मिश्रणमाथि एकनासको मोटाइ हुने गरी फैलाउनु पर्दछ । गिटीलाई एकै ठाउँमा थुपार्नु हुँदैन। यसपछि शाभेलले गिटी, बालुवा र सिमेन्टको मिश्रणलाई राम्री फेटेर गिटी सबैतिर फैलिएको मिश्रण तयार गर्नु पर्दछ ।



५. चौथो चरणमा मिश्रण सतहमा फेटेर तयार भएको सिमेन्ट, बालुवा र गिटीको मिश्रणलाई एकैनासको हुने गरी फैलाउने र यसरी फैलाइएको मिश्रणको बिच भागमा सानो खाल्डो बनाउने । त्यसपछि आवश्यक अनुपातको पानीको आधा वा तीन चौथाइ भाग बिस्तारै सो खाल्डोमा खन्याउने । अनि बिस्तारै मिश्रणस्थलबाट बाहिर पानी बग्न नदिने गरी पानीसंग बाँकी मिश्रण शाभेलले बिस्तारै फेट्दै जाने । पानीको बाँकी मात्रा सो मिश्रणमा बिस्तारै थप्दै जाने र एकनासको मिश्रण तयार नहुञ्जेल शाभेलले ढलान मसला फेट्दै गर्ने ।



६. सामान्यतया : ३ मिनेटको समयभित्र ढलान मिश्रण तयार गर्न सकिन्छ ।

७. दिनभरीको काम सकिएपछि ढलान मिश्रण तयार गर्ने सतह सफा गरी अर्को दिनको लागि तैयारी अवस्थामा राख्नु पर्दछ ।

आ) कंक्रिट मिक्स्चर मेशीन प्रयोग गरी ढलान मसला तयार गर्दा निम्नानुसारको विधि अपनाउनु पर्दछ :

१. कंक्रिट मिक्सर मशीन ढलान गर्ने ठाउँको नजिकै समतल सतह तयार गरी नहल्लने गरी राख्नु पर्दछ ।

२. कंक्रिट मिक्स्वर मेशीनको ब्लेड र भित्री भाग सफा हुनु पर्दछ । साथै मेशिन चलाउनका लागि पर्याप्त पेट्रोल, मोबिल र मेशीन चिस्यान गर्ने पानी भरिएको हुनु पर्दछ । त्यसपछि मेशीन चालु गर्ने ।

३. पहिलो चरणमा मेशीनको घुम्ने ड्रममा केही भाग पानी खन्याउने ।

४. दोश्रो चरणमा आवश्यक अनुपातको गिटीको आधा भाग खन्याउने ।





५. तेश्रो चरणमा आवश्यक अनुपातको सिमेन्ट खन्याउने ।

६. चौथो चरणमा आवश्यक अनुपातको बालुवा खन्याउने ।

७. पाँचौं चरणमा आवश्यक अनुपातको बाँकी गिटी खन्याउने ।

८. निर्माण सामग्रीहरू क्रमशः खन्याउदै जाँदा आवश्यक अनुपातको पानीको बाँकी भाग बिस्तारै थप्दै जाने । सबै निर्माण सामग्रीहरु खसी सक्दा पानीको बाँकी भाग खन्याइसकेको हुनु पर्दछ ।





९. सामान्यतयाः मिक्स्चर मेशीनको ड्रम २० पटक घुम्दा कंक्रिटको मिश्रण राम्ररी फेटिसकेको हुन्छ । मिक्स्चर ड्रमको घुम्ने गति १६ देखि २० घुमाइ प्रति मिनेट हुन्छ । यसर्थ १ देखि १.५ मिनेटभित्र मिश्रण फेट्ने कार्य सम्पन्न हुन्छ ।

१०. १ मिनेट भन्दा कम समय मात्रै मिश्रण घुमाउँदा पर्याप्त गुणस्तरको मिश्रण तयार हुँदैन । यो समयको गणना सबै सामग्री मिक्स्चर मेशीनमा राखिसकेपछि शुरु हुन्छ । आवश्यक भन्दा धेरै घुमाउँदा पानी बाहिरी सतहमा देखा पर्न सक्दछ ।

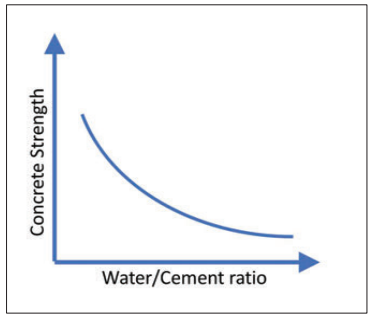
११. दिनभरीको काम सकिए पछि मिक्स्चर मेशीनलाई सफा गर्नु पर्दछ । यसका लागि केही गिटी र पानी राखी ड्रमलाई घुमाउने र पछि मिश्रणलाई फ्याक्ने । त्यसपछि पानी हाली पखाल्ने ।

१२. आंशिक रूपमा वा पूरै रूपमा सेट भइसकेको कंक्रिट निर्माणकार्यमा प्रयोग गर्नु हुँदैन ।

(ख) पानी र सिमेन्टको अनुपात :

- कंक्रिटको भारवहन क्षमताको लागि कंक्रिट मिश्रणमा प्रयोग गरिने पानी र सिमेन्टको अनुपात सबैभन्दा महत्वपूर्ण तत्व हो । कंक्रिट तयार गर्दा पानी अत्यधिक मात्रामा राख्दा कंक्रिट फेट्न र खन्याउन सजिलो हुन्छ तर कंक्रिटको भारवहन क्षमतामा कमी आउँदछ । यसर्थ कंक्रिट मसला तयार गर्दा त्यसमा प्रयोग गरिएको सिमेन्टको अनुपातमा राखिने पानीको मात्रा प्राविधिकबाट तोकिएको स्पेशिफिकेशन अनुसार भए-नभएको विषयमा विशेष ध्यान दिनु पर्दछ ।

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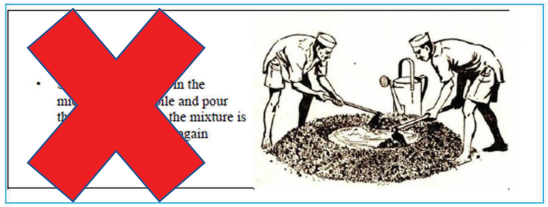


- हातबाट सामान्य कंक्रिट मिश्रण (nominal concrete mix) तयार गर्दा राख्नुपर्ने पानीको मात्रा तलको तालिकामा देखाइएको छ । सामान्य कंक्रिट मिश्रण तयार गर्ने कार्य M20 वा सो भन्दा कम ग्रेडको कंक्रिट तयार गर्न मात्र प्रयोग गर्नु पर्दछ ।

सामान्य कंक्रिट मिश्रण (nominal concrete mix) मा पानीको मात्रा

क्र.सं.	कंक्रिट ग्रेड (मोटामोटी)	सिमेन्ट ब्याग	बालुवा	गिट्टी	पानी लिटरमा
१.	M15	१	२	४	३२
२.	M20	१	१.५	३	३०

- डिजाइन मिक्स (design mix) प्रविधिबाट कंक्रिट तयार गर्दा आवश्यक पानीको मात्रा कंक्रिट बनाउन प्रयोग गरिने बालुवा, गिट्टी, सिमेन्ट र आवश्यक ग्रेडमा भर पर्दछ । यसर्थ यसको लागि प्रयोगशालामा ट्रायल मिक्स (trial mix) तयार गर्न लगाई परिक्षणबाट कंक्रिटको भार वहन क्षमता वा ग्रेड यकीन भए पछि मात्रै आवश्यक पानीको मात्रा यकीन हुन्छ । त्यसै अनुरूप डिजाइन मिक्सको कंक्रिट तयार गर्ने कार्य गर्नु पर्दछ । सामान्य अवस्थामा कंक्रिट मिश्रण तयार गर्नका लागि हातले फेट्ने विधि प्रयोग गर्न वर्जित गरिएको छ । यसर्थ घरधनीले निर्माणकर्मी र निर्माण व्यवसायीलाई कंक्रिट मिक्स्चर मेशीन प्रयोग गरेर मात्रै कंक्रिट मसला तयार गर्न लगाउनु पर्दछ ।



- तर ग्रामीण नगरपालिकाका दुर्गम र पहाडी क्षेत्रमा हातले फेट्ने विधि प्रयोग गरी कंक्रिट ढलान मसला तयार गर्न दिन सकिन्छ ।

(ग) कंक्रिट ढलान मसला राख्ने र खाँद्ने कार्य

- ढलान कार्यको लागि जग, भित्ता, पर्खाल, पिलर, बिम, स्ल्याब इत्यादिको फर्मामा कंक्रिट खन्याउँदा १.५ मीटरभन्दा बढी उचाइबाट खन्याउनु हुँदैन । त्यस्तै गरी पहिले कंक्रिट खन्याइसकेको वा राखिसकेको भागमाथि नयाँ ताजा कंक्रिट राख्दा पुरानो कंक्रिट गरिएको समय ३० मिनेट भन्दा बढी हुनु हुँदैन । ३० मिनेट भन्दा बढी अन्तरालमा कंक्रिट ढलान कार्य गर्नुपर्ने भएमा निर्माण जोर्नी (Construction Joint) राखेर मात्रै गर्नु पर्दछ ।
- कंक्रिट खन्याउने वा राख्ने र खाँद्ने कार्य सुपरिवेक्षण परामर्शदाताको प्रत्यक्ष निगरानीमा मात्रै गर्नु पर्दछ ।
- कंक्रिट मिश्रण तयार गरिसकेपछि Slump Test नियमित रूपमा गरी पानीको मात्रा चाहिएको गिलोपना (consistency) अनुसार भए नभएको परिक्षण गर्नु पर्दछ ।





- कंक्रिट राखिसकेपछि ढलान गरिएको पूरै मोटाइमा खाँदिने गरी खाँद्ने कार्य गर्नु पर्दछ । फर्माको सबै कुनामा र फलामे डण्डीको वरिपरि कंक्रिट राम्ररी बस्ने गरी खाँद्ने कार्य गर्नु पर्दछ । साँगुरो ठाउँमा समेत कंक्रिट खाँदिनु पर्ने कुरामा विशेष ध्यान दिनु पर्दछ । कंक्रिट खन्याउँदा कंक्रिटको तल्लो र माथिल्लो तहबिच बन्धन बस्ने गरी खाँद्नु पर्दछ । खाँद्ने कार्यको लागि निडल भाइब्रेटर (needle vibrator) उपयुक्त हुन्छ र सकेसम्म यसको प्रयोग गर्नु पर्दछ । भाइब्रेटर उपलब्ध हुन नसक्ने अवस्थामा मात्रै डण्डी र काठको दलिनको टुक्रा प्रयोग गर्नु पर्दछ ।

(घ) क्युरिड गर्ने कार्य:

- ढलान कार्य अन्तर्गत फर्मामा कंक्रिट खन्याई सकेपछि कंक्रिट सेट वा कडा हुने शुरुको प्रक्रियाको लागि आवश्यक आर्द्रता कायम गर्न कंक्रिट बाहिरी सतह सुक्न नदिने व्यवस्था गर्नु पर्दछ । बाहिरी सतहमा चिस्यान कायम गरिएन भने सतहमा चिरा पर्ने र गुणस्तरमा ह्रास आउने समस्या देखा पर्न सक्दछ ।
- कंक्रिट ढलान पछि बाहिरी सतह भिजाइ राख्ने वा भएको चिस्यान हट्न नदिने कार्यलाई क्युरिङ भनिन्छ । कम्तीमा पनि १४ दिनको अवधिसम्म कंक्रिटको क्युरिङ गर्नु पर्दछ ।

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- ढलान कार्यको लगतै कंक्रिट अलिकति कडा हुन थाल्ने बितिकै क्युरिङ गर्ने कार्य शुरु गरिहाल्नु पर्दछ ।
- क्युरिङको लागि कंक्रिट गरिएको भागको बाहिरी सतहलाई पानी नछिर्ने/उड्न नदिने बनाउन प्लाष्टिकले छोप्नु पर्दछ । यस्तो तहलाई हावाले नउड्ने गरी तथा त्यसबाट पानी नउड्ने गरी कंक्रिट सतहसँग बांधेर राख्नु पर्दछ ।
- पानी नछिर्ने/उड्न नदिने प्लाटिक तहको व्यवस्था गर्न नसकिएमा कंक्रिट सतह माथि पानी जमाएर वा कंक्रिट सतहलाई भिजाएर लगातार चिस्यान कायम भई राख्ने व्यवस्था गर्नु पर्दछ । यसको लागि पानीको फोहोराले छर्किने वा जुट बोराले बेरेर पानीले भिजाउने व्यवस्था गर्न सकिन्छ ।

(घ) कंक्रिट गरिएको सतह मर्मत गर्ने कार्य :

- क्युरिङ कार्य सम्पन्न भएर फर्मा निकाले पछि ढलान गरिएको कंक्रिट सतहमा कुनै खराबी छ-छैन भन्ने सम्बन्धमा सुपरिवेक्षण परामर्शदाताबाट तुकन्त निरीक्षण गराउनु पर्दछ । फर्मा निकालेको दुई घण्टाको अवधी भित्रै यस्तो निरीक्षणकार्य सम्पन्न गरिसक्नु पर्दछ ।
- फर्मा निकालेपछिको निरीक्षण कार्यको दौरानमा कंक्रिट सतहमा खाल्टो, प्वाल वा खाली भाग (honey comb) वा कुनाहरु चोइटिएको देखिएमा सिमेन्ट र बालुवाको मसला तयार गरी यस्ता खाली भाग वा कुनाको मर्मत गर्नुपर्दछ ।



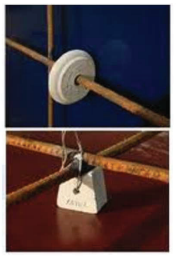


- तर निरीक्षण कार्यको सिलसिलामा कंक्रिट सतहमा वा जोर्नीमा निकै ठूलो भागमा खाली भाग वा प्वाल देखिएमा अथवा फलामे डण्डी समेत देखिने गरी खराबी देखिएको विस्तृत मर्मत कार्य गर्नु पर्दछ । यसको लागि सुपरिवेक्षण परामर्शदाताको प्राविधिक परामर्शमा Injection Grouting वा

shot–creting जस्ता प्रविधि अपनाउनु पर्दछ । धेरै भागमा खराबी देखिएमा ढलान गरिएको भाग फुटाई पुनः नयाँ ढलान गर्नु पर्ने अवस्था आउन सक्दछ ।

(च) कंक्रिट ढलान कार्यमा आवश्यक फलामे डण्डी र फर्माबिन आवश्यक दूरी कायम राख्ने कार्य

- कंक्रिट ढलान गर्दा कंक्रिटको बाहिरी सतह र कंक्रिटभित्र राखिने फलामे डण्डी बिच तोकिएको दूरी कायम गर्नु पर्दछ, जसलाई कंक्रिट कभर (concrete cover) भनिन्छ ।
- तोकिएको कंक्रिट कभर वा अन्तर कायम गर्नुको उद्देश्य फलामे डण्डीलाई बाहिरी वातावरणीय असरबाट रक्षा गर्नु हो । कंक्रिट गरिएको भाग माटोमा भएको चिस्यान वा रसायनको संपर्कमा आएमा, हावामा भएको नूनिलोपना भएको वा नभएको आर्द्रताको सम्पर्कमा आएमा फलामे डण्डीमा चाँडै खिया लाग्न सक्दछ, जसबाट कंक्रिटमा पाप्रा निस्किने समस्या उत्पन्न हुन्छ । त्यस्तै गरी आगलागि भएको अवस्थामा तातिएपछि डण्डी बांगीन गई पिलर, बिम इत्यादि लच्किने र चर्किने हुन जान्छ । यसर्थ पर्याप्त कंक्रिट कभर कायम राख्ने कुरामा ढलान गर्दा ध्यान दिनु पर्ने हुन्छ । यसको लागि सुपरिवेक्षण परामर्शदाताबाट डण्डी राखिएको र बाँधिएको भागहरुको निरीक्षण गराई सबै भागमा तोकिए अनुसारको कंक्रिट कभर राखिएको यकीन भएपछि मात्रै ढलान कार्य गर्नु पर्दछ । कंक्रिट कभर राख्नुको अर्को उद्देश्य फलामे डण्डी र कंक्रिट बिचको जोडाइ मजबूत बनाउनु पनि हो । कंक्रिट कभरको नाप कंक्रिटको बाहिरी सतहबाट फलामे चुरी वा रिङ सम्म मापन गरिन्छ ।





- आर.सि.सि. ढलानकार्यमा सामान्यतया : निम्नानुसारको कंक्रिट कभर कायम हुने गरी डण्डी बाँध्नु पर्दछ ।

  स्ल्याब ढलान कार्य : कम्तीमा १५ मिमि वा फलामे डण्डीको व्यास मध्ये जुन धेरै छ, सोही अनुसार

  बिम ढलान कार्य : कम्तीमा २५ मिमि वा फलामे डण्डीको व्यास मध्ये जुन धेरै छ, सोही अनुसार

  पिलर ढलान कार्य : कम्तीमा ४० मिमि वा फलामे डण्डीको व्यास मध्ये जुन बढी छ, सोही अनुसार

  जग ढलान कार्य : कम्तीमा ५० मिमि

४.१० आर. सि. सि. संरचनामा फलामे डण्डी राख्ने विधि

- आर.सि.सि. ढलान कार्यमा प्रयोग गरिने विभिन्न साइजका डण्डीहरुमा खियाको पत्र, तेल, ग्रिज, अलकत्रा, रंगरोगन, माटो, अन्य जैविक वा अजैविक पदार्थहरू, इत्यादि नटाँसिएको भई सफा सतह भएको हुनु पर्दछ। ढलानमा प्रयोग गर्नु अघि आवश्यकता अनुसार सफा गरेर मात्रै त्यस्तो डण्डीहरुलाई फर्माभित्र राख्ने कार्य गर्नु पर्दछ ।
- स्ट्रक्चरल नक्सामा देखाइए अनुसारको नाप अनुसार हुने गरी फलामे डण्डी बंग्याउने र काट्ने कार्य गर्नु पर्दछ । निर्माण व्यवसायीले स्ट्रक्चरल नक्सामा देखाइए अनुसार फलामे डण्डी राख्नका लागि डण्डीको सूची वा तालिका (bar schedule) तयार गर्नु पर्दछ। यस्तो तालिकाको आधारमा घरधनीले

फलामे डण्डीको आवश्यक तौल यकीन गरी बजारबाट खरीद गरी निर्माणस्थलमा आपूर्ति गर्नु पर्दछ । फलामे डण्डी स्ट्रक्चरल नक्सा अनुसार फर्माभित्र राख्दा यथास्थानमा बसोस् भन्नाको लागि बाँध्ने वार (binding wire) ले डण्डीहरुलाई एक आपसमा बाँध्नु पर्दछ । बाँध्ने तार ग्याल्भानाइज गरिएको र २० गेज मोटाइ भएको हुनुपर्दछ ।

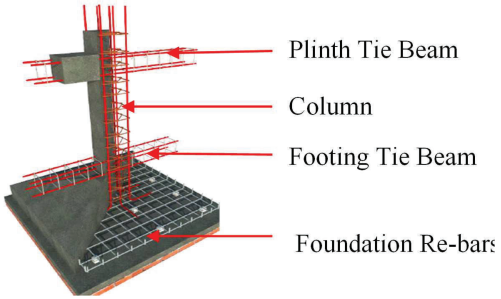




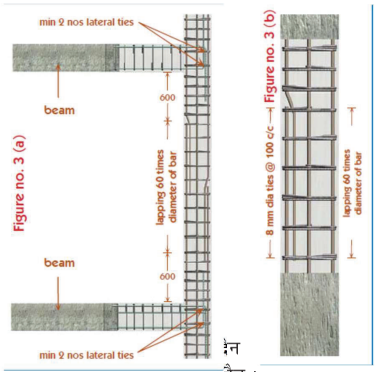
- फर्माभित्र फलामे डण्डी राख्दा डण्डी र कंक्रिटको बाहिरी सतह बीच कायम गर्नुपर्ने कंक्रिट कभर राख्नका लागि स्पेशर वा कभर ब्लक प्रयोग गर्नु पर्दछ । निर्माणस्थलमा नै कभर ब्लक तयार गरेर पनि ढलानकार्यमा प्रयोग गर्न सकिन्छ । साथै हाल बजारमा रेडिमेड वा तैयारी कभर ब्लक पनि किन्न पाइन्छ । कंक्रिट ढलान कार्य गर्दा फर्मामा राखिएको फलामे डण्डीहरु स्ट्रक्चरल नक्सामा देखाइए अनुसारको अवस्थितिमा रहेको र कंक्रिट खन्याउँदा र खोंदा नखल्बलिने र नसर्ने गरी अड्याइएको कुरामा यकीन गरिसकेपछि मात्रै ढलान कार्य गराउनु पर्दछ ।

(क) पिलरको लागि फलामे डण्डी ठड्याउने कार्य

- यसका लागि स्ट्रक्चरल नक्सा अनुसार जगको पि.सि.सि. सतह माथि पिलरको अवस्थितिहरू चिन्ह लगाउनु पर्दछ ।
- त्यसपछि हरेक पिलरको लागि आवश्यक फलामे डण्डीहरू नक्सा अनुसार काटेर तोकिएको आकारमा बंग्याई रिङ वा चूरी सहित बाँधेर तयार गर्नु पर्दछ र तोकिएको अवस्थितिमा जगको जालीमाथि उभ्याउनु पर्दछ । यसरी उभ्याउनका लागि पर्याप्त संख्यामा टेको र डोरीहरू प्रयोग गर्नु पर्दछ ।



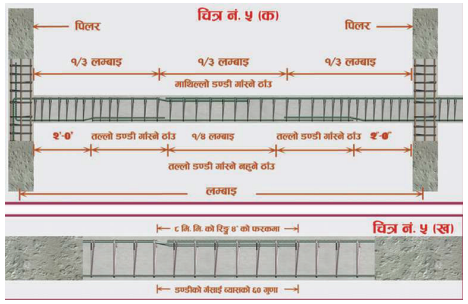
- पिलरको लागि डण्डी काट्दा डण्डी गाँस्ने भाग भूकम्पीय प्रतिरोधात्मक हिसाबले हरेक तल्लाको मध्य उचाइमा राख्नु पर्ने र यसरी गाँस परेको भागमा एकै स्थानमा ५०% भन्दा बढी संख्यामा डण्डीहरु गाँस्न नहुने कुरामा विशेष ध्यान दिनु पर्दछ । यसर्थ पिलरको लागि डण्डी काट्दा हरेक पिलरमा केही डण्डीहरू बढी लामो र केही डण्डीहरु छोटो हुने गरी काट्नुपर्ने हुन्छ ।



- पिलरमा डण्डीको र [illegible] ईन वाट तल वा भुई भन्दा माथि निम्नलिखित [illegible] गर्नु हुदैन ।
  - ❖ पिलरको मोटाइ वा चौडाइ मध्ये ठूलो नाप, वा
  - ❖ पिलरमा जोडिएको बिमको तल्लो सतहबाट भुईंसम्मको दूरीको १/६ भाग, वा
  - ❖ ४५० मि.मि. मध्ये जुन सबैभन्दा बढी छ ।
- पिलरमा डण्डीको गाँस हरेक तल्लाको बिच भागमा मात्रै गर्नु पर्दछ ।
- पिलरको ठाडो फलामे डण्डी गाँस गरेको पूरै भागमा चूरी वा रिङहरु बाँध्नु पर्दछ । चूरीको ग्याप १५० मिमि भन्दा बढी हुनु हुदैन ।
- डण्डीको गाँस पर्ने भागको लम्बाइ ठाडो डण्डी मध्ये सबैभन्दा मोटो डण्डीको Development length भन्दा कम हुनु हुदैन ।

(ख) बिमहरुमा फलामे डण्डी राख्ने विधि :

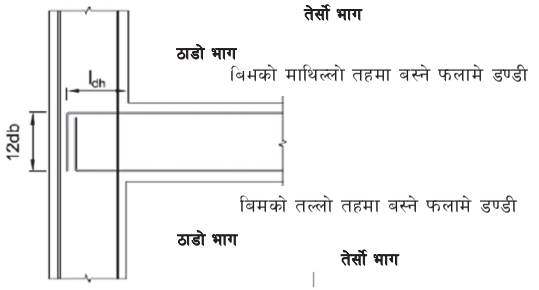
- पिलर प्रणालीको आर.सि.सि. संरचनामा हरेक बिममा बिमको माथिल्लो तथा तल्लो भागमा कम्तीमा पनि दुईवटा डण्डीहरु बिमको एक छेउ देखि अन्तसम्म निरन्तर हुने गरी राखिएको हुनु पर्दछ ।



- स्ट्रक्चरल नक्सा अनुसार बिममा माथिल्लो तथा तल्लो भागमा थप संख्यामा फलामे डण्डीहरु राख्नु पर्दछ ।
- बिम र पिलरको जोर्नी नगीच राखिने थप डण्डीहरु बिमको स्थानको एक चौथाइ दूरीसम्म बिमभित्र development length को लम्बाइ पुग्नेगरी राख्नु पर्दछ । यो दूरीको मापन पिलरको भित्री मोहडाबाट गर्नु पर्दछ ।
- बिममा राखिने रिङ वा चूरीको डण्डीको व्यास न्यूनतम ८ मिमि हुनु पर्दछ । पिलरको भित्री मोहडाबाट बिमको मोटाइको दुई गुणा दूरीसम्म बढीमा बिमको उचाइको एक चौथाइ, रिङको डण्डीको व्यासको आठ गुणा वा १०० मि.मि. दूरी मध्ये जुन कम छ, सो अनुसार र बिमको बाँकी भित्रीखण्डमा रिङहरु बिमको उचाइको आधा वा १५० मि.मि. मध्ये जुन कम छ, सो अनुसारको दूरीमा हुने गरी राख्नु पर्दछ । बिमको माथिल्लो भागमा राखिएको डण्डी बिम र पिलरको जोर्नी नगीच राख्नु हुँदैन । यस्तो गाँस बिमको मध्य एक तिहाइ खण्डमा पर्ने गरी राख्नु पर्दछ ।
- बिमको डण्डीको गाँस गर्दा गाँसमा पर्ने भागको लम्बाइ development length (मोटामोटी फलामे डण्डीको व्यासको ६० गुणा) भन्दा कम हुनु हुँदैन । गाँस परेको भागमा राखिएका रिङ वा चूरीहरु बढीमा १५० मिमि भन्दा टाढाको अन्तरमा नहुने गरी राख्नु पर्दछ ।
- बिमको तल्लो भागमा राखिने डण्डीहरुको जोर्नी वा गाँस बिमको मध्य छ भागमा र साथै बिम पिलर जोर्नीको नगिचै पर्नु हुँदैन ।

(ग) बिम र पिलरको जोर्नी

- बिममा राखिने फलामे डण्डीहरु पिलरका बाहिरी ठाडो डण्डीहरुको भित्र पार्ने गरी राख्नु पर्दछ ।
- बिम र पिलरको बाहिरी जोर्नीमा बिमको माथिल्लो र तल्लो तहमा बस्ने फलामे डण्डीहरुका अन्तिम भाग क्रमश L-आकारमा माथि र तल बंग्याएर राख्नु पर्दछ । बिमको तल्लो तहमा पर्ने डण्डीहरुको टुप्पा L-बनाएर माथितिर फर्काएर राख्नु पर्छ भने माथिल्लो तहका डण्डीहरुको अन्तिम टुप्पा L-आकारमा बंग्याएर तलतिर फर्काएर राख्नु पर्दछ ।



- बिम-पिलरको बाहिरी जोर्नीभित्र पर्ने बिमको L-आकारमा बंग्याइएको फलामे डण्डीको समतल भागको लम्बाइ तलको तालिकामा देखाइएको नाप अनुसार अनिवार्य कायम गर्नु पर्ने भएकोले बाहिरी पिलरको सोही दिशाको मोटाइ न्यूनतम पनि तपसीलमा देखाएको तालिका अनुसार पुग्ने हुनु पर्दछ । साथै बिम-पिलरको बाहिरी जोर्नीभित्र पर्ने बिमको L-आकारमा बंग्याइएका भागको ठाडो खण्डको लम्बाइ कम्तीमा पनि बिमको डण्डीको व्यासको १२ गुणा नापको हुनु पर्दछ ।

बिम-पिलरको बाहिरी जोर्नीभित्रको बिमको डण्डीको तेर्सो भागको न्यूनतम लम्बाइ

कंक्रिटको ग्रेड	डण्डीको ग्रेड	जोर्नीभित्रको बिमका डण्डीको तेर्सो भागको न्यूनतम लम्बाइ (L_{dh})
M20	Fe 500	२३.०५ X बिमको डण्डीको व्यास
M20	Fe 415	१९.१३ X बिमको डण्डीको व्यास
M25	Fe 500	२०.६२ X बिमको डण्डीको व्यास
M25	Fe 415	१७.११ X बिमको डण्डीको व्यास

बिम-पिलरको बाहिरी जोर्नीमा पिलरको न्यूनतम मोटाइ = L_{dh}+L_{dc}

L_{dh} =जोर्नीभित्रको बिमका डण्डीको तेर्सो भागको न्यूनतम लम्बाइ

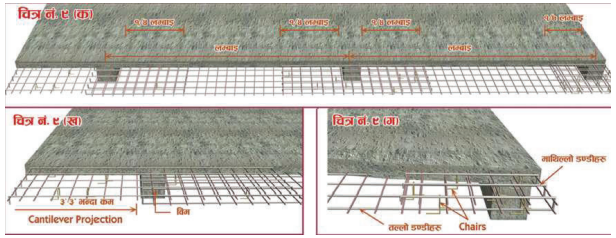
L_{dc} = पिलरमा डण्डीलाई दिनुपर्ने न्यूनतम कभर

L_{db} =जोर्नीभित्रको बिमका डण्डीको ठाडो भागको न्यूनतम लम्बाइ =१२x डण्डीको व्यास

- बिम र पिलरको जोर्नीमा बिमको तल्लो र माथिल्लो सतहहरुमा २/२ वटा फलामे डण्डीहरु गएको हुनुपर्दछ ।

(घ) आर.सि.सि. स्ल्याबमा फलामे डण्डी राख्ने विधि

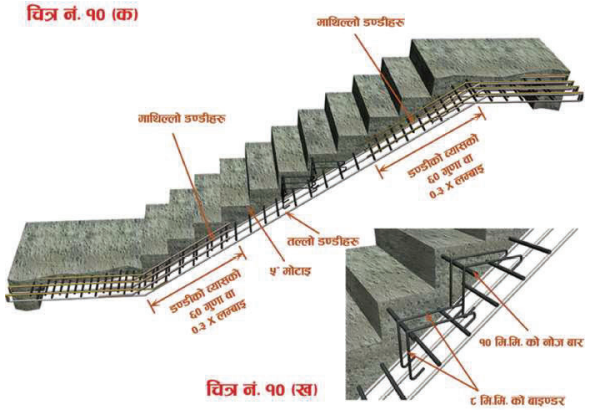
- ३ मीटर X ४ मीटर साइजका आर. सि. सि. स्ल्याबहरूमा तल्लो सतहमा दुवै दिशामा र माथिल्लो सतहमा बिमको आसपासमा दुवै दिशामा आठ मि.मि. व्यासका फलामे डण्डीहरु १५० मिमिको दूरीमा राख्दा पर्याप्त हुन्छ । तर ठूलो साइजका स्ल्याबमा तथा क्याण्टीलिभर स्ल्याबमा ८ मि.मि. भन्दा बढी व्यासका डण्डी प्रयोग गर्नु पर्ने र १५० मिमि भन्दा कम दूरीमा राख्नु पर्ने हुन सक्दछ । यस्ता ठूलो साइजका स्ल्याबमा तथा क्याण्टीलिभर स्ल्याबमा फलामे डण्डीहरु राख्नका लागि प्राविधिकको सल्लाह अनिवार्य रुपमा लिनु पर्दछ ।

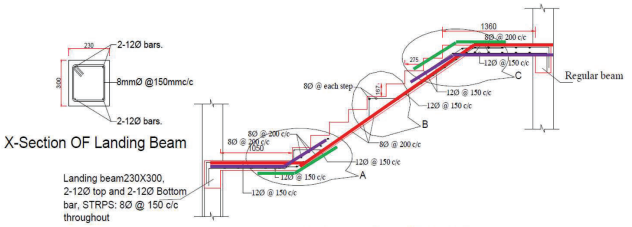


- स्ल्याबको माथिल्लो तहमा राखिने डण्डीहरु यथास्थानमा अड्याउनका लागि १० मिमि व्यासको डण्डीहरुको कुर्ची (chair) बनाएर राख्नु पर्दछ ।
- फर्मामाथि ल्याबको तल्लो तहमा राखिने डण्डीहरुलाई यथास्थानमा र पर्याप्त कभर पुग्ने गरी राख्नका लागि कम्तीमा १५ मि.मि मोटाइको कभर ब्लक माथि अड्याएर राख्नु पर्दछ । कभर ब्लक फुस्किन र सर्न नदिनका लागि कभर ब्लकलाई स्ल्याबको तल्लो सतहको फलामे डण्डीसँग बाँधेर राख्नु पर्दछ ।

(ङ) आर.सि.सि. भऱ्याङको निर्माण

- आर.सि.सि. भऱ्याङ निर्माण गर्दा भऱ्याङको स्ल्याबको मोटाइ कम्तीमा १२५ मि.मि. हुनु पर्दछ । भऱ्याङको लम्बाइ अनुसार भऱ्याङको स्ल्याबको मोटाइ बढी राख्नु पर्ने पनि हुन सक्दछ र यसका लागि प्राविधिकको सल्लाह लिनु पर्दछ ।
- ल्याण्डिङ स्ल्याब नजिकै स्लोप स्ल्याबमा राखिने डण्डीहरु राख्दा विशेष ध्यान पुऱ्याउनु पर्दछ । समतल स्ल्याबबाट स्ल्योप स्ल्याब वा स्लोप स्ल्याबबाट समतल स्ल्याब शुरु हुने स्थानमा तल्लो सतहमा भएका डण्डीहरुलाई बंग्याइ माथिल्लो सतहमा र माथिल्लो सतहमा भएका डण्डीहरुलाई बंग्याएर तल्लो सतहमा पर्ने गरी तलको चित्रमा देखाइए जस्तै गरी राख्नु पर्दछ ।





Reinforcement detailings in Staircase
Use Fe415 or Fe 500 Grade Steel

४.११ फर्मा बाँध्ने र...

- आर.सि.सि. ढलान कार्यको लागि स्ट्रक्चरल नक्सामा देखाइए अनुसार बिम, पिलर, स्ल्याब, पर्खाल, छज्जा, इत्यादिका लागि आवश्यक पर्ने फर्मा ठिक र निश्चित आकार तथा नापमा जडान गर्नु पर्दछ । फर्मा राख्दा वा अड्याउँदा फर्मामा प्वाल पर्ने वा तारले छेक्ने गरी जडान गर्नु हुँदैन ।
- ढलान कार्यको सिलसिलामा कंक्रिट खन्याउँदा फर्मा बाँगिने वा लच्किने हुनु हुँदैन । यस्तो हुन नदिन फर्माको लागि प्रयोग गरिने काठको फल्याक/प्लाइवुड वा फलामे पाता पर्याप्त मोटाइको हुनुपर्दछ । साथै फर्मालाई अड्याउने काठ वा फलामको टेको पर्याप्त संख्यामा र नजीक दूरीमा राम्ररी अडिने गरी जडान गरिएको हुनु पर्दछ । ठाडो उभ्याइएका टेकोहरुलाई नहल्लिन दिनका लागि तेर्सो दलिनहरुले समेत बाँध्नु पर्दछ ।
- स्ल्योपमा स्ल्याब ढलान गर्नु परेमा स्ल्योपको फेरबाट कंक्रिट खन्याउँदै बिस्तारै माथितिर ढलान गर्दै लग्नु पर्दछ । १:४ भन्दा बढी स्लोप भएको खण्डमा माथिल्लो सतहमा समेत फर्मा राखेर मात्रै ढलान गर्नु पर्दछ ।

(१) फर्माको सतहमा कोटिङ गर्ने कार्य

- कंक्रिट ढलानका लागि प्रयोग हुने फर्माको कंक्रिटसंग संपर्कमा आउने सतहमा Form oil वा अन्य तैलीय पदार्थ दलेर कंक्रिटसंग नटाँसिने बनाउनु पर्दछ । नटाँसिन दिनका लागि प्रयोग गरिने यस्तो तैलीय पदार्थ पानीमा घुल्ने वा पखालिने हुनु हुँदैन र यसले कंक्रिटको सेट हुने वा जम्ने प्रक्रियामा नकारात्मक असर पुऱ्याउने खालको हुनु हुँदैन । साथै यी तैलीय पदार्थलाई फलामे डण्डीको सम्पर्कमा आउन दिनु हुँदैन ।

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(२) फर्मा खोल्ने कार्य

- कंक्रिट जम्ने वा सेट हुने कार्य सम्पन्न भएपछि कंक्रिट संरचनामा झट्का वा अन्य किसिमको क्षति नपुग्ने गरी सावधानीपूर्वक फर्मा खोल्नु पर्दछ। फर्मा खोल्दा पहिले कुन भागको फर्मा खोल्ने भन्ने विषयमा विचार पुऱ्याएर मात्र खोल्नु पर्दछ। **कंक्रिट ढलान गरिएको अवधीबाट शुरु भई तापक्रम, हावाको आर्द्रता, क्युरिङको अवधी र सिमेन्टको प्रकार अनुसार निश्चित अवधी सम्पन्न भई सेट भएको कंक्रिटले पर्याप्त भार वहन गर्न सक्ने भएको सुनिश्चितता भइसके पछि मात्रै फर्मा खोल्ने कार्य गर्नु पर्दछ**। साथै स्ल्याब र बिमहरूमा शुरुको अवधीमा स्पानको बिचमा राखिएको टेको (**props**) लामो अवधीसम्म राख्नु पर्दछ। तलको तालिकामा **सामान्य तापक्रम र अवस्थाका लागि** फर्मा खोल्ने न्यूनतम अवधी देखाइएको छ :

फर्मा राख्नु पर्ने न्यूनतम अवधी (सामान्य तापक्रम र अवस्थाका लागि)*

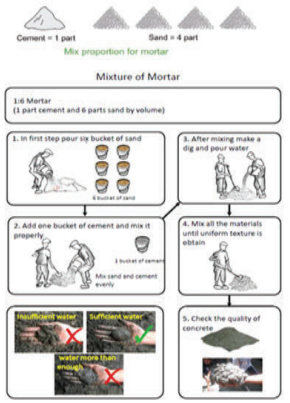
फर्माको किसिम	फर्मा राख्नु पर्ने न्यूनतम अवधी	
	ओ.पि.सि. सिमेन्ट प्रयोग गरिएको कंक्रिट	पि.पि.सि. सिमेन्ट प्रयोग गरिएको कंक्रिट
क) बिम, पर्खाल र पिलरको ठाडो साइडका फर्माहरु	१६-२४ घण्टा	१६-२४ घण्टा
ख) स्ल्याबको तल्लो सतहका फर्माहरु (तर ठाडो टेकोहरु (props) राखी राख्नु पर्ने)	३ दिन	७ दिन
ग) बिमको तल्लो सतहका फर्माहरु (तर ठाडो टेकोहरु (props) राखी राख्नु पर्ने)	७ दिन	१४ दिन
घ) स्ल्याबको ठाडो टेकोहरु (props) ४.५ मी सम्मको स्पान ४.५ मी भन्दा बढीको स्पान	 ७ दिन १४ दिन	 १० दिन १४ दिन
ङ) बिमको ठाडो टेकोहरु (props) ६ मी सम्मको स्पान ६ मी भन्दा बढीको स्पान	 १४ दिन २१ दिन	 १४ दिन २१ दिन

*स्रोत : IS 456: 2000 Code of Practice for Plain and Reinforced Concrete published by Bureau of Indian Standards (BIS)

४.१२ ईंटाको गारो लगाउने कार्य

क) गारोको लागि मसला तयार गर्ने कार्य :

सामान्य ईंटाको गारो लगाउनका लागि वा जोड़ाइका लागि १:४ अनुपात (१ भाग सिमेन्ट, ४ भाग बालुवा) को मसला तयार गर्नु पर्दछ। गारोको बाहिरी भागमा प्लास्टर गर्नका लागि कम्तीमा १:६ (१ भाग सिमेन्ट, ६ भाग बालुवा) अनुपातको सिमेन्ट मसला तयार गर्नु पर्दछ।



ख) कंक्रिट ढलान :

ईंटाको गारो लगाउँदा तेर्सो बन्धन या ब्याण्ड, लिन्टेल इत्यादिमा गरिने कंक्रिट ढलानका लागि कम्तीमा १:१.५:३ (१ भाग सिमेन्ट, १.५ भाग बालुवा र ३ भाग गिट्टी) अनुपातको कंक्रिट मसला तयार गरिन्छ। कंक्रिट तयार गर्न प्रयोग गरिने पानीको मात्रा १ बोरा सिमेन्टको लागि बढीमा ३० लीटरसम्म हुने गरी प्रयोग गर्नु पर्दछ। ढलान कार्य सम्पन्न भएपछि कंक्रिटलाई कम्तीमा १४ दिनसम्म क्युरिङ गर्नु पर्दछ। सिमेन्ट मसला वा कंक्रिट मसलामा पानी मिसाइसकेपछि ४५ मिनेटको समयावधीभित्र प्रयोग गरिसक्नु पर्दछ।

(ग) ईंटा भिजाउने कार्य :

ईंटाको गारो बनाउनका लागि ईंटा प्रयोग गर्नु अघि ईंटालाई कम्तीमा पनि एक घण्टासम्म पानीमा डुबाएर राखी भिजाउनु पर्दछ। गारो लगाउनु अघि ट्यांकीबाट ईंटा झिकी यसको बाहिरी सतह सुक्न दिनु पर्दछ। सतह सुख्खा भएका यस्ता ईंटाहरू माटो र अन्य फोहर पदार्थको संपर्कमा नआउने गरी सफा सतहमाथि खात लगाएर राख्नु पर्दछ र क्रमशः गारो लगाउने कार्यमा प्रयोग गर्नु पर्दछ।

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ग) गारो लगाउने कार्य :

गारो लगाउँदा गारोको लाइन र लेभल मिल्ने गरी लगाउनु पर्दछ । गारोका लागि ईंटा राख्दा तेर्सो सतहमा सिमेन्ट मसला राखी गारोको पूरा मोटाइमा फैलाउनु पर्दछ । यसका साथै दुई ईंटाहरूको बिचको ठाडो जोर्नीमा समेत मसला भर्नु पर्दछ । हरेक सलमा मसलाको मोटाइ १० देखि १२ मिमि भन्दा बढी हुनु हुँदैन । मसलामा ईंटा ओच्छ्याइ सकेपछि ईंटाको माथिल्लो सतहको लेभल मिलेको हुनुपर्दछ । खोपिल्टो भएको ईंटा प्रयोग गर्दा खोपिल्टो भएको ईंटाको सतह माथि पर्ने गरी राख्नु पर्दछ र यस्तो खोपिल्टोलाई सिमेन्ट मसलाले भर्नु पर्दछ । गारोमा ईंटा लगाउदा ठाडो जोर्नीहरु हरेक सलमा माथिदेखि तलसम्म एउटै लाइनमा निरन्तर हुने गरी लगाउनु हुदैन । गारोका लागि सिमेन्ट मसलामा ईंटाको जोडाइ गरिसके पछि गारोको बाहिरी सतहमा देखिने जोर्नीहरूमा कर्नीले कोची १५ मि.मि. सम्म गहिरो प्वाल हुने गरी सतह तयार गर्नुपर्दछ, जसले गर्दा बाहिरी सतहमा प्लाष्टर राम्ररी जोडिन सकोस् ।

घ) ईंटाको गारोको बचावट र क्युरिङ कार्य :

सिमेन्ट मसलाको जोडाइ सेट भई गारोले पर्याप्त भारवहन क्षमता प्राप्त नगरुन्जेल गारोलाई वर्षा र अन्य प्रकारको भार आउने अवस्थाबाट बचाउनु पर्दछ । गारोका बाहिरी सतहहरुमा पानीले कम्तीमा सात दिनसम्म नियमित रूपले भिजाइ क्युरिङः कार्य गर्नु पर्दछ । बाहिरी सतहमा प्लाष्टर गरिसकेपछि बाहिरी सतहमा पनि पानीले भिजाई क्युरिङ गर्नु पर्दछ । गारो निर्माण गर्दा गारोका धारहरूमा क्षति नपुगोस् भन्नाको लागि ध्यान पुऱ्याउनु पर्दछ ।

४.१३ ढुंगाको गारो लगाउने कार्य :

- सुख्खा ढुंगामा गारो लगाउने कार्य बाहेक अन्य किसिमका ढुंगाको गारो लगाउने कार्यमा ढुंगा-ढुंगा बिचको भागमा सिमेन्ट मसला पूरै भरिने गरी गारो लगाउनु पर्दछ । दुई ढुंगाहरू आपसमा टाँसिने वा ढुंगाहरू बीच खाली भाग रहने गरी गारो लगाउनु हुँदैन । गारोमा लगाइने ढुंगा सफा सतह भएको र पानीमा भिजाइसकिएको हुनु पर्दछ ।
- गारोमा ढुंगा प्रयोग गर्नु अघि यसलाई आवश्यक साइजमा ताछेर बाहिरी सतह खस्रो बनाई सकेपछि मात्रै गारो बनाउन प्रयोग गर्नु पर्दछ ।



- गारो लगाउँदा ढुंगाहरूको बीचमा खुकुलो किसिमले मसला भर्ने र त्यसपछि पानी खन्याई मसलालाई बग्न दिने जस्ता कार्य गर्न हुँदैन । यसको साटो सिमेन्ट मसलालाई आवश्यक मात्रामा मात्रै गिलोपना हुने गरो पहिले नै भिजाउने र त्यसपछि मात्रै तेर्सो र ठाडो जोर्नीहरुमा प्रयोग गर्नु पर्दछ । गारोको कुनै पनि भागमा खाली भाग हुने गरी वा सुख्खा जोर्नी हुने गरी निर्माण कार्य गर्न हुँदैन । गारोका हरेक ढुंगाका तल माथि तथा साइडका सतहहरूमा मसला भरिने गरी जोडाइ कार्य गर्नु पर्दछ । मसलाको जोडाइको मोटाइ अत्यधिक हुनु हुँदैन ।

४.१४ फिनिशिङ कार्य :

क) प्लाष्टर गर्ने कार्य :

सतहको तैयारी : प्लाष्टर गर्नुपर्ने सतह सफा हुनु पर्दछ । सतहलाई धूलो, खुकुलोसँग टाँसिएका पदार्थ, तैलीय वा चिल्लो पदार्थबाट सफा गर्नु पर्दछ र प्लाष्टर गर्नु भन्दा केही घण्टा अगाडि बिजाउनु पर्दछ । प्लाष्टर गरिने भित्ता पूरै पानीले भिजाउनुको साटो बाहिरी सतह चिसा बनाउनु पर्दछ । धेरै भिजाइएको भित्तामा प्लाष्टर राम्रोसंग बस्दैन । प्लास्टर एक, दुई वा तीन तह वा कोटमा लगाउन सकिन्छ । सामान्यतया: दुई तहमा प्लाष्टर गर्दा पर्याप्त हुन्छ । पहिलो तहमा लगाइएको प्लास्टरले भित्तामा भएका खाल्डाखुल्डीलाई पूरेर समतल सतह तयार गर्ने हुनुपर्दछ । जुनसुकै तहको प्लाष्टर गर्दा प्रत्येक तहको मोटाइ १२ मि.मि भन्दा बढी हुनु हुँदैन । साथै पहिले लगाइएको तह भन्दा पछि लगाइएको तह पातलो हुनुपर्दछ । प्लाष्टरको मोटाइ बढी भयो भने मसला सेट हुँदा यो सुक्दछ र यसमा चिराहरू बढी देखा पर्दछ । भित्तामा प्लाष्टरको लागि सामान्यतया: १:६ (१भाग सिमेन्ट : ६ भाग बालुवा) अनुपातको सिमेन्ट मसला प्रयोग गरिन्छ भने सिलिङमा प्लाष्टर गर्दा १:३ (१ भाग सिमेन्ट : ३ भाग बालुवा) अनुपातको सिमेन्ट मसला प्रयोग गरिन्छ ।

प्लास्टर गर्दा माथिल्लो तल्लादेखि तल्लो तल्ला र कुनै पनि तल्लामा माथिल्लो भागदेखि तल्लो भागसम्म प्लास्टर गरिन्छ । भित्तामा बनाइएका खटप्वालहरु क्रमश: टाल्दै खटहरु हटाउदै प्लाष्टर कार्य सम्पन्न गरिन्छ । प्लाष्टर शुरु गर्दा ७५ मि.मि. चौडाइको र आवश्यक मोटाइको काठको टुक्रा भित्तामा २.५ मी देखि ४ मीटरको अन्तरमा नमूनाको लागि ठोक्नु पर्दछ । त्यसपछि ती टुक्राहरुको बीचमा प्लाष्टर गर्ने float ले प्लाष्टर गर्ने कार्य गरिन्छ । गारोका ढुंगा वा ईंटाको जोर्नीमा बनाइएको खाँचमा पूरा मसला भरिने गरि प्लाष्टर लगाइन्छ । फिनिसिङका लागि काठको दलिनले काठको टुक्राहरु बीच घोटी बाहिरी सतह समतल र चिल्लो बनाइन्छ । काठको दलिनले घोट्दा माथितिर र दायाँ बायाँ एक पटकमा ५० मिमि वा ७५ मिमिको दूरीमा चलाउनु पर्दछ । अन्तमा बाहिरी सतह सम्याउन प्लाष्टर गर्ने काठको float ले फिनिशिङ गरिन्छ । प्लाष्टर कार्य सम्पन्न भएपछि बाहिरी सतह समतल र Plumb मिलेको हुनाको साथै चिल्लो देखिने हुनुपर्दछ । प्लाष्टरको औसत मोटाइ तोकिएको मोटाइ भन्दा कम हुनु हुँदैन । प्लाष्टरको न्यूनतम मोटाइ तोकिएको मोटाइमा ३ मि.मि. भन्दा कम हुनु हुँदैन । प्लाष्टरको मोटाइ कम्तीमा १२ मि.मि. र बढीमा २० मि.मि. भन्दा बढी हुनु हुँदैन । २० मि.मि. भन्दा मोटो प्लाष्टर गर्नु परेमा दुई वा सो भन्दा बढी तह वा कोटमा गर्नुपर्दछ र यसरी प्लाष्टर गर्दा एक तहको मोटाइ १२ मि.मि. भन्दा बढी हुनु हुँदैन ।

A3-4-94

(ख) रंगरोगन गर्ने कार्य :

रंगरोगनका लागि सतह तयार गर्ने कार्य :

सिमेन्ट लगाइएको सतह र कंक्रिट गरिएको सतह रंगरोगन गर्नका लागि सतह मिलेको, कुनै खराबी नभएको र सुकिसकेको हुनुपर्दछ । रंगरोगन गर्ने सतहलाई धूलो, मैलो र लवणयुक्त पदार्थबाट सफा गर्न राम्रो बुरुश लगाई सफा गर्नु पर्दछ । तैलीय वा इनामेल रंग लगाउनु पर्ने सतहहरूमा क्षार प्रतिरोधात्मक प्राइमर दुई कोट लगाउनु पर्दछ । प्लाष्टर वा कंक्रिट गरिएको यस्तो सतहलाई कम्तीमा चार हप्ता सुक्न दिनु पर्दछ । ईंटा देखिने गरी छोडिने (fair faced) सतहहरू सुख्खा बनाई धूलो, मैलो र अन्य पदार्थहरुबाट बुरुश लगाई सफा गरेपछि क्षार प्रतिरोधात्मक प्राइमर लगाउनु पर्दछ । धातुका सतटहरुमा रंगरोगन गर्नु अघि तार बुरुसले सफा गरी धूलो, खिया र टाँसिएको पदार्थहरु हटाउनु पर्दछ । धेरै खिया लागेको सतह भएमा खिया प्रतिरोधी प्राइमर प्रयोग गर्नु पर्दछ । धातुका सामानमा रंग लगाई सकेपछि ओत मुनि जमीन भन्दा ६० से.मी.माथि राखी सुक्न दिनु पर्दछ । वर्कशपमा तयार गरिएको धातुको सामानमा कुनै ठाउँमा प्राइमर गर्न छुटेको भए छुटेको स्थानमा कम्तीमा एक कोट प्राइमर लगाउनु पर्दछ । ग्याल्भानाइज गरिएको सतह खिइएको छ भने सेतो स्पिरिटले पखालेर सफा गरी जिन्क क्रोमेट प्राइमरको एक कोट लगाउनु पर्दछ । बिटुमेन लगाइएको सतह छ भने shellac knotting को एक तहले सफा गरेपछि धातुमा लगाइने मेटल प्राइमर लगाउनु पर्दछ । काठको सामानमा सतह सफा गरी shellac knotting को एक कोट लगाए पछि एक कोट wood self–knotting प्राइमर लगाउनु पर्दछ । काठमा भएका चिरा, प्वाल र अन्य चिराहरु टाल्नु पर्दछ । काठको सामानमा तेल लगाउनु अघि यसमा भएका दागहरु मेटाई एकनासको रंग कायम गर्नु पर्दछ ।

प्राइमिङ र रंग लगाउने कार्य

प्राइमिङ गर्दा लगाउने भित्री तहमा र रंग लगाउने बाहिरी तहको रंग फरक किसिम (Tint) को हुनु पर्दछ । बाहिरी तहको रंगसँग मिल्ने किसिमको भित्री तहको रंग हुनु पर्दछ । बाहिरी तहमा लगाइने फिनिशिङ कोटको रंग सुपरीवेक्षण परामर्शदाताको स्वीकृतिमा छनोट गर्नु पर्दछ । बाहिरी सतहमा लगाइने रंग बाहिर लगाउने प्रकृति (Exterior Quality) को हुनु पर्दछ । भित्री र बाहिरी सतहमा लगाइने रंगरोगनले एकनासको फिनिसिङ दिने खालको हुनुपर्नेछ ।

घोट्ने कार्य

रंगरोगनको कार्यमा हरेक तहको रंग लगाई सकेपछि सुक्न दिनु पर्दछ र अर्को तह लगाउनु अघि मसिनो खाक्सीले घोट्नु पर्दछ । रंग लगाइएको सतहमा अन्तिम कोट लगाई सकेपछि चिल्लो र बुरुशको दागरहित हुनुपर्दछ । रंग लगाउने कार्य शुरु गर्नु अघि रंगको नमूना कार्ड (Sample card) सुपरीवेक्षण परामर्शदाताबाट स्वीकृत गराउनु पर्दछ ।

४.१५ निमार्णकार्य सम्पन्न भएको सुनिश्चितता

- निर्माण व्यवसायीले भवनको संरचना र फिनिसिङको कार्य सम्पन्न गरेपछि लाइन लेभल मिले-नमिलेको र फिनिशिङ कार्य सम्पन्न भए-नभएको सुनिश्चित गर्न सुपरीवेक्षण परामर्शदाताबाट जाँच गराउनु पर्दछ । सम्पन्न भएको निर्माणकार्य घरधनीलाई पनि चित्तबुझ्दो हुनु पर्दछ । झ्याल र ढोकाहरुमा कब्जा, चुकुल, हेण्डल लगायतका सबै सामानहरु जडान गरिएको हुनुपर्दछ । स्यानीटरी र प्लम्बिङ कार्यहरु सम्पन्न भई पानीको चाप र चुहावटका लागि गर्नु पर्ने परिक्षण कार्य सम्पन्न भई पास भएको हुनुपर्दछ । वाश बेसिन, धारा, सावर, कम्मोड, सिंक लगायतका बाथरुम, किचेन, शौचालयमा जडान गर्नु पर्ने स्यानिटरी उपकरणहरूको जडान कार्य सम्पन्न भई भवनका सबै भागहरु घरधनीको प्रयोगका लागि तैयारी अवस्थामा हुनु पर्दछ ।
- भुई र भित्तामा गरिएको प्लाष्टर, पनिङ, मार्बल र टाइल जडान कार्य सम्पन्न भई लाइन र लेभल मिलेको हुनु पर्नेछ । विद्युत् जडान प्रणाली अन्तर्गत विद्युतीय स्वीच, सकेट, बत्ती, पंखा लगायतका उपकरणहरु जडान र परिक्षण भई प्रयोगका लागि तैयारी अवस्थामा हुनुपर्नेछ । भित्ताहरूमा प्लाष्टर सम्पन्न भई रंग रोगन कार्य सम्पन्न भएको हुनुपर्नेछ । भवनको बाहिरी भागमा एप्रोन, वर्षादको

पानी बग्ने ढल, सेप्टिक ट्यांकी, सोक पिट, फोहरपानी बग्ने ढल, खानेपानी प्रणालीको पाइपलाइन, सिंढी, परिसरको काँडेवार वा पर्खाल, प्रवेशद्वार जस्ता संरचनाहरु र प्रणालीहरूको निर्माण र फिनिशिङ कार्य निर्माण व्यवसायीले सम्पन्न गरी सम्पूर्ण भवन घरधनीलाई हस्तान्तरण गर्न तैयारी अवस्थामा राख्नु पर्नेछ । निर्माण व्यवसायी मार्फत् भवन निर्माण गरिएको अवस्थामा निर्माणको ठेक्का संझौता र स्पेशिफिकेद्वान अनुसार भवन निर्माण सम्पन्न भए-नभएको निक्यौल सुपरिवेक्षण परामर्शदाताले गर्नेछ ।

४.१६ निर्माणकार्यको गुणस्तर नियन्त्रणका लागि प्रयोगशालामा गरिने परीक्षण

क) कंक्रिटको परीक्षण

कंक्रिट ढलानको लागि स्पेसिफिकेशन बमोजिम मिश्रण तयार गरिसकेपछि नमूना संकलन गरेर क्युब टेष्टका लागि क्युब साँचो (Cube Mould) मा खन्याई क्युबहरू तयार गर्नुपर्दछ । ढलानको लागि तयार गरिएको कंक्रिटको परिमाण अनुसार तपसीलमा देखाए बमोजिमको संख्यामा नमूना (Sample) बनाउनु पर्दछ । एउटा नमूना भन्नाले तीनवटा क्युब भन्ने बुझाउँदछ ।

क्र.सं.	निर्माणकार्यको कंक्रिटको परिमाण (घन मी.)	नमूनाको संख्या
१.	१-५	१
२.	६-१५	२
३.	१६-३०	३
४.	३५-५०	४
५.	५१ र सो भन्दा माथि	४+ हरेक थप ५० घन मी. कक्रिटको लागि थप एक/एक नमूना

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अनुसूची- १ : नेपालका प्रचलनमा रहेका भवन निर्माण मापदण्डमा समावेश भएका मुख्य मुख्य प्रावधानहरु

भुई क्षेत्रफलको अनुपात

- भुई क्षेत्रफलको अनुपात (Floor Area Ratio, FAR) ले श्रोत र पूर्वाधारहरूमा तोकिएको सिमितता भन्ने बुझाउँदछ ।
- शहरले धान्न सक्ने क्षमताभित्र भवन निर्माणकार्यलाई सिमित राख्न भुई क्षेत्रफलको अनुपात निर्धारण गरिएको हुन्छ ।
- यसलाई Floor Space Ratio वा Floor Space Index पनि भनिन्छ ।
- यसले भवनको सबै तल्लाको भुईंहरुको कूल क्षेत्रफल र जग्गाको कूल क्षेत्रफलको अनुपातलाई बुझाउँदछ।
- भुई क्षेत्रफलको अनुपात (%) = १००x (सबै तल्लाको भुईंहरुको कूल क्षेत्रफल/ जग्गाको कूल क्षेत्रफल)
- नगरपालिकाभित्रका विभिन्न क्षेत्रहरूका लागि स्वीकृत भुईं क्षेत्रफलको अनुपात र भवनको अधिकतम उचाइ नगरपालिकाले आफ्नो निर्माण मापदण्डमा तोके अनुसार हुनेछ ।

अधिकतम भुईं क्षेत्रफलको अनुपात र ढाकेको क्षेत्रफल

भवनको किसिम	जग्गाको क्षेत्रफल	अधिकतम ढाकेको क्षेत्रफल (%)	अधिकतम भुई क्षेत्रफलको अनुपात
आवासीय भवन	२५० वर्ग मी. सम्म	७०	१.२५
आवासीय भवन	२५० वर्ग मी. भन्दा बढी तर ५०० वर्ग मी. सम्म	६०	१.२५
आवासीय भवन	५०० वर्ग मी. भन्दा बढी	५०	१.२५
विद्यालय, कलेज	सम्बन्धित निकायले तोके बमोजिम	४०	१.५
स्टार होटेल	सम्बन्धित निकायले तोके बमोजिम	४०	३.०
चलचित्र प्रदर्शन घर, नाटकघर, सभा हल	सम्बन्धित निकायले तोके बमोजिम	४०	२.०
नर्सिङ होम, पोलिक्लिनिक	सम्बन्धित निकायले तोके बमोजिम	४०	१.५
घरेलु वा साना उद्योग	सम्बन्धित निकायले तोके बमोजिम	४०	१.५
स्रोत : काठमाडौं उपत्यका भित्रका नगरपालिकाहरू र नगरोन्मुख गाविस. हकमा गरिने निर्माण सम्बन्धी मापदण्ड, २०६४, प्रकाशक : काठमाडौं उपत्यका विकास प्राधिकरण			

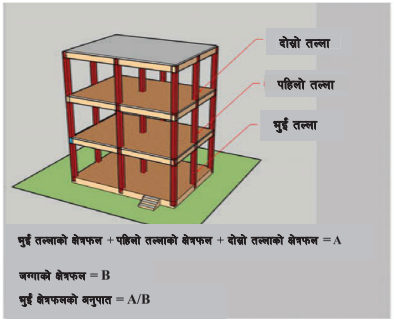
उदाहरण :

१. कुनै व्यक्तिको कुनै स्थानमा भएको जग्गाको क्षेत्रफल १०० वर्ग मीटर छ र उक्त स्थानका लागि नगरपालिकाको मापदण्डमा स्वीकृत भुईं क्षेत्रफलको अनुपात १.२५ छ भने मापदण्डका अन्य

प्रावधानहरूको समेत पालन हुने गरी निजले सबै तल्लामा गरी बढीमा कूल १२५ वर्ग मीटर भुईं क्षेत्रफल भएको भवन निर्माण गर्न पाउँदछ ।

२. भवनको प्रयोजन, निर्माणको किसिम, निर्माण स्थल रहेको क्षेत्र र जग्गाको साँधमा रहेको सडकको चौडाइको आधारमा भवनको लागि फरक फरक भुईं क्षेत्रफलको अनुपात हुन सक्दछ ।





ढाकेको क्षेत्रफल (Ground Coverage)

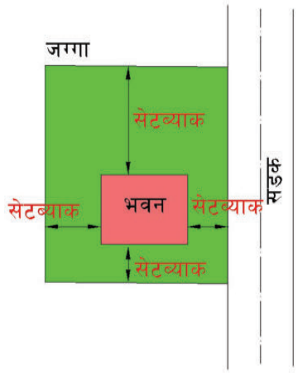
- जमीन तल्लामा भवनले ढाकेको वा चर्चेको कूल क्षेत्रफललाई ढाकेको क्षेत्रफल भनिन्छ । कुनै पनि क्षेत्रमा तोकिएको भवनको अधिकतम उचाइ र भुईं क्षेत्रफलको अनुपातका आधारमा जग्गाबाट अधिकतम लाभ हुने गरी घरधनीले ढाकेको क्षेत्रफलमा घटबढ गरी तर अन्य स्वीकृत मापदण्डभित्र रही भवन निर्माणकार्य गर्न सक्दछ ।
- ढाकेको क्षेत्रफल अनुपात (Ground Coverage Ratio) निकाल्नका लागि प्रस्तावित भवनको भुईं तल्लाको कूल क्षेत्रफललाई जग्गाको क्षेत्रफलले भाग गर्नु पर्दछ ।

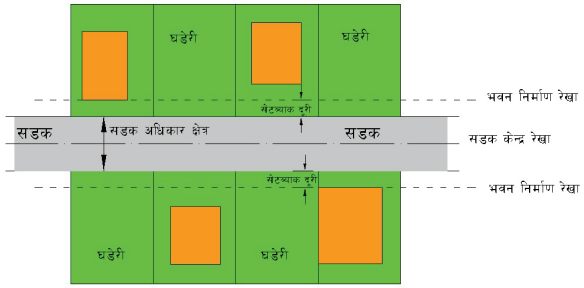
ढाकेको क्षेत्रफलको अनुपात (%) = १०० x भवनको ढाकेको क्षेत्रफल/जग्गाको क्षेत्रफल

सेट ब्याक (Set Back)

- सेट ब्याक भन्नाले भवन र जग्गाको साँधको बीचको खुल्ला भाग भन्ने बुझाउँदछ ।
- कुनै पनि जग्गामा सेट ब्याक रेखाको सिमासम्म मात्र भवन निर्माण गर्न पाइन्छ ।
- भवनको किसिम अनुसार फरक फरक सेट ब्याक तोकिएको हुन्छ । सेट ब्याक दूरी भवनको अगाडि मात्र होइन, सबै मोहडाहरुमा लागु हुन्छ तर अन्य मोहडाहरुका लागि फरक फरक सेट ब्याक दूरी भवन निर्माण मापदण्डमा तोकिएको हुन सक्दछ ।
- जग्गाको कूल क्षेत्रफल अनुसार पनि सेट ब्याक दूरी फरक फरक हुन सक्दछ ।

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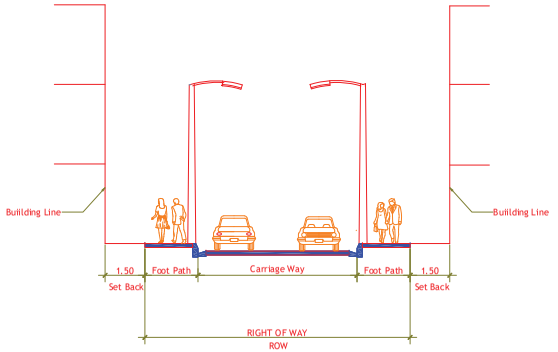




सडक अधिकार क्षेत्र (Right-of-way)

- सडक अधिकार क्षेत्र भन्नाले सार्वजनिक पहुँच, यातायातका साधनहरुको आवागमन, सडक, राजमार्ग वा पैदलमार्गहरु जस्ता सार्वजनिक पूर्वाधारहरुको अवस्थितिका लागि जमीनमा तोकिएको क्षेत्र वा करिडोरलाई बुझाउँदछ ।
- भू-उपयोग नक्सामा सार्वजनिक सडकको केन्द्ररेखाको दुवैतिर बराबर दूरीमा सडक अधिकार क्षेत्र अंकित गरिएको हुन्छ । सडक अधिकार क्षेत्र तोकिएको ठाउँमा भवन र यसका भागहरुले सडक अधिकार क्षेत्रलाई मिच्नु वा नाघ्नु हुँदैन ।
- सडक अधिकार क्षेत्र नतोकिएको ठाउँमा नगरको नयाँ विस्तारित क्षेत्रमासडक अधिकार क्षेत्र न्यूनतम ६ मीटरको हुनुपर्नेछ ।

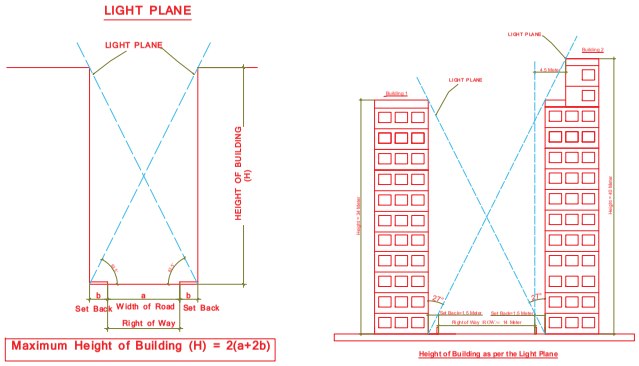
- नगरपालिकाको भू-उपयोग नक्सामा सेट ब्याक रेखा देखाइएको छैन भने सडक अधिकार क्षेत्रको जग्गातिरको सिमानाबाट १.५ मीटरको दूरी कायम राखी भवन निर्माण कार्य गर्नु पर्दछ ।
- सेट ब्याक क्षेत्रभित्र भवनलाई घाम र पानीबाट जोगाउन निश्चित मापसंम्मको छज्जा वा क्यान्टिलिभर निकाल्न पाइने वा खुडकिलाका लागि ठाउँ दिन सकिने व्यवस्था नगरपालिकाले गर्न सक्दछ ।
- सेट ब्याक क्षेत्रभित्र बार्दली, कोठा वा खुल्ला भऱ्याङ निर्माण गर्न पाइदैन । त्यस्तै गरी सेट ब्याकमा पर्खाल वा घेराबार लगाउन पनि पाइदैन ।



ROAD SECTION

भवनको उचाइमा बन्देज

- भवनको उचाइ भन्नाले जमीनको औसत लेभलबाट भवनको सबैभन्दा अग्लो भागसम्मको ठाडो दूरीलाई बुझाउँदछ । भवनमा भूमिगत तल्ला बनाइएको छ भने भूमिगत तल्लाको उचाइलाई भवनको उचाइमा गणना गरिदैन ।
- भवन निर्माण गरिने क्षेत्रको अवस्थिति र भुई क्षेत्रफलको अनुपातको आधारमा कुनै स्थानमा अधिकतम कति अग्लो भवन निर्माण गर्न पाइन्छ भन्ने कुरा निर्धारण गरिन्छ । साथै, लाइट प्लेनले पनि भवनको अधिकतम उचाइ निर्धारण गर्दछ ।
- भुई क्षेत्रफलको अनुपात अनुसार बढी उचाइको भवन निर्माण गर्नसके तापनि लाइट प्लेन अनुसार कम उचाइमा मात्र भवन बनाउन सकिने अवस्था हुन सक्दछ । चित्रमा देखाइए अनुसार लाइट प्लेनको उचाइसँग बराबर हुने गरी मात्र भवनको अधिकतम उचाइ हुन सक्दछ । भवनको अधिकतम उचाइ सडकको चौडाइको दुई गुणा र सेट ब्याक दूरीहरुको योगफलसम्म हुन सक्दछ ।



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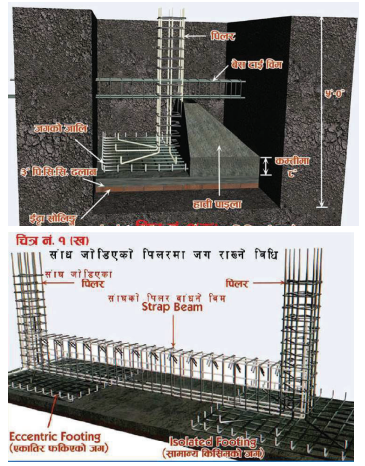
अनुसूची- २ : भूकम्प प्रतिरोधात्मक भवन निर्माण गर्न ध्यान दिनु पर्ने कुराहरु

क) पिलर प्रणालीको भवन भूकम्प प्रतिरोधात्मक बनाउन ध्यान दिनु पर्ने कुराहरु



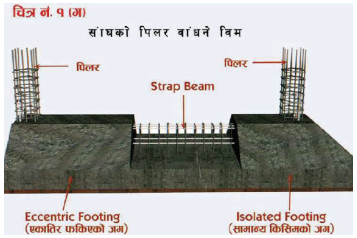
क) जग निर्माण

- जगमा राखिने फलामे डण्डी माटोको नजिक पर्ने भागतिर न्यूनतम ५० मि.मि. को कभर हुने गरी राख्नु पर्दछ। जगको तल्लो भाग माटोसंग सिधै सम्पर्कमा आउने भएमा सो ठाउँमा राखिने डण्डीको लागि ७५ मिमिको कभर दिनु उपयुक्त हुन्छ।
- जगमा राखिने मुख्य फलामे डण्डीको व्यास १२ मिमि भन्दा कम हुनु हुँदैन।
- जगको स्ल्याबमा दिइने फलामे डण्डीको न्यूनतम क्षेत्रफल कंक्रिटको क्रम-सेक्सनल क्षेत्रफलको ०.१२% हुनु पर्दछ।
- पिलरमा राखिएको ठाडो फलामे डण्डीहरुलाई न्यूनतम पनि Development Length पुग्ने गरी जगमा छिराउनु पर्दछ। तर भारवहन क्षमताको हिसाबले आवश्यक डण्डी भन्दा बढी क्षेत्रफलको फलामे डण्डी राखिएमा Development length घटाउन सकिन्छ।

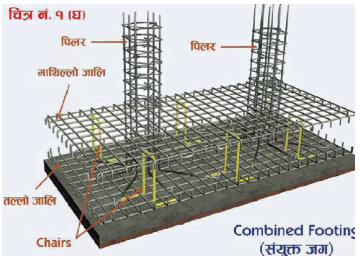


- पिलरमा राखिएको विशेष Confining फलामे रिङ वा चूरीलाई जगाभित्र पनि न्यूनतम ३०० मि.मि.को दूरीसम्म राख्नु पर्दछ । यी रिङहरुको आपसी दूरी १०० मि.मि. भन्दा बढी हुनु हुँदैन ।
- जगमा हात्तीपाइले वा Isolated प्रकारको जग राख्दा यी जगहरुको क्षेत्रफल आपसमा खप्टिने भएमा संयुक्त जग (Combined Footing) राख्नु पर्दछ । यस्तो संयुक्त जग तीन प्रकारका हुन सक्दछन् :
  - ❖ दुईवटा हात्तीपाइल जगमा तल्लो सतहमा फलामे डण्डीको जाली राखी ती दुई जगहरूलाई स्ट्राप बिमले जोडेर निर्माण गरिने स्ट्राप फुटिङ (Strap Footing)
  - ❖ दुई पिलरहरूलाई तल्लो र माथिल्लो दुवै सतहमा फलामे डण्डीको जाली राखी स्ल्याब ढलान गरिने स्ल्याबवाला संयुक्त जग (Combined Footing with Slab only)
  - ❖ दुई पिलरहरूलाई बिमले जोडी बिम भन्दा बाहिर स्ल्याबमा तल्लो सतहमा मात्र फलामे डण्डीको जाली राखी ढलान गरिने बिम र स्ल्याबवाला संयुक्त जग (Combined Footing with beam and slab)
- भवनको पिलरको बाहिरी भाग संधियारको जग्गासँग टाँसेर भवन निर्माण गर्नु परेमा संयुक्त जग निर्माण गर्नु पर्दछ
- स्ट्राप बिम सहितको संयुक्त जगमा राखिने बिममा अन्य बिममा जस्तै तल्लो र माथिल्लो तहमा फलामे डण्डी राख्नु पर्दछ ।
- भवनका सबै जगहरु संभव भएसम्म एउटै लेभलमा राख्नु पर्दछ । कुनै कारणवश फरक लेभलमा राख्नु परेमा प्राविधिकसंग सल्लाह गरेर मात्र निर्माण गर्नु पर्नेछ

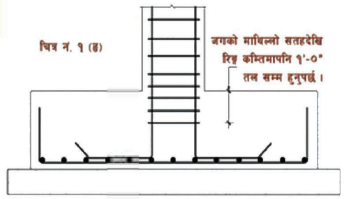
चित्र नं. १ (ग)



चित्र नं. १ (घ)



चित्र नं. १ (ङ)



ख) पिलरको निर्माण

- पिलरको न्यूनतम नाप (लम्बाइ वा चौडाइ) बिममा राखिने सबैभन्दा मोटो तेर्सो डण्डीको व्यासको २० गुणा भन्दा कम हुनु हुँदैन । तर यसका साथै पिलरको नाप ३०० मि.मि. भन्दा कम पनि हुनु हुँदैन ।
- भवनको बाहिरी फेसमा पर्ने पिलरहरूको हकमा तपसीलमा उल्लेखित तालिका अनुसारको बाहिरी पिलरको नाप हुनुपर्दछ ।

बिम-पिलरको बाहिरी जोर्नीभित्रको बिमको डण्डीको तेर्सो भागको न्यूनतम लम्बाइ

कंक्रिटको ग्रेड	डण्डीको ग्रेड	जोर्नीभित्रको बिमका डण्डीको तेर्सो भागको न्यूनतम लम्बाइ (L_{dh})
M20	Fe 500	२४.०५ x बिमको डण्डीको व्यास
M20	Fe 415	१९.१२ x बिमको डण्डीको व्यास
M25	Fe 500	२०.६२ x बिमको डण्डीको व्यास
M25	Fe 415	१७.१९ x बिमको डण्डीको व्यास

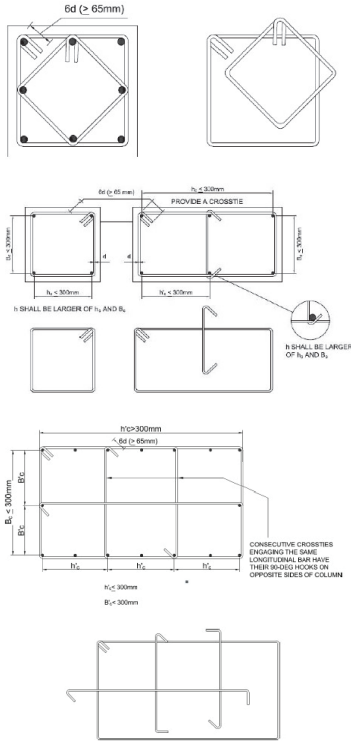
बिम-पिलरको बाहिरी जोर्नीमा पिलरको न्यूनतम मोटाइ = $L_{dh}+L_{dc}$

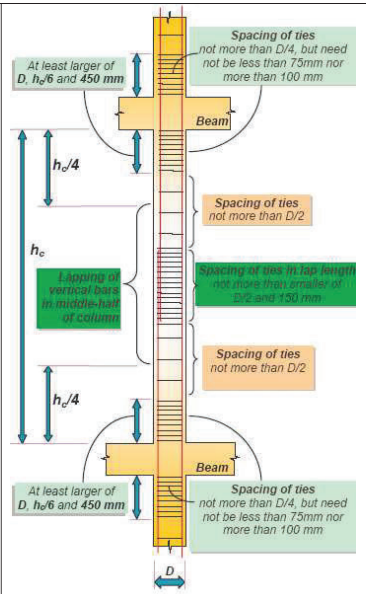
L_{dh} =जोर्नीभित्रको बिमका डण्डीको तेर्सो भागको न्यूनतम लम्बाइ

L_{dc} = पिलरमा डण्डीलाई दिनुपर्ने न्यूनतम कभर

L_{dh} =जोर्नीभित्रको बिमका डण्डीको ठाडो भागको न्यूनतम लम्बाइ =१२x डण्डीको व्यास

- आयताकार वा वर्गाकार पिलरहरूमा न्यूनतम ८ वटा फलामे डण्डीहरु राख्नु पर्दछ ।
- पिलरमा राखिने रिङ वा चूरीका हुकहरू पिलरको भित्री भागतिर १३५° डिग्रीको कोणमा बंग्याउनु पर्दछ र यस्तो हुकको न्यूनतम लम्बाइ रिङको डण्डीको व्यासको ६ गुणा बराबर तर ६५ मि.मि. भन्दा कम हुनु हुँदैन । रिङ वा चूरीमा प्रयोग गरिने फलामे डण्डीको न्यूनतम व्यास ८ मि.मि. हुनु पर्दछ ।
- पिलरमा राखिने ठाडो फलामे डण्डीहरुको बिचको दूरी ३०० मि.मि. भन्दा बढी भएमा बिचमा थप रिङहरु राख्नु पर्दछ । पिलरमा सिलिङ भन्दा तल र भुईं भन्दा माथि तल उल्लेखित दूरीसम्म विशेष Confinement डण्डी राख्नु पर्दछ ।
  - ❖ पिलरको नाप (लम्बाइ वा चौडाइ मध्ये जुन बढी छ),
  - ❖ पिलरमा जोडिएको बिमको तल्लो सतहबाट भुईंसम्मको दूरीको १/६ भाग, वा
  - ❖ ४५० मि.मि. मध्ये जुन बढी छ, सोही दूरी

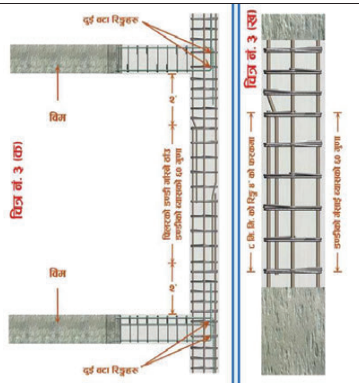




(ग) पिलरमा डण्डीको गाँस

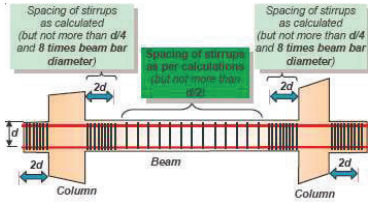
पिलरमा ठाडो फलामे डण्डी राख्दा लम्बाइ नपुगेमा अर्को फलामे डण्डी गाँस्नु पर्ने हुन्छ । यसरी गाँस गर्दा दुईवटा डण्डीहरु खप्ट्याएर वा कप्लर (Coupler) प्रयोग गरेर गर्न सकिन्छ ।

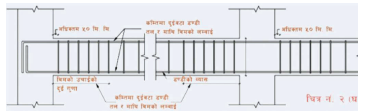
- कुनै एक स्थानमा डण्डी गाँस गर्दा ५० प्रतिशतभन्दा बढी डण्डीहरू गाँस गर्न हुँदैन ।
- विशेष confinement क्षेत्रमा पिलरमा डण्डीको गाँस गर्नु हुँदैन । पिलरको उचाइको मध्य आधा क्षेत्रमा मात्र डण्डीको गाँस गर्नु पर्दछ । गाँस गरिएको लम्बाइमा रिङहरु नजिक नजिक राख्नु पर्दछ । गाँस गर्नलाई डण्डी खप्ट्याउँदा खप्टिने भागको लम्बाइ पिलरमा राखिएको सबैभन्दा मोटो डण्डी अनुसारको Development Length भन्दा कम हुनु हुँदैन ।
- गाँस गरिएको लम्बाइमा राखिने रिङहरूको एक आपसको दूरी १५० मिमि भन्दा बढी हुनु हुँदैन ।

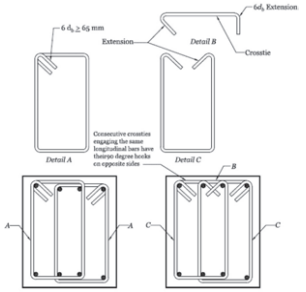


(घ) बिमको निर्माण

- बिममा पिलरसंगको जोर्नी नजिक तल्लो तहमा राखिने डण्डीको क्षेत्रफल त्यसै स्थानमा माथिल्लो तहमा राखिने डण्डीको क्षेत्रफलको ५०% प्रतिशत भन्दा कम हुनु हुँदैन ।
- बिममा कुनै पनि ठाउँमा राखिने फलामे डण्डीको क्षेत्रफल त्यस बिममा राखिएको डण्डीको अधिकतम क्षेत्रफलको २५% प्रतिशत भन्दा कम हुनु हुँदैन ।
- बिममा तेर्सो डण्डीहरुका साथै लम्बवत् दिशामा चूरी वा रिङहरु पनि राख्नु पर्दछ ।
- बिमको रिङ दुई टुक्रामा राख्ने गरेर पनि बनाउन सकिन्छ - यु आकारको डण्डी जसको दुई छेउमा १३५° डिग्रीमा कम्तीमा डण्डीको व्यासको ६ गुणा वा ६५ मि.मि. लम्बाइमा हुक बनाइएको हुन्छ र दोश्रो खण्ड तेर्सो टुक्रा वा क्रम टाईको रुपमा राखिन्छ ।
- रिङ र क्रस टाईलाई बिमको तेर्सो डण्डीसंग बाँधिने गरी राख्नु पर्दछ । क्रस टाइमा भएको ९०° डिग्रीको खण्डलाई बिमको एकैतिर लगातार नपर्ने गरी राख्नु पर्दछ ।
- बिममा प्रयोग गरिने रिङ वा चूरी ८ मि.मि. भन्दा कम व्यासको हुनु हुँदैन ।
- बिममा पिलरको भित्री मोहडाबाट बिमको मोटाइको दुई गुणा दूरीसम्म रिङ वा चूरी नजिक नजिक राख्नु पर्दछ । यो क्षेत्रमा रिङहरुको आपसी दूरी बढीमा बिमको मोटाइको १/४, रिङको डण्डीको व्यासको ८ गुणा वा १०० मि.मि. मध्ये जुन कम छ, सो अनुसार हुनु पर्दछ ।
- रिङ राख्दा पिलरको भित्री मोहडाबाट बिमतिर बढीमा ५० मि.मि.दूरीबाट राख्न शुरु गर्नु पर्दछ ।

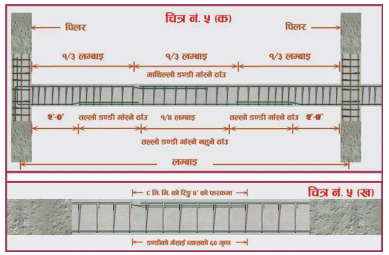






(ङ) बिममा डण्डीको गाँस

- बिममा तल्लो तहमा राखिने तेर्सो फलामे डण्डी बिमको मध्य भागमा गाँस्नु हुँदैन । यी डण्डीहरु पिलरको भित्री मोहडाबाट बिमको मोटाइको दुई गुणा दूरीमा मात्र गाँस गर्नु पर्दछ ।
- बिमको माथिल्लो तहमा राखिने तेर्सो फलामे डण्डीहरु बिमको मध्य १/३ भागमा गाँस गर्नु पर्दछ ।
- तेर्सो फलामे डण्डीहरु गाँस गर्दा डण्डी खप्ट्याइने लम्बाई त्यस तहमा बिममा राखिएको तेर्सो फलामे डण्डीको Development Length भन्दा कम हुनु हुँदैन । डण्डी गाँस गरिएको



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लम्बाइमा रिङहरु १०० मि.मि.को अन्तरमा राख्नु पर्दछ ।

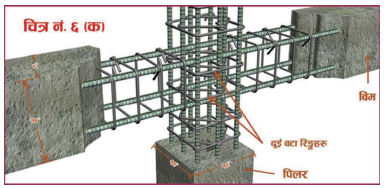
- बिममा राखिने रिङको डण्डीको व्यास ८ मि.मि. भन्दा कम हुनु हुँदैन ।

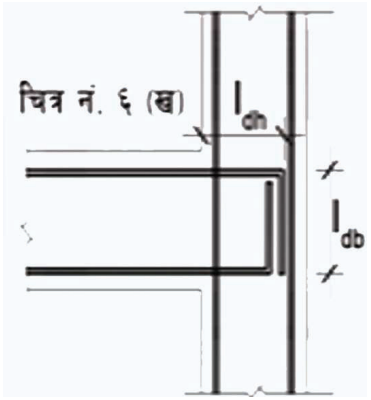
(च) बिम र पिलरको जोर्नी

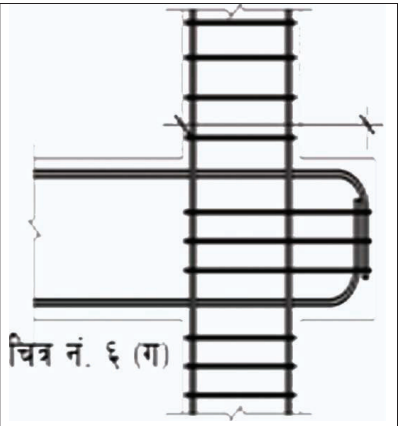
- भवनको बाहिरी फेसतिर भएको बिम पिलर जोर्नीमा पर्ने बिमको तेर्सो फलामे डण्डीको जोर्नीभित्रको सिधा लम्बाइ कम्तीमा horizontal development length हुनु पर्दछ र यसमा राखिने L-आकारको हुकमा हुकको भागको लम्बाइ डण्डीको व्यासको १२ गुणा हुनु पर्दछ ।

क्र. सं	कंक्रिटको ग्रेड	फलामे डण्डीको ग्रेड	horizontal development length
१	M 20	Fe 415	४९.१२ x बिमको डण्डीको व्यास
२	M 20	Fe 500	४३.०४ x बिमको डण्डीको व्यास
३	M 25	Fe 415	४७.११ x बिमको डण्डीको व्यास
४	M 25	Fe 500	४०.६२ x बिमको डण्डीको व्यास
५	M 30	Fe 415	४५.६२ x बिमको डण्डीको व्यास
६	M 35	Fe 500	४८.८२ x बिमको डण्डीको व्यास

- बिम-पिलर जोर्नीभित्र रिङहरु १०० मि.मि.को अन्तरमा राख्नु पर्दछ ।
- बिम-पिलर जोर्नीभित्र बिमको डण्डीको सिधा लम्बाइ horizontal development length अनुसार राख्न नसकिने भएमा पिलरको बाहिरी फेसबाट बिमलाई क्यान्टिलिभरको रुपमा बाहिर निकाली निर्माण गर्न सकिनेछ ।

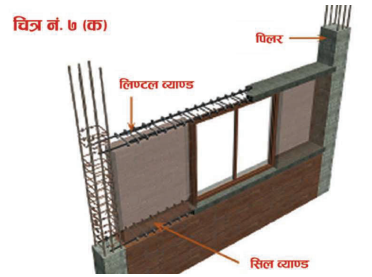


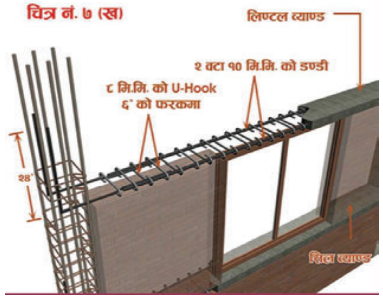




(ट) सिल र लिन्टेल ब्याण्ड

- पिलर प्रणालीको भवनमा बिम र पिलरको बिचमा राखिने गारोलाई लम्बवत् दिशामा भत्किनबाट जोगाउनका लागि गारोमा कंक्रिटको तेर्सो बन्धन वा ब्याण्ड निर्माण गर्नु पर्छ । भ्याल भएको स्थानमा यस्तो ब्याण्ड सिल लेभल र लिन्टेल लेभलमा राख्नु पर्दछ । खुल्ला भाग नभएको गारोमा पनि गारोको एक तिहाइ र दुई तिहाइ उचाइमा ब्याण्ड निर्माण गर्नुपर्दछ ।
- कंक्रिटका तेर्सो ब्याण्डहरुलाई गारोसंग जोडिएको पिलरसँग बाँध्नु पर्दछ । यसका लागि पिलरबाट यु - आकारको डण्डी निकाली कंक्रिटको तेर्सो ब्याण्डको डण्डीसंग गाँस गर्नुपर्दछ । यसको विकल्पमा कंक्रिटको पिलरमा २५ मि.मि. चौडाइको पाताको पट्टीले कस्ने र यस पट्टीमा तेर्सो ब्याण्डको डण्डीहरु वेल्डिङ गरेर जोड्न सकिन्छ ।
- कंक्रिटको तेर्सो ब्याण्ड निर्माण गर्दा ब्याण्डको चौडाइ गारोको चौडाइसँग बराबर राख्नु पर्दछ । यसको मोटाइ गारोमा राखिने इँटको मोटाइ वा कम्तीमा ७५ मि.मि. बराबर हुनुपर्दछ ।



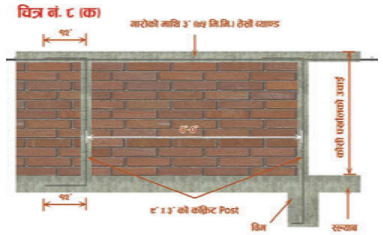


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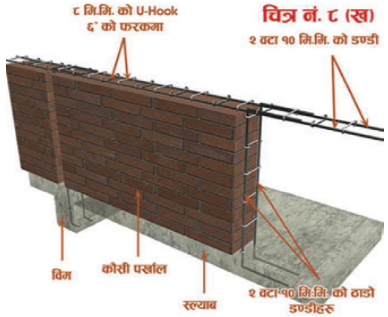
(छ) प्यारापेट ब्याण्डको निर्माण

- छत तथा बरण्डामा निर्माण गरिने प्यारापेट गारो भूकम्पमा क्षतिग्रस्त हुनबाट बचाउन प्यारापेट ब्याण्डको निर्माण गर्नु पर्दछ ।
- यसका लागि स्ल्याब र बिमबाट २३० मि.मि. x ७५ मि.मि.को पिलर निकाल्नु पर्दछ । यी पिलरहरुमा १० मि.मि. व्यासको दुईवटा फलामे डण्डीहरु राख्नु पर्दछ र ८ मि.मि. व्यासको यु-हुक लम्बवत् दिशामा १५० मि.मि. अन्तरमा राख्नु पर्दछ । यी पिलरहरू प्यारापेट गारोमा १२०० मि.मि दूरीको अन्तरमा बनाउनु पर्दछ ।
- कंक्रिट पिलरको माथिपट्टि ७५ मि.मि. मोटाइको कंक्रिट ब्याण्ड निर्माण गर्नु पर्दछ । यी ब्याण्डहरूमा १० मिमि व्यासको दुईवटा तेर्सो फलामे डण्डीहरु राखी ८ मि.मि. व्यासको १५० मि.मि. को अन्तरमा लम्बवत् दिशामा यु-हुकहरु राख्नु पर्दछ ।

चित्र नं. ८ (क)

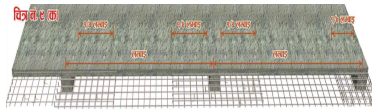


चित्र नं. ८ (ख)

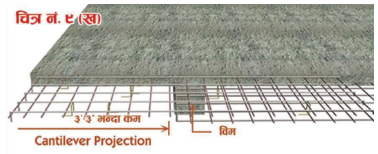


(९) स्ल्याब निर्माण

- ४.५ मी x ३.० मी साइज भएको कोठाको लागि १२५ मि.मि. मोटाइको कंक्रिट स्ल्याब पर्याप्त हुन्छ, जसमा ८ मि.मि. व्यासका १५० मि.मि. को अन्तरमा तेर्सो फलामे डण्डीहरु राख्नु पर्दछ ।
- छज्जाको लागि १ मी सम्मको क्यान्टिलिभर स्ल्याब निकालिएको छ भने यस्तो छज्जामा स्ल्याबको माथिल्लो तहमा १० मि.मि. व्यासको फलामे डण्डी १५० मि.मि.को अन्तरमा राख्नु पर्दछ ।
- स्ल्याबमा माथिल्लो सतहमा राखिने फलामे डण्डीहरु अड्याउनका लागि १० मि.मि. व्यासको कुर्ची वा चेयर राख्नु पर्दछ ।
- स्ल्याबको तल्लो सतहमा राखिने तेर्सो फलामे डण्डीहरुको कभरका लागि १ भाग सिमेन्ट र १ भाग बालुवा राखी तयार गरिएको मसलाबाट १५ मि.मि. मोटाइको कभर ब्लक तैयारी गरी

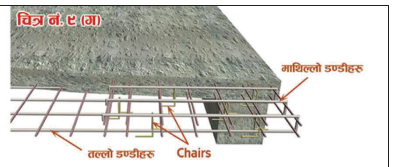


चित्र नं. ८ (ख)



स्ल्याबको तेर्सो फलामे डण्डीको तल्लो भागमा बाँध्नु पर्दछ ।

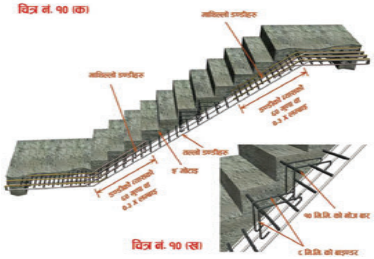
चित्र नं. ९ (ग)



(१०) भऱ्याङको निर्माण

- भऱ्याङको आधार स्ल्याबको न्यूनतम मोटाइ १२० मि.मि हुनु पर्दछ । स्लोपबाट ल्याण्डिङमा जाने भागमा स्लोप स्ल्याबको तल्लो तहमा राखिएका डण्डीहरु बंग्याई ल्याण्डिङमा माथिल्लो सतहमा ल्याउनु पर्दछ । त्यस्तै स्लोप स्ल्याबमा माथिल्लो तहमा राखिएका डण्डीहरु बंग्याई ल्याण्डिङ स्ल्याबमा तल्लो तहमा ल्याउनु पर्दछ । यसको साथै स्लोप र ल्याण्डिङको जोर्नी भागमा थप फलामे डण्डी माथिल्लो तहमा राख्नु पर्दछ ।
- भऱ्याङको खुडकिलाको लागि १० मि.मि. व्यासको नोज बार राख्नु पर्दछ । यी नोज बारहरु अड्याउन ८ मि.मि. व्यासको बाइण्डर डण्डीहरु ३०० मि.मि. को अन्तरमा राख्नु पर्दछ ।

चित्र नं. १० (क)



चित्र नं. १० (ख)

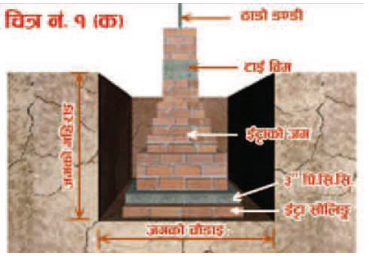
(ख) तीन तल्ला सम्मको गारो प्रणालीको आवासीय भवन भूकम्प प्रतिरोधी बनाउन ध्यान दिनु पर्ने कुराहरू

१. जग निर्माण

एक तल्ले भवनका लागि

- सिमेन्ट मसलाको जोडाइमा ईंटको गारोमा बनाइने एक तल्ले भवनका लागि जगको चौडाइ ६५० मि.मि. र गहिराइ ८०० मि.मि. हुनु पर्दछ ।
- सिमेन्ट मसलाको जोडाइमा ढुंगाको गारोमा बनाइने एक तल्ले भवनका लागि जगको चौडाइ ८०० मि.मि. र गहिराइ ८०० मि.मि. हुनु पर्दछ ।
- माटो मसलाको जोडाइमा ईंटको गारोमा बनाइने एक तल्ले भवनका लागि जगको चौडाइ ७५० मि.मि. र गहिराइ ७५० मि.मि. हुनु पर्दछ ।

चित्र नं. १ (क)



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दुई तल्ला र बुइंगल भएको भवनका लागि

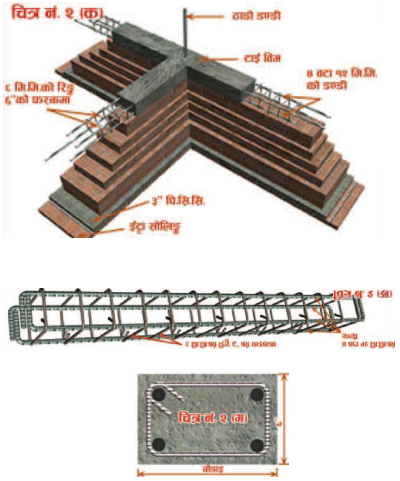
- सिमेन्ट मसलाको जोडाइमा ईंटको गारोमा बनाइने दुई तल्ला र बुइंगल भएको भवनका लागि जगको चौडाइ ९०० मि.मि. र गहिराइ ९०० मि.मि. हुनु पर्दछ ।
- सिमेन्ट मसलाको जोडाइमा ढुंगाको गारोमा बनाइने दुई तल्ला र बुइंगल भएको भवनका लागि जगको चौडाइ ८०० मि.मि. र गहिराइ ९०० मि.मि. हुनु पर्दछ ।
- माटो मसलाको जोडाइमा ईंटको गारोमा बनाइने दुई तल्ला र बुइंगल भएको भवनका लागि जगको चौडाइ ९०० मि.मि. र गहिराइ ७५० मि.मि. हुनु पर्दछ ।

- जग निर्माणको लागि एकसल ईंटा तेर्सो सोलिड गरिसकेपछि १:२:४ को कंक्रिटबाट ७५ मि.मि. मोटाइको कंक्रिट ढलान गर्नु पर्दछ र यसमाथि ईंट वा ढुंगाको जग निर्माण गर्नु पर्दछ ।



२. टाई बिमको निर्माण

- गारोहरुलाई एक अर्कोसंग बाँध्न र जमीन मुनिको चिस्यान भवनको माथिल्लो भागमा नआओस भन्नका लागि प्लिन्थ तहमा डि.पि.सि. बिम वा टाई बिम निर्माण गरिन्छ ।
- टाई बिमको जमीन सतहबाट उचाइ ४५० मि.मि. देखि ७५० मि.मि. सम्म राख्न सकिन्छ । टाई बिमको चौडाइ गारोको चौडाइ बराबर हुनु पर्दछ र यसको न्यूनतम मोटाइ १५० मि.मि. हुनु पर्दछ ।
- टाई बिममा ४ वटा १२ मि.मि. व्यासका तेर्सो फलामे डण्डीहरु राख्नु पर्दछ र यी डण्डीहरुको लम्बवत् दिशामा ८ मि.मि. व्यासका रिङहरु १५० मि.मि. को अन्तरमा राख्नु पर्दछ ।
- टाई बिमको निर्माण १:१.५:३ अनुपातको कंक्रिट मिश्रणबाट तयार गर्नु पर्दछ ।



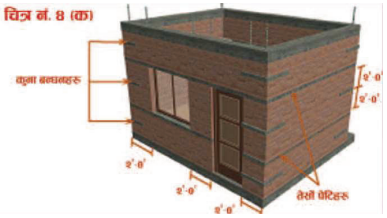
(३) गारोको मोटाइ

- यदि कोठाको चौडाइ ३.५ मी. सम्मको छ भने १.६ अनुपातको सिमेन्ट मसलाको जोडाइमा बनाइने ईटाको गारो भुई तल्लामा ३५० मि.मि. मोटाइको र पहिलो तथा दोश्रो तल्लामा २३० मि.मि. मोटाइको हुनुपर्दछ ।
- १:६ अनुपातको सिमेन्ट मसलाको जोडाइमा बनाइने ढुंगाको गारो भुई तल्लामा ४५० मि.मि. मोटाइको र पहिलो तल्लामा ३५० मि.मि. मोटाइको निर्माण गर्नु पर्दछ । ढुंगाको गारो राखी दुई तल्लासम्मको भवन निर्माण गर्नु बढी सुरक्षित हुन्छ ।
- माटो मसलाको जोडाइमा भवन निर्माण गर्दा ईटको गारो भुई तल्लामा ३५० मि.मि. मोटाइको र पहिलो तल्लामा २३० मि.मि. मोटाइको हुनु पर्दछ । माटो मसलामा ईंटाको गारो राखी भवन बनाउँदा अधिकतम दुई तल्लाको मात्रै निर्माण गर्नु पर्दछ ।

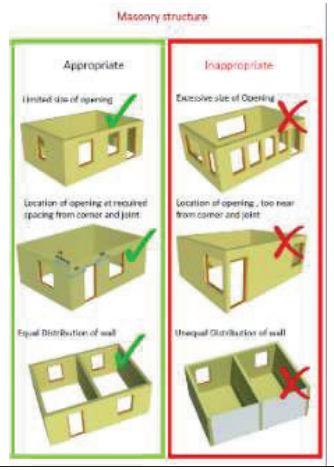


(४) गारोमा भ्याल र ढोकाको अवस्थिति

- गारो प्रणालीको भवनमा भ्याल र ढोकाहरू राख्दा गारोको कुना र जोनीहरूबाट न्यूनतम ६०० मि.मि. को दूरीमा राख्नु पर्दछ ।
- गारोमा भ्याल - भ्याल वा भ्याल- ढोका बिचको दूरी ६०० मिमि भन्दा कम हुनु हुँदैन । अर्थात् भ्याल र ढोकाहरूको बिचको दूरी कम्तीमा ६०० मि.मि. हुनु पर्दछ ।
- सिमेन्ट मसलाको जोडाइमा ईंटको गारोमा निर्माण गरिने एक तल्ले भवनमा भ्याल र ढोकाहरूको कूल लम्बाइ गारोको लम्बाइको ५०% भन्दा बढी हुनु हुँदैन ।

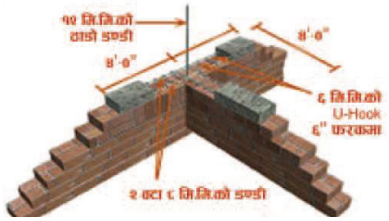


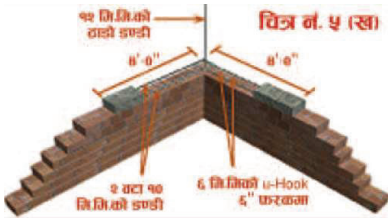
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(५) गारोको जोर्नी र कुनाहरूमा कंक्रिट स्टिचको निर्माण

- गारोको जोर्नी र कुनाहरुमा कंक्रिटको स्टिचहरु निर्माण गर्नु पर्दछ ।
- स्टिचको चौडाइ गारोको मोटाइ बराबर हुनुपर्दछ र स्टिचको मोटाइ इँटाको सलको मोटाइ वा ७५ मि.मि. बराबर हुनु पर्दछ । गारोको कुनाबाट स्टेचको लम्बाइ ९०० मि.मि. हुनु पर्दछ ।
- स्टिचमा दुईवटा १० मि.मि. व्यासका तेर्सो फलामे डण्डीहरु राख्नु पर्दछ । यसको लम्बवत् दिशामा ८ मि.मि. व्यासको यु-हुक १५० मि.मि. को अन्तरमा राख्नु पर्दछ । गारोको उचाइमा ६०० मि.मि. को अन्तरमा कंक्रिट स्टिच निर्माण गर्नु पर्दछ ।





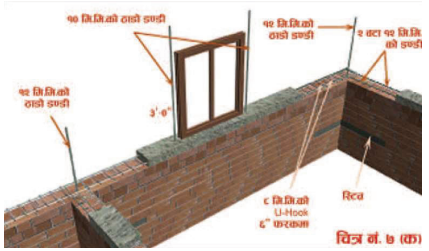
(६) बिम निर्माण

- गारोमाथि कंक्रिट स्ल्याबसँगै जोडिने गरी कंक्रिटको बिम निर्माण गर्नु पर्दछ ।
- गारोमाथि निर्माण गरिने बिमको चौडाइ गारोको मोटाइ बराबर हुनु पर्दछ । यस्तो बिमको मोटाइ न्यूनतम ३२५ मि.मि. हुनु पर्दछ ।
- बिममा राखिने तेर्सो फलामे डण्डीहरु चित्रमा देखाइएका छन् ।



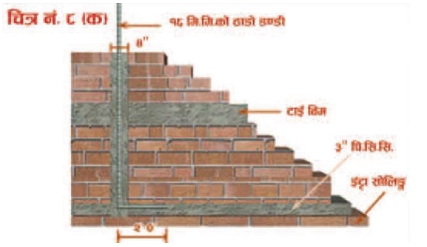
(७) सिल र लिन्टेल ब्याण्ड

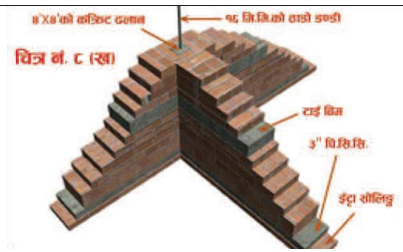
- गारोको खुल्ला भाग वा झ्याल रहेको भागमा सिल र लिन्टेल ब्याण्ड निर्माण गर्नु पर्दछ । यी तेर्सो ब्याण्डहरूको चौडाइ गारोको मोटाइ बराबर हुनेछ । यिनीहरुको मोटाइ ७५ मि.मि.को हुनु पर्नेछ । १.२ मीटर भन्दा ठूलो खुल्ला भाग भएमा लिन्टेल ब्याण्डको खुल्ला भाग रहेको स्थानमा ब्याण्डको मोटाइ १५० मि.मि. राख्नु पर्नेछ र खुल्ला भागको दुवैतिर ४५० मि.मि.को बियरिङ दिनु पर्नेछ ।
- कंक्रिटको सिल र लिन्टेल ब्याण्डमा २ वटा १२ मि.मि. व्यासका तेर्सो फलामे डण्डीहरु राखी लम्बवत् दिशामा ८ मि.मि. व्यासको यु-हुक १५० मि.मि. को अन्तरमा राख्नु पर्नेछ ।
- १५० मि.मि. मोटाइको लिन्टेल ब्याण्डमा ४ वटा १२ मि.मि. व्यासका तेर्सो फलामे डण्डीहरु राखी लम्बवत् दिशामा ८ मि.मि. व्यासको रिङहरु १५० मि.मि.को अन्तरमा राख्नु पर्नेछ ।



(८) ठाडो फलामे डण्डीहरु

- गारो प्रणालीको भवनमा गारोको जोर्नी र कुनाहरूमा पर्ने गरी जगदेखि शुरु गरी स्ल्याबसम्म नै जाने गरी १२ मि.मि. व्यासको ठाडो फलामे डण्डी राख्नु पर्दछ । गारोका खुल्ला भागहरूको साइडमा टाई बिमबाट शुरु गरी स्ल्याबसम्म १० मि.मि. व्यासको ठाडो फलामे डण्डी राखी ढलान गर्नु पर्दछ ।
- ठाडो फलामे डण्डी गारोमा राख्दा यसको वरिपरि १०० मि.मि. X १०० मि.मि. साइजको कंक्रिट ढलान गर्नु पर्दछ र यसका लागि इँटको सल मिलाएर राख्नु पर्दछ ।



• गारो निर्माण गर्दा अर्को गारो जोड्न वा थप्न इँटाका दाँतीहरू ठाडो लाइनमा पर्ने गरी राख्नु हुँदैन । यसको साटो दाँतीहरू खुडकिलो बनाएर वा स्लोपमा छोड्नु पर्दछ । • गारो निर्माण गर्दा एक दिनमा बढीमा १ मीटर उचाइ सम्म मात्रै निर्माण गर्नु पर्दछ ।	

अनुसूची- ३ : निर्माणकर्मीहरु नगरपालिकामा सूचीकृत हुनका लागि नमूना फाराम

नगरपालिकामा निर्माणकर्मीहरु सूचीकृत हुनका लागि आवेदन फाराम

श्री ..... नगरपालिका

..... काठमाण्डौं ।

विषय : दर्तावाला निर्माणकर्मीमा सूचीकृत हुन पाऊँ भन्ने बारे ।

म विगत ..... वर्षदेखि भवन निर्माण क्षेत्रमा निर्माणकर्मीको रुपमा कार्यरत रहेको र त्यस नगरपालिका क्षेत्रमा भवन निर्माण गर्न इच्छुक घरधनीहरुलाई दर्तावाला निर्माणकर्मीमा सूचीकृत भई निर्माणकर्मीको सेवा प्रदान गर्न तत्पर रहेको जानकारी गराउँदछु । त्यस नगरपालिकाको भवन निर्माण कार्यविधि, २०७८ को दफा २० बमोजिम तपसीलमा उल्लेखित विवरणहरु पुष्ट्याई गर्ने कागजातहरु संलग्न गरी नगरपालिकामा दर्तावाला निर्माणकर्मीहरुको रुपमा सूचीकृत हुन पाऊँ भनी यो निवेदन पेश गरेको छु ।

तपसील

दर्तावाला निर्माणकर्मीमा सूचीकृत भई निर्माणकर्मीको सेवा प्रदान गर्न इच्छुक व्यक्तिको विवरण	
नाम, थर :	**हालको ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
पत्राचार गर्ने ठेगाना : .....न.पा., ...वडा नं. ..... जिल्ला	**स्थायी ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
मोबाइल नं. :	**टेलिफोन नं. :**
नागरिकता नं. :	**नागरिकता जारी भएको मिति :** ..... साल .....महिना.....गते
नागरिकता जारी गर्ने कार्यालय :	**जन्म मिति :** .....साल .....महिना.....गते
लिङ्ग : ☐ पुरुष ☐ महिला ☐ अन्य	
शैक्षिक योग्यता : ☐ सामान्य साक्षर ☐ प्राथमिक विद्यालय तह ☐ माध्यमिक विद्यालय तह ☐ १०+२ वा सो भन्दा माथि	
निर्माणकार्यको अनुभव : .....वर्ष	**भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको मिति :**
निर्माणमा विज्ञता : ☐ डकर्मी ☐ सिकर्मी ☐ नकर्मी अन्य :	

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संलग्न कागजातहरु :	
१. नेपाली नागरिकताको प्रमाणपत्रको प्रतिलिपि २. शैक्षिक योग्यताको प्रमाणपत्रको प्रतिलिपि ३. भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको प्रमाणपत्रको प्रतिलिपि ४. पासपोर्ट साइजको फोटो २ (दुई) प्रति	
माथि लेखिएको व्यहोरा ठिक साँचो हो, फरक परेमा म आफै जवाफदेही हुनेछु र अन्यथा भएमा कानून अनुसारको सजाय भोग्न तयार छु।	
निवेदन दिएको मिति : .....साल .....महिना.....गते	**निवेदकको नाम, थर :** ..... हस्ताक्षर :
निवेदकको औठा छाप दायाँ बायाँ	**निवेदकको तस्वीर**

अनुसूची- ४ : भवन निर्माण गर्नका लागि घरधनी र निर्माणकर्मी बिच गर्नुपर्ने सम्झौताको नमूना

भूकम्प प्रतिरोधात्मक भवन निर्माण गर्नका लागि घरधनी र निर्माणकर्मी बिचको सम्झौतापत्र

लिखितम् ..... नगरपालिका, वडा नं..... साविक ..... न. पा., साविक वडा नं ..... बस्ने वर्ष ..... को को छोरा/छोरी बुहारी वर्ष ..... को घरधनी श्री ..... (पहिलो पक्ष) र ..... नगरपालिका, वडा नं..... साविक ..... न. पा., साविक वडा नं ..... बस्ने वर्ष ..... को को छोरा/छोरी बुहारी वर्ष ..... को निर्माणकर्मी/ ठेकेदार श्री ..... (दोश्रो पक्ष) बिच यस नगरपालिकाबाट नक्सापास भए बमोजिमको नक्सा र डिजाइन अनुसार भवन निर्माण गर्न मञ्जुरी भई तपसीलमा उल्लेखित शर्तहरूको अधिनमा रही सम्झौता गर्दछौं :

१. निर्माणकर्मीले पूरा गर्नुपर्ने दायित्वहरू

१.१ सम्झौतामा हस्ताक्षर सम्पन्न भए लगतै संलग्न अनुसूचीमा उल्लेख भएका शर्तहरू बमोजिम निर्माणकर्मीले भवन निर्माण कार्य गर्नु पर्नेछ। निर्माणकर्मीले तोकिएको समयावधीभित्र भवनको सिभिल र स्यानिटरी निर्माणकार्यहरु सम्पन्न गर्नु पर्नेछ । भवनको निर्माणस्थल ..... नगरपालिका, वडा नं..... को ..... टोलमा रहेको छ।

१.२ निर्माणकर्मीले भवन निर्माणकार्य (आर. सि. सि. कार्य, गारो निर्माण, प्लाष्टर-पनिङ सहितको फिनिशिङ कार्य सहितको सम्पूर्ण निर्माणकार्य) ..... महीना (मिति २०..... /...../.....) भित्र सम्पन्न गर्नु पर्नेछ।

१.३. कँक्रिट ढलानको गुणस्तर सुनिश्चित गर्न आर्.सि.सि. (जग, पिलर, बिम, स्ल्याब, भऱ्याङ, इत्यादि) निर्माणकार्यमा कँक्रिटको क्यूब टेष्ट गराउनका लागि निर्माणकर्मीले आवश्यक सहयोग गर्नु पर्नेछ। क्युब टेष्टको परीक्षण शुल्क घरधनीबाट बेहोरिने छ।

१.४ समयबद्ध ढंगले गुणस्तरीय भवन निर्माणकार्य सम्पन्न गर्न निर्माणकर्मीले आवश्यक सबै प्राविधिक र व्यवस्थापकीय सहयोग प्रदान गर्नु पर्नेछ।

१.५ भवन निर्माण गर्नका लागि आवश्यक निर्माणकार्यका प्रमुख आइटमहरु सम्पन्न गर्न लाग्ने समयावधी देखाइएको कार्यतालिका तयार गरी निर्माणकर्मीले मिति २०..... /...../..... भित्र घरधनीलाई बुझाउनु पर्नेछ। यसरी तयार गरिएको कार्यतालिका यो सम्झौताको अभिन्न अंग मानिनेछ। सम्झौता कार्यान्वयन गर्ने सिलसिलामा निर्माणकर्मीले यो कार्यतालिकालाई अनिवार्य रूपमा पालन गर्नु पर्नेछ।

२. निर्माणकार्यका आइटमहरुको दररेट र भुक्तानी

२.१ सम्झौता अन्तर्गत निर्माणकर्मीबाट गरिएको गुणस्तरीय निर्माणकार्यको लागि घरधनीले सम्पन्न आइटमहरूको रनिङ बिल अनुसारको परिमाणको आधारमा पहिले तय भएको दररेट अनुसार निर्माणकर्मीलाई भुक्तानी गर्नु पर्नेछ।

२.२ सम्झौता अनुसार निर्माणकार्य गर्दा निर्माण सामग्रीहरु वा ज्यालामा कुनै मूल्यवृद्धि वा परिवर्तन भएमा निर्माणकार्यको आइटमको पहिले तय भएको दररेटमा कुनै परिवर्तन गरिने छैन। कुनै आइटमको दररेट

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परिवर्तन गर्नुपर्ने भएमा निर्माणकर्मी र घरधनीबिच वार्ता भई सहमति भइसके पछि घरधनीले निर्माणकर्मीलाई लिखितमा सो सूचित गरेपछिको अवस्थामा बाहेक दररेट अपरिवर्तनीय रहनेछ ।

२.३ निर्माणकर्मीबाट निर्माणकार्यको आइटमहरूको निर्माण र जडान सम्पन्न भएपछि सो को आधारमा रनिङ बिल वा अन्तिम बिलहरू तयार गरी घरधनी समक्ष भुक्तानीको लागि पेश गर्नु पर्नेछ र घरधनीले सुपरिवेक्षण परामर्शदाताबाट चेकजाँच भई निजबाट सिफारिस भएपछि निर्माणकर्मीलाई बिल अनुसारको रकम भुक्तानी दिइनेछ । यसरी पेश गरिने बिलमा हाल सम्पन्न भएको आइटमहरु र सो अनुसारको बिल रकमको साथै हालसम्म सम्पन्न भवन निर्माणकार्यका आइटमहरू, बाँकी भएका आइटमहरु र सो को परिमाणको विवरण समेत समावेश गर्नु पर्नेछ ।

२.४ निर्माणकार्यको फाइनल बिलको रकम निर्माणकर्मीले सम्झौतामा उल्लेख भए बमोजिमको दररेट बमोजिम निर्माण सम्पन्न हुँदाको समयमा नापजाँचबाट तय भए अनुसारको आइटमको कुल परिमाण अनुसार सुपरिवेक्षण परामर्शदाताबाट चेकजाँच गरी गुणस्तरीय रुपमा गरिएको भनी सिफारिस भएपछि निर्धारण हुनेछ । पहिले तय भएको आइटमको दररेटमा माथि दफा २.२ मा उल्लेख भएको अवस्थामा बाहेक कुनै परिवर्तन गर्न पाइने छैन ।

३. विशेष शर्तहरु

३.१ निर्माणकर्मीले सुपरिवेक्षण परामर्शदाताको प्रत्यक्ष सुपरिवेक्षणमा रही काम गर्नु पर्नेछ ।

३.२ कार्यतालिकामा उल्लेख भए बमोजिमको निर्माण अवधीभित्र भवन निर्माणकार्य सम्पन्न गर्न निर्माणकर्मीले संभव भएसम्मका सबै प्रयासहरु गर्नु पर्नेछ र यस सिलसिलामा निर्माणकार्यको गुणस्तर स्पेशिफिकेशनमा तोकिए बमोजिम कायम गर्नु पर्नेछ । यसको लागि घरधनीको कुनै सहयोग आवश्यक भएमा निर्माणकर्मीले निजलाई पर्याप्त समय अगावै सूचित गर्नु पर्नेछ । घरधनीले आवश्यकता हेरी निजलाई सहयोग प्रदान गर्नु पर्नेछ ।

३.३ निर्माणस्थलमा अनधीकृत व्यक्तिहरूको प्रवेश हुन नदिनका लागि निर्माणकर्मीले निर्माणस्थलमा सुरक्षा घेरा वा बारको व्यवस्था गर्नु पर्नेछ ।

३.४ निर्माणकर्मीलेसंभव भएसम्म निर्माणस्थल सफा र व्यवस्थित राख्नु पर्नेछ ।

३.५ निर्माणस्थल वरिपरिका संरचनाहरु, भवनहरु र पूर्वाधारहरुमा कुनै क्षति नपुग्ने गरी यथास्थितिमा राख्नका लागि कामदारहरूले अधिकतम सावधानी र सुरक्षाका उपायहरु अवलम्बन गरेका छन् भने सम्बन्धमा निर्माणकर्मीले नियमित सुपरिवेक्षण र अनुगमन गर्नु पर्नेछ ।

३.६ भवन निर्माण कार्यका लागि आवश्यक विद्युत र पानीको आपूर्तिको व्यवस्था घरधनीले गर्नु पर्नेछ ।

३.७ भवन निर्माणको कार्यतालिकामा उल्लेखित समयावधीभित्र निर्माणकर्मीले भवन निर्माणकार्य सम्पन्न गर्नु पर्नेछ । युद्ध, प्राकृतिक प्रकोप, कर्फ्यू जस्ता काबु बाहिरको अवस्था आइपरेको अवस्थामा निर्माणकर्मी र घरधनीको आपसी वार्ता र सहमतिमा निर्माण अवधीमा संशोधन गर्न सकिनेछ । निर्माण अवधी थप भएको भन्ने सम्बन्धमा निर्माणकर्मीले घरधनीबाट लिखित रूपमा स्वीकृति प्राप्त गर्नु पर्नेछ ।

३.८ तपसीलमा उल्लेखित विषयहरुमा निर्माणकार्यको रनिङ बिलमा उल्लेखित रकम घरधनीले रोकेर आफुलाई नोक्सानी हुनबाट बचाउन सक्नेछ :

क) गुणस्तर विहिन भई मर्मत गर्न सूचित गरिएको तर निर्माणकर्मीबाट मर्मत नगरिएका निर्माणकार्यका आइटमहरु

ख) निर्माणकर्मीले निर्माणकार्यमा संलग्न कामदारहरूलाई भुक्तानी गर्नुपर्ने रकम भुक्तानी नगरेमा

ग) तोकिएको समयावधीभित्र पूरा हुन नसक्ने देखिएका निर्माणकार्यका आइटमहरू

४. सम्झौता लागू हुने अवस्था र समयसिमा

४.१ यस सम्झौतामा दुवै पक्षबाट हस्ताक्षर भए लगतै यो सम्झौता लागू भएको मानिनेछ ।

४.२ निर्माणकर्मीले संझौता अनुसारको कार्यहरु मिति २०...../...../..... देखि शुरु गर्नु पर्नेछ । मोबिलाइजेशन अवधी संझौताको मितिदेखि सात दिनको अवधीको हुनेछ ।

४.३ यस सम्झौतामा उल्लेखित समयसिमाहरु निर्माणकर्मीले प्रदान गर्नुपर्ने सेवा सम्बन्धी हो भन्ने मानिनेछ ।

५. सम्झौताका दफाहरुको हेरफेर

५.१ यस सम्झौतामा कुनै हेरफेर गर्न सम्झौताका दुवै पक्षहरुबाट हस्ताक्षर गरिएको लिखित संशोधनपत्र आवश्यक हुनेछ ।

तपसीलमा उल्लेखित साक्षीहरूको रोहबरमा यस सम्झौता बमोजिम निर्माणकार्य गर्न दुवै पक्ष राजीखुशी छौं भनी यो सम्झौतामा सहीछाप गरी एक-एक प्रति लियौं । दियौं ।

<u>प्रथम पक्ष (घरधनी)</u>
हस्ताक्षर : .....
नाम/थर : .....
ठेगाना : .....
मिति : .....

<u>द्वितीय पक्ष (निर्माणकर्मी)</u>
हस्ताक्षर : .....
नाम/थर : .....
ठेगाना : .....
मिति : .....

<u>साक्षी (घरधनीका तर्फबाट)</u>
हस्ताक्षर : .....
नाम/थर : .....
ठेगाना : .....
मिति : .....

<u>साक्षी (निर्माणकमीका तर्फबाट)</u>
हस्ताक्षर : .....
नाम/थर : .....
ठेगाना : .....
मिति : .....

संलग्न :

अनुसूची-१: भवन निर्माणकार्यका सिभिल र फिनिसिङ सम्बन्धी आइटमहरूको दुवै पक्षको सहमतिमा तय भएको दररेटहरुको सूची

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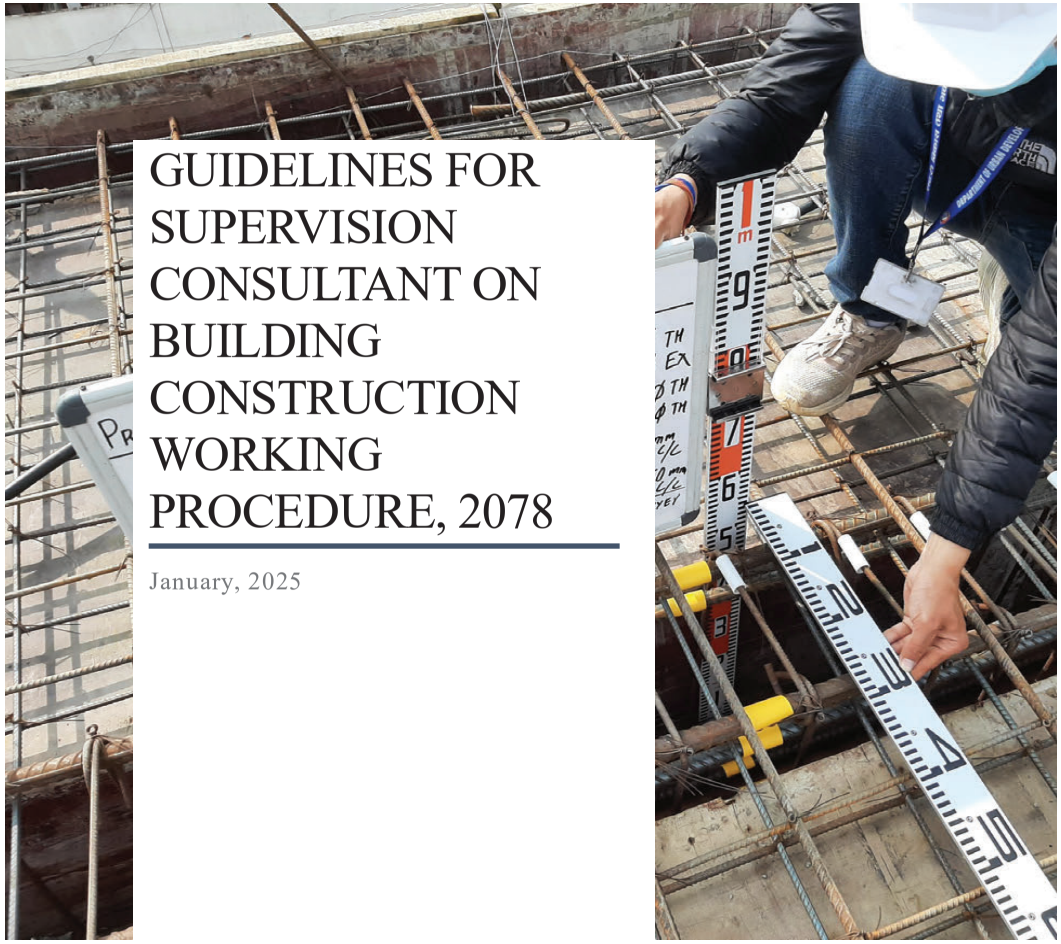
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3-5. For Supervision Consultant



GUIDELINES FOR SUPERVISION CONSULTANT ON BUILDING CONSTRUCTION WORKING PROCEDURE, 2078

January, 2025

A3-5-1

Under the project "The Project for Promotion of Nepal National Building Code Compliance for Safer Building Construction"

Department of Urban Development and Building Construction, Babarmahal, Kathmandu

Technically Supported by Japan International Cooperation Agency (JICA) Nepal



Attention to Municipality

The Municipality is responsible for issuing the building permit for building construction works at the design phase while it is responsible for issuing the inspection certificates and completion certificates as well during and after the construction respectively. The Municipality shall be responsible for the strict enforcement of the building By-Laws & the building code in the municipality during the design phase as well as during construction.

Building Owner

The Building Owner is the main body for Building Application who shall makes the final decision of the building design and its construction. The Building Owner is responsible for employing the Designer, the Supervision Consultant and the Contractor as well as application to Municipality.

Designer

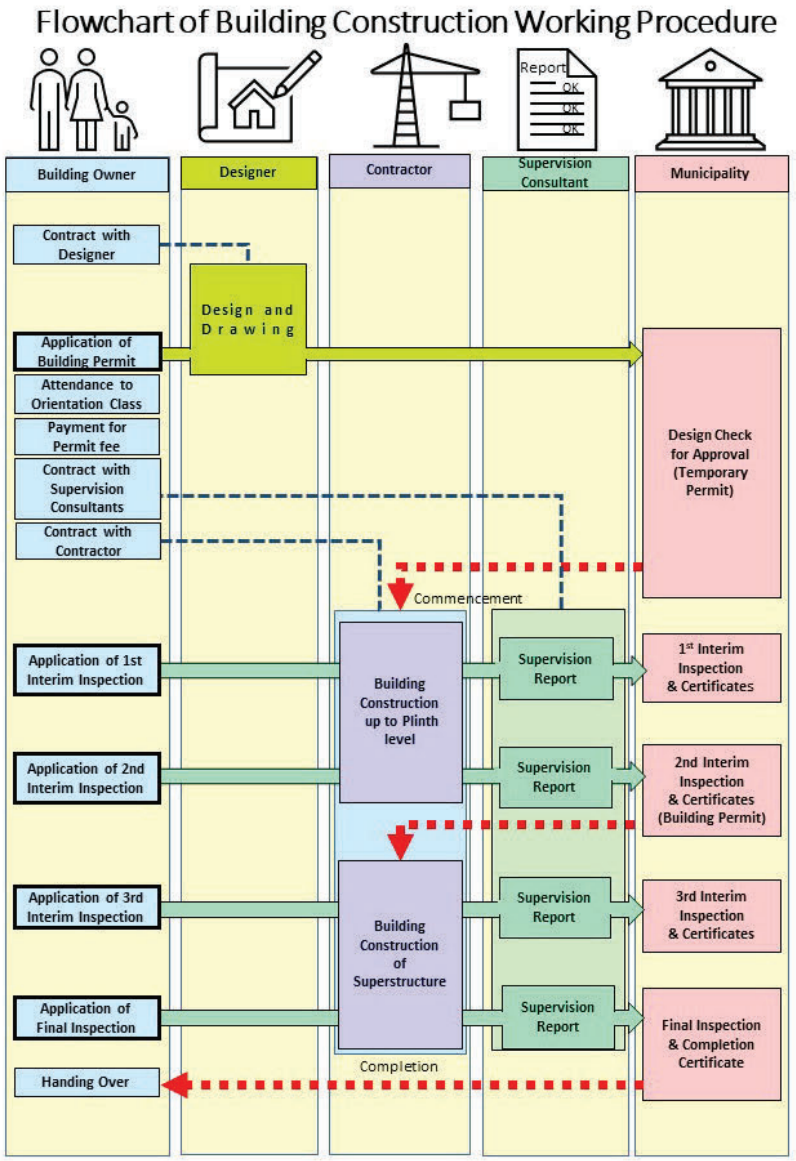
The Designer is responsible for preparing design documents for building construction. The Designer must be qualified for defined category of Building and registered to the Municipality. Construction and Supervision are implemented based on the design documents prepared by the Designer.

Contractor

Contractor is responsible for carrying out the construction work according to the design & drawing documents within the construction period specified in the contract as well as safety control on site. The Mason/Contractor must be qualified for defined category of Building and registered to the Municipality

Supervision Consultant

The supervision consultant is responsible for confirming that the construction work is being carried out according to the design documents and for reporting to the Municipality. The supervision consultant must be qualified for defined category of Building and registered to the Municipality.



Abbreviations

GON	Government of Nepal
NRA	National Reconstruction Authority
MoUD	Ministry of Urban Development
MoFAGA	Ministry of Federal Affairs and General Administration
DUDBC	Department of Urban Development and Building Construction
KVDA	Kathmandu Valley Town Development Committee
JICA	Japan International Cooperation Agency
UNDP	United Nations Development Progarmme
UNCHS	United Nations Human Settlement Programmes (UN-Habitat)
NEC	Nepal Engineering Council
NS	Nepal Standard
IS	Indian Standard
BCWP	Building Construction Working Procedures
e-BPS	Electronic Building Permit System
RCC	Reinforced Cement Concrete
RC	Reinforced Concrete
PCC	Plain Cement Concrete
NBC	National Building Code
NNBC	Nepal National Building Code
DPC	Damp Proof Course
Re-bars	Reinforcement Bars
CAO	Chief Administrative Officer
ROW	Right of Way
FAR	Floor Area Ratio
OPC	Ordinary Portland Cement
PPC	Portland Pozzolana Cement
M15	Mix 15 (1part cement: 2 Part Sand: 4 Part aggregates)

M20	Mix 20 (1part cement: 1.5 Part Sand: 3 Part aggregates)
M25	Mix 25(1part cement: 1 Part Sand: 2 Part aggregates)
TMT Bars	Thermo-mechanically treated Bars
BoQ	Bill of Quantity
CGI	Corrugated Galvanized Iron
db	Diameter of Rebar
ldh	Horizontal Development Length
N/A	Not Applicable

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Preamble

This guideline for Supervision Consultant on building construction working procedures has been prepared to facilitate Supervision Consultants on all stages of building permit process and building construction complying building By-Laws and building code. The guideline provides highlights on role and responsibilities of Supervision Consultant for maintaining quality of materials and workmanships following construction safety and detailing works. The required documents, forms and formats are included for reference to supervision consultant to process for building applications and field inspections. Illustrations and sketches are provided wherever necessary to educate Supervision Consultants on attentions to be made to avoid discrepancies in building construction works. The ultimate target of the guideline is to make Supervision Consultant more responsible in whole process of building permit system by providing guidance to every step of building applications, construction supervision, building inspection and issuance of building completion.

Government of Nepal has formulated this working procedure pursuant to the clause 22 of the Building Act, 2055 (1998 AD).

Section 1. Preliminary

1.1. Short title, Commencement & Application

a) These guidelines shall be called "The Guidelines for Supervision Consultant on Building Construction Working Procedure, 2078 (2022 AD)".
b) This guideline shall extend to the whole territory of Nepal.
c) This guideline shall come into operation immediately.
d) This guideline shall be applicable for the issue of building permit from the municipality to all kind of the Building Construction including repair, retrofitting, renovation, expansion, addition of storeys and changing of occupancy type, compound wall.

1.2. Definition

In this guideline, unless the context otherwise requires, the expressions given below shall have the meaning indicated against each of them.

a) "Building" means any closed structure constructed using various construction materials for the purpose of human habitation.
b) "Building Construction" means construction of new building, reconstruction after demolition of the old building, expansion of building, addition of storeys, change of façade of the existing building, additions or alterations of windows, doors, parapets, balconies, height, porticos, etc and other related works.
c) "e-BPS" means the Electronic Building Permit System through which building permit is issued online by the municipality.
d) "Drawing" means all drawings and relevant documents pertaining to the construction of building.
e) "Designer" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of the preparation of drawings & designs and/or construction.
f) "Supervision Consultant" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of carrying of construction supervision of the building as prescribed by the municipality.
g) "Deed of Public Inquiry (Sarjamin Muchulka)" means the document prepared after the public inquiry on the land plot, access road, neighboring plots with regard to the construction of building conducted by the ward chairman or his representative in presence of the land owners of the adjoining plots including the signatures of the present.
h) "Storey" means the portion of building between two floors or between the floor and the ceiling.
i) "Plinth" means the portion of a structure between the surface of the surrounding ground and surface of the floor immediately above the ground.
j) "Plinth Level" means the level of the floor of a building immediately above the surrounding ground.

k) "Plinth Area' means the built-up covered area of the building / buildings immediately at plinth level.
l) "Superstructure" means the portion of the building above the Plinth Level.
m) "Occupancy Type" means the "use to which the building is put, such as residential, commercial, cold storage, warehouse, apartment, hospital, hostels, institutional, etc.
n) "Occupancy Change" means change of occupancy type of the building from the approved occupancy type at the time of building permit issuance.
o) "Building Code" means National Building Code of Nepal enacted by the Government of Nepal.
p) "Building By-Laws" means the building By-Laws of the respective municipality
q) "Municipality" means the municipalities in Nepal established as per the Constitution of Nepal and also denotes Metropolitan City, Sub-metropolitan City and Rural municipality in the country.
r) "Mayor" means the Mayor of the respective municipality.
s) "Chief Administrative Officer" means the Chief Administrative Officer of the respective municipality.
t) "Act" means Local Government Operations Act, 2074 (2017 AD).
u) "Municipal Assembly" means the municipal assembly of the respective municipality.
v) "Financial Act" means the approved financial act approved each year by the municipal council of the respective municipality.
w) "Building Owner" means every person, company or institution, who intends to construct or re-construct a building or make material alterations or cause the same to be done.
x) "Mason" means masons engaged in the building construction activities.
y) "Contractor" means contractor engaged by the Building owner for the building construction activities.
z) Application form: means the documents prepared for getting building permit from the municipality for Class A, Class B, Class C and Class D buildings separately

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Section 1. General information of BCWP

1.1. Background and Purpose of BCWP

The building construction practices in Nepal is improving drastically in recent decades. New construction materials, equipment, technologies are being introduced in the construction sector for carrying out the sophisticated construction works smoothly, properly and timely. That is in the case of the bigger and large-scale building construction projects such as high-rise apartments, group housing, commercial complexes, corporate office buildings and so on. The qualified technical team and professional contractors are involved in such large-scale building projects. Quality tests and technical supervision and monitoring are carried out in a professional way. However, for most of residential buildings which are comparatively small scale in terms of cost and volume of works, the professional qualified technicians are rarely involved and quality works mostly depends on the informal contractors and semi-skilled masons. Construction details are not followed and the new technologies and testing methodologies are rarely used to assure the quality constructions. Building act, 1999 and Building Regulation, 2009 of Nepal has made mandatory provision of technical supervision of building construction works with qualified technicians. However, these are not being enforced by most of the municipalities. There is lack of standard working procedures and guidelines to carry out inspection works as per prevailing building By-Laws and building code. The role and responsibilities of the major stakeholders of building constructions are not clearly defined. There are no cross checking and monitoring mechanism to regulate the building constructions in the urban and rural municipalities. Moreover, the informal stakeholders of building sectors are not trained, capacitated and sensitized on building norms, criteria, quality control and detailing to safeguard the building stocks from possible natural disasters mainly the earthquakes. Realizing these adverse situations on building sector, DUDBC has taken initiation to develop Building Construction Working Procedures (BCWP) based on Building Act 1999 to support municipalities to enforce building regulations following building By-Laws and building code of Nepal, The main purpose of the BCWP is to make uniformity in the building permit process in the municipalities all over the country with introduction of interim inspections of building constructions by municipal technicians. The other purposes of developing and enforcing new BCWP are as follows:

- To make the municipal technicians, designers, supervision consultants, contractors and masons and Building owner more responsible on overall building permit system of municipalities.
- To make the technical supervision mandatory for all new building constructions in municipalities
- To improve the quality of construction works with introduction of compulsory lab testing of construction materials and concrete works
- To improve compliancy of building By-Laws and building code in design and construction

- To safeguard the building stocks in urban and rural areas of the country from probable earthquake disasters

1.2. Flowchasrt of BCWP



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1.3. General information of Building By-Laws and building code in Nepal

1.3.1. Earthquake Risk in Nepal

- Nepal is ravaged by multiple natural hazards annually resulting in significant number of loss of lives and properties. Epidemics, floods and landslides are among the most frequent natural hazards with high magnitudes and intensities occurring throughout the country. Earthquake, cyclonic wind, thunderstorm, drought, famine, cloudburst, fire, avalanche is often recurring natural disasters in the country. In terms of vulnerability to natural disasters, UNDP/BPCR has ranked Nepal as the eleventh in terms of risk from earthquakes and thirtieth in terms of risk from flood (UNDP/BCPR 2004).
- Nepal's location in a highly active tectonic region of the Himalayan belt has increased the risk of earthquake disaster in the region. The subduction of Indian plate under the Tibetan plate is considered as the major source of seismicity in the region. Over the last century, great earthquakes in the Himalayan region occurred in 1803, 1833, 1897, 1905, 1934 and 1950 (Bilham ,Gaur, and Molnar 2001). Seismic records showed the 1833 earthquake in Nepal, 1879 earthquake in Shilong, 1905 earthquake in Kangra, 1934 earthquake in Bihar-Nepal and 1950 earthquake in Assam also caused deaths of thousands of people.

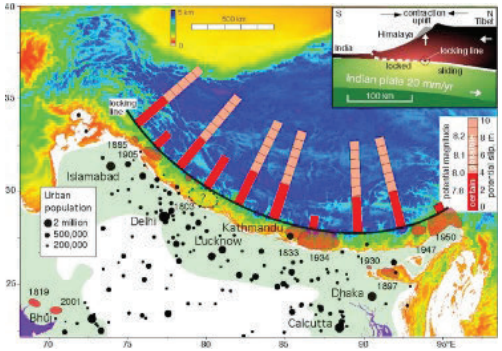


Figure 1: Estimated slip potential along the Himalaya and urban populations south of the Himalaya (Bilham, Gaur, and Molnar 2001)

- Seismic records for Nepal date back to 1255 and since that time several destructive earthquakes have occurred in 1408, 1681, 1810, 1833, 1866, 1934 and 2015. The 1934 Bihar-Nepal earthquake with magnitude of 8.4 took a toll of 4,300 people, destroying about 20 percent of all structures and damaging another 40 percent of buildings in Kathmandu Valley. This earthquake was believed to rupture a 200-300 km long segment to the east of Kathmandu(Pandey and Molnar 1988). In recent decade, Nepal experienced four major earthquakes: a 6.5 magnitude quake in Bajhangdistrict on 29 July 1980 that killed 178 people and destroyed about 40,000 buildings and a 6.6 magnitude quake in Udayapur district that killed 721 people and destroyed 65,000 buildings.

- Similarly, an earthquake of 6.9 Richter Scale hit at eastern border of Nepal between Taplejung and Sikkim on 18September2011. The earthquake had affected eight districts of eastern region caused 5000 building totally collapsed and 6500 buildings partially damaged including many school buildings.
- On 25 April 2015, a huge 7.8 magnitude earthquake (Gorkha earthquake) struck Barpak in the historic district of Gorkha, about 76 km northwest of Kathmandu. Nepal had not faced a natural shock of comparable magnitude for over 80 years since the Bihar earthquake. And numerous aftershocks have occurred since the Gorkha earthquake, the largest aftershock is a magnitude 7.3 on May12, 2015. The Gorkha earthquake and aftershocks caused massive damages and losses, a lot of collapse of the buildings of high vulnerability which were increased the number of death. Remarkable and regrettable damages extended many historical buildings including world heritage sites. A damage and loss assessment showed that over 8,831 people lost their lives and 22,309 were injured. An over 602,000 private houses and 2,600 public buildings were completely collapsed. 285,000 private houses and 3,700 public buildings were damaged partially. 19,000 classrooms were completely damaged and more than 11,000 classrooms were damaged partially.
- In 2005, the Western Himalaya was hit by an earthquake with magnitude 7.4 killing more than 74,000 people in Pakistan and India. The location of ruptured areas shows a gap along the mountain range between the location of the 1905 Kangra and 1934 Bihar-Nepal earthquakes. It is believed that this region has not experienced such an earthquake since the last large earthquake. This portion of the arc is thus referring to as a 'seismic gap' (Figure 2), a potential location for the next large earthquake. This earthquake scenario evidently indicates that the entire Himalayan belt is one of the most vulnerable zones in terms of seismic hazard. The works on fault modelling (Chamlagain and Hayashi 2007)of Nepal Himalaya has shown continuous accumulation of elastic strain to reactivate older geological faults to generate earthquake of different magnitude. Moreover, several other lines of evidence (e.g. neotectonic, geomorphological, geophysical, geological, andseismological) also show that one or more mega-earthquakes may be overdue in a large fraction of the Himalaya (probably area between Kathmandu and Dehradun), threatening millions of people in the region.

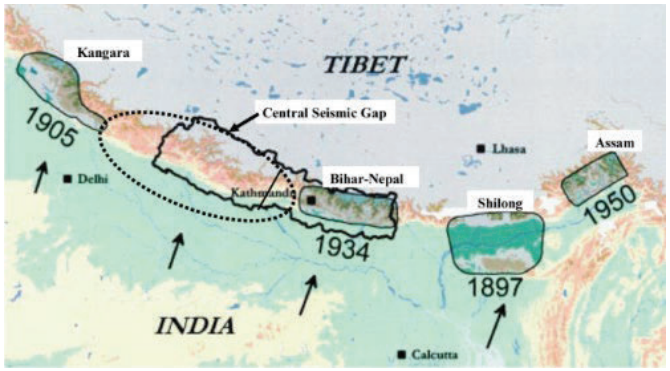


Figure 2: Distribution of probable rapture zones of 1879, 1905, 1934 and 1950 earthquakes along the Himalayan arc. Modified from (Yeats and Lillie 1991; Yeats et al. 1992)

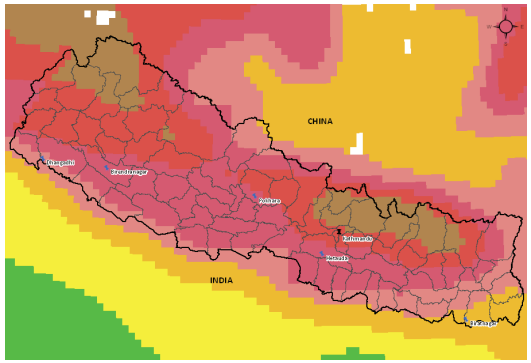


Figure 3: GSHAP seismic hazard map of Nepal [Adopted from (Giardini et al. 1999)]

- The GSHAPseismic hazard map shows that the entire country falls in a high earthquake intensity region of seismic risk scale corresponding to MMI, IX and X. The far western and eastern mountainous regions are the most hazardous regions with rest of entire hilly and the Terai regions lying in a high earthquake hazard zone. The hilly regions and the southern Terai region are the most densely populated areas of the country with a probability of very high population loss in an event of a major earthquake in the region.
- The level of risk has been increased further in our cities due to high urban growth rates and consequent high physical exposure and lack of preparedness. There are number of factors that contribute to the configurationof risk in cities. Firstly, the location of the city in terms of geology and seismological hazard; secondly the urbanization process which leads to the concentration of populations in risk-prone cities, and risk–prone locations within cities.



Figure 4: Some pictures of Building Damages in Kathmandu during Earthquake of April 2015 (Source: Google)

1.3.2. Background of NBC

That earthquake of 6.7 Richter scale that struck in eastern Nepal in 1988 drew attention of the Ministry of Urban Development (Former Ministry of Physical Planning and works), need for changes and improvement in current building construction practices in Nepal. It was recognized and request of Government of Nepal, technical assistance from UNDP and UNCHS (Habitat) had set up a three-year program “Policy and Technical Support to the Urban Sector” within the ministry. Then the sub-project “National Building Code Development Project” (UNDP/UNCHS/(Habitat)NEP/88/054) was formulated in 1992-93 within the Department of Urban Development and Building Construction (DUDBC) (former Department of Buildings) including with the government counterpart from the department. The Project developed Nepal National Building Code of Nepal which included 20 volumes of the different kinds of the Codes.

Building code is a set of standard practice adopted by engineering community for designing and constructing buildings and backed by legislation. It is an engineering tool for ensuring structural safety of buildings and convenience of occupants. In other words, in context of Nepal, building code is an official document which comprises of earthquake resistant design and construction technology considering suitability of Nepal’s geology, environment using locally available construction materials and technology as far as possible. The main purpose of the building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law

of a particular jurisdiction when formally enacted by the appropriate authority. Thus, in context of Nepal implementation of National Building Code is mandatory in all Urban and Rural Municipalities of Nepal according to Building Act 1999 (First Amendment 2007). Building code is not changeable according to the location or topography of municipalities. The code is unique for all over Nepal as it covers all categories of buildings especially structural design part which are constructed in the country.

Although too late, initiations have been taken to implement the National Building Code in municipalities of Nepal. Many municipalities have been implementing Nepal National Building code in building permit process. And DUDBC is strictly applying NBC in government buildings. Other municipalities and rural municipalities are trying to apply NBC gradually.

Department of Urban Development and Building Construction (DUDBC) had added three additional codes in 2003 besides the existing 20 volumes of the codes. They are Architectural (NBC 206), Sanitary (NBC 207) and Electrical code (NBC 208). After the Earthquake of 2015 NBC 202, 203, 204 and 206 have been updated. NBC 205: Mandatory Rules of Thumb for RC Buildings without masonry infill has been updated in 2012 as NBC 205: Ready to use detailing for RC Buildings without masonry infill. The present 23 volumes of codes have been formerly approved by the Government in the year 2003. The name list of Nepal National Building Codes is as follows:

- NBC 000: Requirement of State-of-the-Art Design and Introduction:
- NBC 101: Materials Specifications
- NBC 102: Unit Weight of Material
- NBC 103: Occupancy Load (Imposed Load)
- NBC 104: Wind Load
- NBC 105: Seismic Design of Buildings in Nepal
- NBC 106: Snow Load
- NBC 107: Provisional Recommendation on Fire Safety
- NBC 108: Site Consideration for Seismic Hazards.
- NBC 109: Masonry: Unreinforced
- NBC 110: Plain & Reinforced Concrete
- NBC 111: Steel
- NBC 112: Timber
- NBC 113: Aluminium
- NBC 114: Construction Safety
- NBC 206: Architectural Design Requirement.
- NBC 207: Electrical Design Requirements for (Public Buildings)

- NBC 208: Sanitary and Plumbing Design Requirements)
- NBC 201: Mandatory Rules of Thumb: Reinforced Concrete Building with Masonry Infill
- NBC 202: Mandatory Rules of Thumb: Load Bearing Masonry
- NBC 203: Guidelines for Earthquake Resistance Building Construction: Low Strength Masonry
- NBC 204: Guidelines for Earthquake Resistance Building Construction: Earthen Buildings (Eb)
- NBC 205: Mandatory Rules of Thumb: Reinforced Concrete Building without Masonry Infill

1.3.3. Background of Building By-Laws

- Building By-Laws refer to the set rules and regulations for building planning architectural designing enforced by municipalities which are mandatory to be obliged by building owners during building application and building construction.
- Ministry of Urban Development (MoUD) had developed and circulated "Model building By-Laws (2014)" as a reference document for new municipalities to formulate building By-Laws.
- The Ministry of Federal Affairs and Local Development (MoFALD), immediately after the major earthquake of April 2015, had circulated basic directives (2015) for housing development, urban planning, and building construction for all municipalities to upgrade and formulate building By-Laws considering resilience of the cities from earthquake and other natural disasters.
- Similarly, Ministry of Urban Development (MoUD) had published and circulated the Basic Standards on Settlement Development, Urban Planning & Building Construction (2015) as a guiding document for the new municipalities to formulate complete building By-Laws as per their geo-physical circumstances and conditions. This By-Laws was approved by Government of Nepal on 30 September 2015 was published in Nepal Gazette on 8th April 2016. This By-Laws was amended and published in Nepal Gazette on 10 April 2017.
- Building By-Laws may vary in different municipalities according to the local context, geography, topography such as provision of floor area ratio as per the land use zones, right of ways for local roads etc. However, municipalities cannot make weaker By-Laws than Basic Planning By-Laws of MOUD.
- If any municipality has already applied stronger By-Laws than the National Building By-Laws, the municipality one will prevail.
- Building By-Laws for the Construction in Kathmandu Valley, 2064 was approved by Government of Nepal on 1st May 2007 which was effective from 15 may 2007. This By-Laws was amended by the Government of Nepal on 16th November 2008 and 28 June 2010.
- The basic criteria of building By-Laws are Right of ways (ROW), front Setbacks, side setbacks, setbacks from river, lake, pond, forest, high tension electric lines, ground

coverage, floor area ratio (FAR), light planes, rules for open spaces and so on. The detail description of the basic criteria of building By-Laws has been provided in Annex-2.

- Discrepancies to building By-Laws may lead to the rejection of the building permit during application process or certifications of superstructure and building completion if the construction violates the norms of building By-Laws.
- Apart from the building By-Laws provisions of building code should be followed during construction of buildings.
- Till now few municipalities of Nepal have been enforcing building code and most of the urban and rural municipalities are still lagging behind for the implementation of building code.
- Masons should understand that violation/ignorance of building code is violation/ignorance of Government's law and negligence in structural safety of buildings.
- Undermining building code means compromising safety of its inhabitants from earthquake disasters which is inevitable in earthquake prone country like Nepal.
- Thus, masons should strictly follow Building Construction Working Procedures (BCWP) for getting compliance of both building code and building By-Laws in design/ drawing and in actual construction.

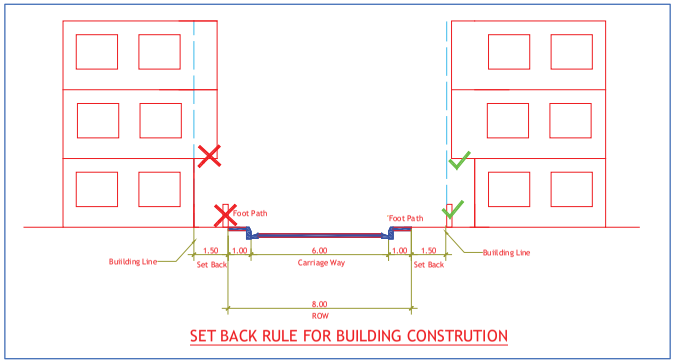


Figure 5: Set back rule for building construction

1.3.4. Category of buildings

Building Act, 1998 categorizes design and construction of buildings into four types according to their level of sophistication.

Category A: Buildings constructed as per the International State-of-the-Art

- Under the first category International State-of-the-Art, if consultants/ designers ensure that their designs meet the corresponding international standard, the designs are considered to be in conformity with NBC.

Category B: Professionally Engineered Buildings

- The second level refers to Professionally engineered structures and covers all usual structures such as hospitals, meetings halls, factories, warehouses, multi-storey buildings and residential buildings.

Category C: Buildings designed & detailed to the Mandatory Rules-of-Thumb

- The third category refers to buildings of restricted size designed with simple Rules-of-Thumb, and mostly applies to remote areas where simpler buildings are prominent. The explanatory documents are such that an experienced Sub-Engineer will be able to understand them and present sufficient details at the time of permit application to prove to a skilled appraiser at the Local Authority that the requirements have been met. The requirements are in terms of limits on spans and heights, minimum reinforcing and member sizes, positioning of earthquake-resisting elements and other such rules.

Category D: Buildings detailed to the Guidelines for Remote rural buildings

- The fourth category is guidelines for remote rural buildings. These guidelines address about a dozen typical building styles that have been condensed from an inventory of approximately fifty-five building types surveyed in 1993.
- These structures are normally of earthen construction (e.g. unburned masonry, mud-mortar, rubble, dry stone, wattle and daub). Whereas these recommendations are described as guidelines, it is intended to be mandatory for such structures built in areas controlled by a building permit-issuing local authority.

Classification of National Building Code according to their use

S. No.	Type of Building Code	Purpose
1	**International State-of-Art** **Applicable codes:** **NBC 000**	**Modern building to be built, based on the international state-of-the-art, also in pursuance of the building codes to be followed in developed countries.** **For Example: Constitutional Assembly Building at Baneshwor, Kathmandu** 

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S. No.	Type of Building Code	Purpose
2	**Professionally Engineered Buildings** **Applicable codes:** NBC 101 | NBC 107 | NBC 113 NBC 102 | NBC 108 | NBC 114 NBC 103 | NBC 109 | NBC 206 NBC 104 | NBC 110 | NBC 207 NBC 105 | NBC 111 | NBC 208 NBC 106 | NBC 112	**Buildings with plinth area of more than one thousand square feet or with more than three floors including the ground floor or with structural span of more than 4.5 meters.** **These are the buildings designed and constructed under the supervision of engineers.** **For example: Multi-Storied Commercial Buildings** 
3	**Mandatory Rules of Thumb** **Applicable codes:** NBC 110 NBC 201 | NBC 202 NBC 205	**Buildings with plinth area of up to one thousand square feet, with up to three floors including the ground floor or with structural span of up to 4.5 meters.** **These are the buildings with regular configurations designed and constructed by technicians in the areas where professional engineers' service is not available.**  **For Example: Three Storied RCC framed Structured Residential Buildings.**

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S. No.	Type of Building Code	Purpose
4	**Guidelines for Remote Rural Buildings (Low Strength Masonry/ Earthen Buildings** **Applicable codes:** NBC 203 | NBC 204	**Small houses, sheds made of baked or unbaked brick, stone, clay, bamboo, grass etc., except those set forth in clauses (a), (b) and (c).** **These are the buildings constructed by local masons in remote areas and not more than 2 stories in height.**  **For Example, Brick or Stone in mud mortar Rural Building with slate/CGI Sheet roofing.**

1.3.5. Classification of Building according to the Occupancy Type described in the Building By-Laws:

For the purpose of implementation of building By-Laws, buildings are classified into the following categories:

a) **Conference/ Community Hall:** buildings where people gather for the purpose of getting entertainment, recreation, social functions, political programs, physical fitness, etc. such as dance theatre, cinema halls, city centers, museums, exhibition hall, fitness centres, gymnasiums, auditoriums, pray areas, restaurants, bus terminal, airport terminals, railway terminals, discotheque centers, etc.

b) **Commercial Buildings:** buildings used for the display and selling of retail or wholesale goods including their storage, such as shops, malls, departmental stores, etc.

c) **Academic Buildings:** buildings used for the academic teachings to students under the authority of education boards and universities, such as schools, colleges, coaching centers, research centers, hostel facilities of the educational institutions, etc.

d) **Industrial Buildings:** buildings used for the processing, assembly and manufacture of various goods, generation of electricity, etc. such as assembly plants, refineries, dairies, factories, power plants, etc.

e) **Institutional Buildings:** buildings used for the management, care and treatment of people such as hospital buildings, jail buildings, center for taking care of senior citizens, facilities housing single women, children or differently-abled persons, etc.

f) **Business Buildings:** buildings used for business activities such as business firm offices, auditing offices, professional firms, banks, etc.

g) **Warehouse:** buildings where storage of various goods and materials is done, such as goddamn house, store house, warehouse, garage, hanger, cold store building, etc.
h) **Residential Buildings:** buildings used for common residential purpose including facilities for cooking, living and sleeping, such as common residences, apartment buildings, group housing buildings, etc.
i) **Mixed Use Buildings:** buildings used for more than one use, such as those buildings in which lower stories are used for commercial purposes and upper ones are used for residential purposes.

1.4. Steps in Building permission process

The steps in Building Permit Process in municipalities as per the new BCWP are as follows:

Step 1: Selection of Designer, Supervision Consultant & Contractor / Masons from the list published by the municipality

Step 2: Preparation and submission of Application Documents, Designs and Drawings at Registration Desk

- Preparation of designs, drawings & details through the registered designers in the municipality
- Checking and verification of the application form, designs and drawings by the building owner
- Signatories of the building owner or his/her authorized representative and the designer in application form and design/drawings along with the names, addresses and contact numbers
- Submission of Building application to registration desk of the Municipality

Step 3: Approval of Submitted Designs, Drawings & Details

- Completeness check of design drawings and required documents by registration desk
- Checking of design drawings as per prevailing building By-Laws by Building By-Laws Section/Unit of Municipality
- Checking of design drawings as per building code by Building Code Section/Unit of Municipality
- Suggestion to building owner/designer for corrections of design drawings, if any
- Endorsement building application for Registration

Step 4: Field Verification and Public Inquiry:

- Sending the submitted application form with designs & drawing from the Registration Desk to the ward office
- 15 days' notice to neighbors for registering complaints, if any
- Complaint Processing by technical/legal section of municipality, if any
- On-Site verification and Public Inquiry by Ward Office
- Field Report Submission by Ward Office Technician and Admin staff

- File Submission to Technical Desk/Section by the Ward Office

Step 5: Payment of Building Permit Fee

- Recommendation by technical desk/section for payment of building permit fee to the Revenue Desk
- Payment of Building Permit Fee by Building Owner
- Final verification of design drawings and copies of required documents with original one by the Technical Desk/Section

Step 6: Attendance to the Orientation Class on NBC &Earthquake Resistant Building Construction by the Building Owner:

- Attend by building owner in the orientation class on National Building Code & Earthquake Resistant Building Construction along with the hired masons/contractors
- Forward the name list of the building owners who have attended orientation classes to the Technical Desk/Section

Step 7: Temporary Building Permit for the Construction up to Plinth Level 1

- Design final check & recommendation for issuing Temporary Building Permit to Chief Administration Officer (CAO) by Technical desk/Section
- Verification building application and approval by CAO
- Issuance of temporary building permit along with a set of approved drawings by Technical Desk/Section

Step 8: Selection of supervision consultant and contractor/masons from the list published in the municipalities' website

- The building owner will hire registered supervision consultant from the roster published in the municipal website for technical supervision of building construction
- Likewise, the building owner will hire registered contractor or masons from roster published in the municipal website for carrying out the construction work

Step 9: Construction up to the Plinth level

- Commencement of the Building Construction Works
- Layout and preparation of foundation works
- Supervision report about the preparation of foundation works by the Supervision Consultant

Step 9(a): First Interim Site Inspection by municipality

- Construction up to foundation and column re-bars
- Application for first interim site inspection with Supervision Report by the Registered Supervision Consultant
- The first interim site inspection is carried out by the municipal technician for the construction arrangement of foundation before casting.

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- Verify that the actual layout of the foundations and columns along with their rebar arrangements has been done as per the approved designs & drawings.
- In the case of masonry structures, layout of masonry foundations and walls shall be checked.

Step 9(b): First Interim Inspection Certification

- If the construction below plinth level is confirmed with approved designs and drawings, then first Inspection Certificate is issued
- Notice to proceed will be issued to Building Owner for construction works up to plinth level

Step 9(c): Second Interim Inspection

- Construction up to plinth level casting
- Application for second interim site inspection with Supervision Report by the Registered Supervision Consultant
- The second interim site inspection is carried out to verify the actual construction up to the plinth level including the plinth beam as per the approved designs & drawings after casting.

Step9(d): Final Inspection for the Completion Certificate by Municipality

- The municipal technician shall recommend for the issuance of second Inspection Certificate along with recommendation for the issuance of Permanent Building Permit if the actual construction has been done up to the plinth level as per the approved design drawings.

Step 9(e): Permanent Building Permit for Construction of Superstructure

- Chief Administrative Officer (CAO) issues the Permanent Building Permit for the construction of superstructure of the building upon receiving the recommendation from the Technical Desk

Step 10: Construction of Superstructure of the Building

- Commencement of the Superstructure Construction
- Supervision Report by Registered Supervision Consultant

Step 10(a): Third Interim Inspection by Municipality

- Construction up to first floor beam and slab re-bars.
- Application for third interim site inspection with Supervision Report by the Registered Supervision Consultant
- The 3rd interim site inspection is carried out at first floor level to verify that the actual construction has been done as per the approved designs and drawings before casting.
- The Technical Section issues the 3rd Inspection Certificate

- Interim inspections for upper storeys may be carried out by the municipality to verify that the construction is being undertaken in full compliance with the approved designs & drawings.

Step 10(b): Third Interim Inspection Certification:

- The municipal technician shall recommend for the issuance of Third Interim Inspection Certificate if the actual construction has been done up to the first floor level as per the approved design drawings.

Step 11: Building Completion Certificate

Step 11(a): Final Inspection for Completion Certificate by Municipality

- Completion of Construction
- Application for Building Completion Certificate with Supervision Report by the Registered Supervision Consultant
- Municipal technician carries out final inspection of the building, review technical supervision report and verify that the actual construction has been done as per the approved designs and drawings and maintenance of public infrastructure road, drain etc. have been completed.
- Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon recommendation from technical section

Step 11(b): Issuance of building construction completion Certification:

- If the inspection report indicates that the building has been completed as indicated in the Supervision Report and the building has been painted at least one coat on the inside and outside surfaces and maintenance of public infrastructure road, drain etc have been completed, then the building construction completion certificate shall be issued to the Building Owner by the Municipality.
- Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon receiving recommendation from technical desk/section

1.5. Critical points of BCWP for Supervision Consultant

Supervision Consultants should consider following critical points of BCWP for conducting his supervision services for compliancy of building By-Laws/ building code in the constructions:

- The technical supervision is mandatory for all buildings and building owners need to hire Supervision Consultant for carrying the supervision works
- Supervision Consultants need to be registered in the concerned municipality to work for Supervision services on behalf of the owner
- Registered Supervision Consultant shall supervise building site and prepare supervision report proving building is constructed as per approved designs and drawings.
- The supervision report shall include test reports on compressive tests of concrete for every story to assure the quality of reinforced cement concrete worksfor building categories A, B and C

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- Contractor should assist supervision consultant to provide photographic evidenceand record of construction detailing and quality works
- Municipality will carry out three interim inspections and one final inspection of building constructions for assurance of compliancy of building By-Laws and building code.
- Supervision Consultant shall apply foreach Inspection with supervision report on behalf of the Owner
- Interim inspection certificates are required for getting permanent building permit and final completion certificates from the municipality

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Section 2. General Role and Responsibility of Municipality

2.1. Legal Position of Supervision Consultants

a) Building Acts, 2055 (1998 AD)

Clause 10. Buildings to be built in consonance with Building Code states, “Any person, body or government body shall, in making a building, build it in consonance with the standards set forth in the building code. In so making a building, the building shall be built under the supervision of a designer or his/her representative, engineer or architect whose rank is at least the same as that of the designer, engineer or architect who has certified the map and design of that building.”

Accordingly, Supervision Consultant shall be legally responsible as follows

i) Supervision consultant is responsible to supervise if the building is in consonance with the standards set force in the Building Code.

ii) Also, Supervision consultant shall be a designer or his/her representative, engineer or architect whose rank is at least the same as that of the designer, engineer or architect who has certified the map and design of that building.

b) Responsibility as per BCWP

Supervision Consultant who is registered in the municipalities and is working on behalf of building owner will be legally bound to follow the provisions of BCWP, endorsed by the municipality. The legal responsibilities for supervision consultant for conducting supervision services in construction are as follows but not limited to:

- Supervision Consultant shall, with due care and diligence, supervise the building works to confirm if the works are in accordance with the approved designs and drawings.
- The Supervision Consultants shall give prompt notice to the Contractor, with a copy to the building owner, of any error, omission, fault or other defect in the works, which he discovers.
- The Supervision Consultants shall keep the essential record of the supervision to prove that his supervision compliance to the design documents.
- In no case shall the Supervision Consultant instruct or allow the Building Owner or the Masons or the Contractor for carrying out construction against the provisions of the prevailing laws & the building By-Laws and the building code. The Supervision Consultant shall terminate the supervision contract signed with the Building Owner in case the Building Owner issues instructions to him/her against the prevailing laws, By-Laws and the building code.

2.2. Classification and Registration

Engineers, Architects and consulting firms who wishes to provide the services for Supervision of buildings shall get registered in the municipality. Registration of Supervision Consultant shall be done free-of-cost by the municipality. It shall be done at any time

provided the Supervision Consultant has submitted all copies of documents required for the registration process. Municipality shall publish the list of such registered designer consultant in the website for easy access of the Building Owner. There are two levels of Supervision Consultant depending upon their academic qualifications and category of buildings for which they are authorized to certify.

i) Engineers or Architects having obtained at least bachelors' degree in civil engineering or architecture respectively and who are required to be registered in Nepal Engineering Council

ii) Sub-engineers or Diploma Engineers who have completed certificate or diploma level in civil engineering or architecture from recognized institution

Pursuant to Clause 11 sub-clause 3 of the Building Act 2055 (1988 AD), the level of technical personnel on the basis of their academic qualifications required for the certification of buildings of various categories are as follows:

S.N.	Academic Level	Building Category			
		"A"	"B"	"C"	"D"
a)	Engineers/ Architects	✓	✓	✓	✓
b)	Sub-engineers/ Diploma Engineers	X	X	✓	✓

Residential buildings

categorized by Building act Category C and Category D can be supervised by professionals registered in class "b". Construction Supervision of Category A and Category B buildings is liable by professionals registered in class "a".

2.3. Responsibility of Supervision Consultant at different stages of building permit process

2.3.1. General Responsibility of Supervision consultant for building application stage

a) Registration to Municipality:For the building permit, building owner shall get an application form which include name and address of Supervision Consultant who will be engaged in building construction after getting building permit and such supervision consultant shall be registered in municipality.
In case the Supervision Consultant is changed during the construction phase, the building owner shall notify the municipality with the revised list of such consultants before the commencement of construction. Supervision Consultant Registration form is attached in Annex-II-b

b) Contract with Building Owner: The building owner shall select supervision consultant for applying for building permit. While municipality have made easy access to building owners

on selecting supervision consultant by providing list of registered supervision consultant in their website. The Supervision Consultant shall break or terminate the contract with building owner in case the building owner issues instructions to go against the prevailing laws, By-Laws and building code in building construction.
If the Supervision Consultant could not continue to provide service to client due to any reason, he has to provide written inform to the client within mentioned time period in bi-party agreement and also notice c/o to the municipality. A sample of agreement between building owner and supervision consultant is attached in Annex-II-a.

2.3.2. General Responsibility of Supervision consultant for building Construction stage

Supervision Consultant shall perform his/her duties with full diligence in supervising the building works confirming as per the approved designs and drawings. Following activities shall be performed by Supervision Consultant in construction stage of the building:

a) Confirmation of building permit:

Supervision Consultant shall be aware of the confirmation of building permit before carrying construction work in the field.

b) Confirmation of Design documents and Contract Condition between Contractor and the Building owner:

The Supervision Consultants shall confirm the design documents and Contract Condition of the Contractor. In case any defects, unclear indication or unclear condition is found, the Supervision Consultants shall notice to the Building Owner and Design Consultants.

c) Commencement of the Building Construction Work:

Supervision Consultant shall supervise the building site and prepare supervision report of every detail after temporary building permit.

d) Confirmation of Compliance under the Design documents

The supervision consultant shall confirm the construction done as per approved designs and drawings and in field including the below mentioned major points

- Building Position and its layout
- Building dimension (size and height)
- Confirmation of materials for construction
- Confirmation of Construction Methodology
- Confirmation of reinforcement as per approved design drawing etc.
- Confirmation of mix proportion of concrete and its compressive strength
- Confirmation of Quality of Workmanship of Construction

e) Assurance of building construction as per rules and regulations of Municipality:

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Supervision Consultant shall keep record of every stage of building construction which proves building is constructed according to approved drawings with photographs of field progress. For buildings of Categories A, B and C, compressive tests of concrete shall be done and supervision consultant shall file test reports on compressive strength of concrete casted at site during the building construction. In case of buildings with floor area greater than 10,000 sq.ft or more than 17m in height, Supervision Consultant shall confirm testing of construction materials are certified and performed as mentioned in QAP.

f) Prepare and Submit Supervision report to municipality of field progress:

Supervision Consultant shall prepare supervision report of building construction along with photographs of field progress**. A sample form of Supervision report is attached in Annex-II-c.**

g) Coordination between Design and Actual Construction:

In case of any omissions or errors done during building construction, supervision consultant shall consult building owner as well as designers for rectifying such works and carry out efficiently following prevailing laws, building By-Laws and building code.

h) Record of Interim Inspection by Municipality:

Supervision Consultant shall be aware of the application for 1st, 2nd and 3rd interim site inspection from municipality during the building construction. Supervision Consultant shall guide building owner for an application for each interim site inspection in right time of building construction to avoid any further obligations from municipality in building construction.

2.3.3. General Responsibility of Supervision consultant for building Completion stage

a) Assurance of application and final inspection of building:

The supervision consultant shall confirm the construction done as per approved designs and drawings before the application for Final Inspection.

b) Prepare and Submit Supervision report to municipality for final Inspection:

Supervision Consultant shall provide technical report along with photographs of field progress in order to file an application for final inspection for getting Completion Certificate by building owner. The report shall contain final inspection checklist along with photographs representing the condition. The report shall be attached with application by the owner to municipality for final inspection request. Final pre-inspection checklist is attached in Annex 3.1

Final report shall contain following data and document, **but not limited to:**

- Construction starting and completion date, Gapping period

- Municipal construction approval drawings, if any deviations done during construction period - re-approvals provided by municipality considering the deviations.
- As built drawings: In general, the Supervision Consultant shall ensure the production and submission of the as-build drawings by the contractor. In absence of provision to prepare 'as build drawing' in contractor's part, the Supervision Consultant has to prepare the document. The drawing should cover as-build architectural drawings, reinforcement detailing of major structural components,
- Photographs: Photographs of municipalities' monitoring stage and completion stage shall include in the report. Sample photo with criteria is attached in Annex IV
- Structural characteristics of constructed buildings such as design parameters and capacity of building, final structural analysis input file, specification of major construction materials, Geo-technical investigation report, and other miscellaneous information related to services and strength.
- Confirmation of Building Construction Completion Certificate: Supervision Consultant shall follow municipality procedure regarding the completion of building construction as per approved designs and drawings. If there are any recommendations to rectify from municipality, supervision consultant shall be responsible to carry out in field and help to confirm building owner to get building construction completion certificate.

2.4. Punishments to defaulters

Action on Unethical Activities by the Consultants (Designers/ Supervision)

Professionals appointed to supervise the construction work should perform his work as per best knowledge to support owner and as per municipal requirements. Any unethical activities during the work performance will be panelized.

2.4.1. Warning Letter at the First Occurrence of Unethical Activity:

At the first instance of notice of occurrence of unethical activity by the Supervision Consultant such as unethical demand with contractor (घुस)or the submission of Supervision Report not complying with the actual field condition or falsifying quality test reports, municipality shall issue a written warning letter to the Supervision Consultant notifying not to repeat such activity and that at the second occurrence, the Supervision Consultant shall be black-listed.

2.4.2. Black-listing at the Second Occurrence of Unethical Activity:

When the Supervision Consultant is found to have done unethical activity for the second time even after the issue of warning letter at the first occurrence, municipality shall black-list the Supervision Consultant for a period of one year debarring the Supervision Consultant from working in the municipality. At the same time, names of the Supervision Consultant shall be removed from the approved list of supervision consultant for such period.

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2.4.3. Recommendation for Action from NEC at the Third Occurrence of Unethical Activity:

Municipality shall recommend to the Nepal Engineering Council for taking actions as per prevailing laws against any work complying with the building By-Laws and/or building code if such activity is found to have repeated for the third time. Furthermore, municipality shall also recommend to the NEC for taking actions against any Supervision Consultants which submits technical report of building construction falsifying the actual construction carried out by the Building Ownerand/ or submitting false report on quality and/or details of actual construction in the field in case such unethical activity is repeated for the third time. The Supervision Consultant shall be completely debarred from providing services as a supervision consultant respectively for the time until the investigation by NEC clears them from unethical activity. Names and addresses of such consultants who have been debarred shall be published on the website of the municipality.

Section 3. Technical task for Supervision Consultant under BCWP

3.1. Critical Control Points under BCWP:

To avoid the building damages and failure described in Clause 3.1, BCWP aims the at fundamental quality of structural works especially of rebar arrangement and concrete strength. To control such quality, following three inspections and testing methods are highlighted under BCWP:

3.1.1. Supervision of the rebar arrangement before the casting

The Supervision Consultant shall check the rebar arrangement of structural members before the casting. In case that the Supervision Consultant is not able to inspect all the rebar arrangement in one-time, alternative evidence such as photo report can be acceptable. The Supervision Consultant shall consult with Contractor in advance if necessary.



Re-bars layout for Foundation and Strap Beam (Source: JICA Project for promotion of NNBC)

3.1.2. Compressive strength test of concrete for every story

In case of RC structure which shall conform to NBC 110, 105, 201, 205, the Supervision Consultant shall confirm the mix proportion and the compressive strength with required number of testing cube sampled at every casting. In case the strength is not confirmed, the Contractor may be instructed to demolish the casted structure. Therefore, the Supervision Consultant is strongly recommended to ensure the mix proportion, mixing method and the compressive strength of the concrete in advance of casting on site in order to avoid the incompliance of required concrete strength.

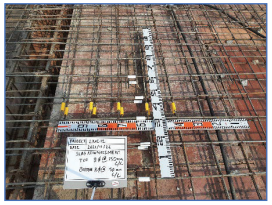



Photos of sampling and comp. test (Source: JICA Project for promotion of NNBC)

3.1.3. Record and report the work

To ensure the quality of the building, physical inspection by the Supervision Consultant is the best way. However, in case the supervision consultant is not available fulltime on site, alternative evidence such as photo report will be acceptable on the condition that the photos can clearly demonstrate the details of the works. Followings are the example of photo report to the Supervision Consultants.





Re-bars Layout for columns, beams and slabs (Source: JICA Project for promotion of NNBC)



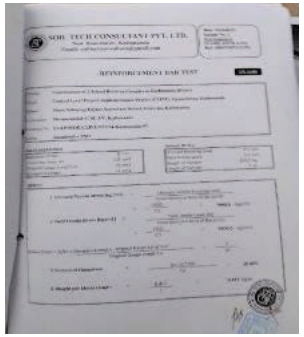
Photo of concrete mixing by mechanical mixer



Photo of Test Sampling for Compressive strength test



Photo of Compressive strength test

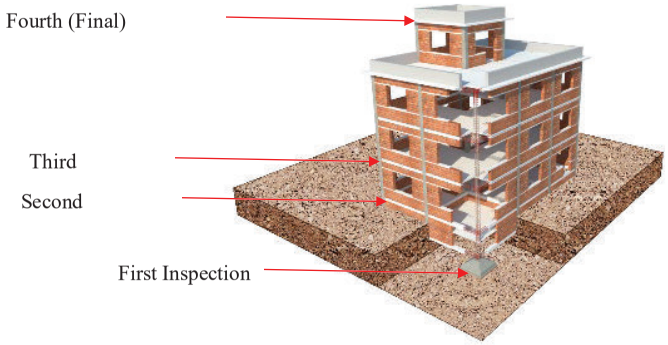



Sample Rebar Test Certificate (Source: Own)

3.2. Details of Four Level Interim Inspections:

3.2.1. Description about for Four Level of Inspections by Municipality

As per BCWP, municipality technicians will inspect the building construction at four stages namely at foundation before casting of footing, at plinth level after casting of plinth tie beams, at first floor level before casting of floor slab and finally at complete finishing of the building. The Supervision Consultant has to apply to Municipality on behalf of the Building Owner taking the site progress by the Contractor into consideration.Supervision Consultant shall prepare technical report of completed works and apply for inspection by Municipality. (Check list for each inspection is attached in Annex)



Source: Guideline: Booklet of minimum requirement forR.C.C Framed structure, National Reconstruction Authority

- For first site inspection, the Supervision Consultant, on behalf of the Building Owner,has to apply to Municipality on the condition that all foundations with laying of re-bar mesh, erection of vertical bars of column and reinforcement of footing ties are ready for casting for the case RCC framed structure buildings. In case of Load Bearing Wall Structure Buildings, the strip footing with foundation need to make ready with vertical bars at all corners and junctions.




Source: Own

- For 2ndinspection, the Supervision Consultant, on behalf of the Building Owner, has to apply to Municipality on the condition that complete RCC work of plinth tie beam for RCC framed structured building has been completed and in case of Load Bearing Wall Building plinth band has been completed. The main bars, vertical stirrups, beam column joint detailing, lap positions for tie beam and other details should be as per design drawing and compliant with building code.




Source: Own



Photo of Concrete Mixing

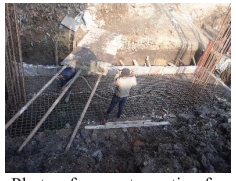


Photo of concrete casting for substructure



Photo of Substructure before back filling

Required evidence in Supervision Report

- For the third interim inspection, the Supervision Consultant, on behalf of the Building Owner, has to apply to Municipality on the condition that all rebar works for beam and

slab at first floor with necessary centering and shuttering are completed. The main bars, shear reinforcements, beam column joint detailing, beam rebar lap positions and other detailing should be as per design drawing compliant with building code.




Source: Own



Photo of Compressive strength test report of substructure



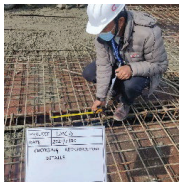
Photo of rebar arrangement of 1st floor Column

Required evidence in Supervision Report

- For the final inspection, the Supervision Consultant, on behalf of the Building Owner, has to apply to Municipality on the condition that all structural and finishing works of the building including door/windows fitting, cement plaster and at least one coat of painting has been completed. The whole building should be compliant with building By-Laws and building code.




Source: Own





・Inspection record of rebar ・Sampling of Test cubes ・Test record

Required evidence in Supervision Report

3.2.2. Main Check point of Inspections by Municipality

- The supervision consultant has to collectall necessary documents including quality testing reports and photographic evidences of structural detailing works for submission of the supervision report to the Municipality.

S. No.	Tasks for Verification	Timing	Main Check Points but not limited to
1	1st Interim Inspection	Before casting of Foundation	• Setting out of column and Building size • Excavation depth and bearing soil condition • Piling works record (if any) • Rebar arrangement of foundation and Column • Technical report by Supervision Consultant
2	2nd Interim Inspection	After concreting of plinth beam	• Setting out of column and Building size • Back filled soil condition • Rebar arrangement of Column • Technical report by Supervision Consultant
3	3rd Interim Inspection	Before the casting of first floor beam & slab	• Rebar arrangement of beam and slab • Technical report by Supervision Consultant
4	Final Inspection	After completion of building	• Final figure of the building (Building Height) • Technical report by Supervision Consultant

3.3. Minimum Sequence of Supervision under BCWP (RC Structure)

Following are the technical tasks of Supervision Consultant to be carried out in any building construction, but not limited to following sequence:

S. No.	Description of Work	Recommendations
1	Preparation for building Supervision	
1.1	Confirmation of designs drawings and temporary permit by municipality	Document Check
1.2	Contract with Building Owner	Document Check
2	Site Clearance Work/Ground Work	
2.1	Setting Work	Visual check and measurement
2.2	Excavation Work	Visual check, measurement and soil sampling
2.3	Bearing Soil (or Piling works)	Visual Check and soil sampling

2.4	Soil Treatment	Visual Check and soil sampling
2.5	Back-filling	Visual Check
3	Materials	
3.1	Rebar	Document Check, measurement and Visual check
3.2	Concrete	Document Check, Visual check and In-situ test
4	Rebar Arrangement	
4.1	Foundation	Visual check and record keeping
4.2	Column (Every floor)	Visual check and record keeping
4.3	Beam (Every floor)	Visual check and record keeping
4.4	Beam and Column Joint (Every floor)	Visual check and record keeping
4.5	Slab (Every floor)	Visual check and record keeping
4.6	Splicing of bars (Every floor)	Visual check and record keeping
5	Concrete Works	
5.1	Concrete mix proportion	Document Check, Visual check, In-situ test and Test data
5.2	Concrete Casting (Every floor)	Visual check and In-situ test
5.3	Curing (Every floor)	Visual check
5.4	Concrete Strength Test (Every floor)	Document Check, Visual check, In-situ test and Test data
6	Formwork (Every floor)	Visual check
7	Safety Check	Visual check

Detailed Check point of Each Works:

The check points (but not limited to) for supervision consultant on major items of the works are as follows:

3.3.1. Preparation for Building Supervision:

Supervision Consultant shall check the all the required documents in advance of his supervision service and notify to the building owner if there is unclear information, error, wrong indication or discrepancies in the documents. Following are the point to be confirmed before the commencement of construction.

a) Design Document

The Supervision Consultant shall check the drawings and temporary permit in advance of construction and notify to the Building Owner and Designer if there is unclear information, error, wrong indication or discrepancies in the drawings. Followings are the points to be confirmed before the commencement of the construction.

1) Structural System of Building
2) List of the drawings
3) Architectural drawings / working drawings as per Building By-Laws

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4) Structural design and details as per NBC

b) Building Contract

The Supervision Consultant shall check the contract condition with the Building Owner in advance of the construction works and notify to the Building Owner if there is unclear information, error, wrong indication or discrepancies in the contract. Followings are the points to be confirmed before the commencement of the construction.

1) Contract with Building Owner and documentation
2) List of the contract document:
3) Construction period
4) Negotiated Rates for each item
5) Total Negotiated Contract Amount
6) Specification of materials and works
7) Insurance of Labours, Equipment and Third Party Insurance
8) Material supply (Building owner shall be responsible to comply with NS standards in case Building Owner supplies the materials)
9) Measures for surrounding site conditions

3.3.2. Site Clearance/Groundwork:

Supervision Consultant shall check the site clearance and preparation work performed from the initial phase of the commencement of work at field and supervise the building work to confirm if the works are in accordance with the approved designs and drawings and consequently notify building owner if there is any discrepancy. Following are the points to be confirmed before the commencement of construction.

a) Setting out

The Supervision Consultant shall check the setting out of the building in advance of commencement of the works and notify to the Building Owner and supervision consultant if there is unclear information, error, wrong indication or discrepancies in the contract. Followings are the points to be confirmed before the commencement of the construction.

1) Orientation of the building
2) Right of Way (ROW) of access road and side roads if any
3) Minimum Setback form the main road and side road if any
4) Side Setbacks/open space from neighboring property lines
5) Centre to Centre Dimension of the Gridlines in X and Y directions
6) Diagonal cross checking to assure right angles of grid lines in X and Y directions

7) Working Bench Marks tied with reference stations for building levels
8) The existing profile and cross-sections

b) Excavation works

Check Points

1) Layout of foundation for soil excavation works
2) Size of foundation
3) Depth of foundations
4) Method of excavations (Manual or by machine)
5) Compaction of foundation beds

c) Bearing soil (or Piling works)

Check Points

1) Confirmation of bearing of footing soil
2) Geo-technical investigation of the site
3) Determine type of foundation based on soil test report
4) Assumed bearing capacity if soil test is not done
5) Confirm considered bearing capacity of footing base by the structural designer for foundation design and basis of the assumption.
6) Confirm type of soil (hard, medium, soft soils or weak soils)
7) If soil of site is found suspicious then consult with design engineer)
8) Piling works:
   - Type of piles
   - Layout of piles
   - Methodology for installation of piles
   - Equipment and tools for piling works
   - Pre-construction survey of the nearby properties before commencing the piling works
   - Additional measures to preventing damage to nearby property

d) Soil Treatment for foundation

Check Points

1) Methodology for soil treatment
2) Type of Grouting chemicals for soil stabilization
3) Tools and equipment for soil treatment
4) Technically skilled human resources for carrying soil treatment

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5) Dewatering

e) Back Filling

Check Points

1) Type Materials for back filling
2) Source of materials for back filling
3) Allowable Thickness of backfill layers
4) Compaction method for backfilled materials (Manual, use of Monkey Jumper)

3.3.3. Material Check:

Supervision Consultant shall check all the construction materials and tools to be used in construction work and keep essential record of the supervision to prove that material complies with design, drawing documents and specification document. Following are the points to be confirmed at working site.

a) Rebar material

Check Points

1) Rebar Grades
2) Sizes of Re-bars to be used for RCC works
3) Test certificates from manufacturer
4) Required ductility and elongation
5) Satisfactory result in Tensile and Bend test
6) Re-bars quality (no crack, scale or rust)
7) Rebar storage
8) Re-bars conditions (free from pitting due to corrosion, loose rust, mill scale, paint, oil, grease, adhering earth, ice or other materials)

b) Concrete material

Check Points

1) Type/grade of Cement
2) Type/source of Sand
3) Manual test for silt content in Sand
4) Allowable silt content for sand
5) Type/source of Aggregates
6) Grading of aggregates for structural elements

7) Delivery and storage of cement, sand and aggregates
8) Quality of Water for concrete
9) Type of Admixtures if any

3.3.4. Rebar Arrangement:

Supervision Consultant shall check workman ship of all the rebar arrangement during the construction and give prompt notice to the contractor and owner if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

a) Foundation

Check points

1) Depth and size of foundations
2) Dimension and spacing of re-bars for different structural members
3) Structural details for foundation and footing beams
4) Tools and equipment for re-bar cutting and bending
5) Trained bar benders for re-bar works

b) Column

Check points

1) Size of columns
2) Height of columns
3) Layout of columns
4) Rebar section of columns
5) Size and Spacing of lateral ties
6) Concrete cover for the column
7) Method for erections column re-bars

c) Beam

Check points

1) Size of beams
2) Rebar details for beams
3) Size and spacing of vertical stirrups
4) Concrete cover for beams
5) Line and level of beams

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d) Beam and Column Joint

Check points

1) Requirement of detailing of joints at middle and end
2) Confining reinforcement for joints
3) Anchorage of beam longitudinal bars in column

e) Slab

Check points

1) Thickness of slabs
2) Finishing level of slabs
3) Concrete cover for slab
4) Provision of chairs
5) Size and spacing of re-bars for slab

f) Splicing of Re-Bars

Check points

1) Maximum number of bars that can be splice in a location.
2) Proper Locations for splicing of main re-bars
3) Spacing of Closed links/stirrups/hoops over the entire length over which the longitudinal bars are spliced.
4) Required lap length for reinforcement bars in tension and compression.
5) Bending of re-bars for lapping

3.3.5. Concrete Works:

Supervision Consultant shall check workman ship ofconcrete works during the construction and give prompt notice to the contractor and owner if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

a) Concrete Mixing proportion

Check Points

1) Cube boxes for batching sand and aggregates
2) Mechanical Concrete mixers or batching plants for concrete mixing
3) Mix ratio (Nominal or design mix)
4) Water cement ratio

5) Allowable slump of concrete for workability
6) Nominal Temperature for mixing

b) Concrete Casting

Check Points

1) Thickness and size of structural members
2) Reference level for the structural members
3) Finishing line levels of structural members
4) Equipment for compaction of concrete (Needle and plate vibrators)
5) Method of pouring of concrete mix

c) Curing of concrete

Check Points

1) Methodology of curing
2) Duration of curing for different structural member
3) Tools and materials for curing

d) Concrete Strength Test

Check Points

1) Type and quantity of cube molds
2) Compaction tools for concrete cubes
3) Compaction methodology
4) Number of samples for the cube tests for different structural elements
5) Sampling methods
6) Requirement of minimum compressive strength of concrete for 28 days
7) Curing method of concrete cubes
8) Transportation of concrete cubes

3.3.6. Formwork

Supervision Consultant shall check workman ship ofForm worksduring the construction and give prompt notice to the contractor and owner if any error, omission, fault or other defects in work, which the supervision consultant discovers. Following are the points to be confirmed at working site.

Check points

1) Type of formwork for different structural members
2) Type of props/supports
3) Removal time of the formworks
4) Line and level of formworks

3.3.7. Safety Check:

Supervision Consultant shall be responsible for checking safety for all the workers, supervisor and third party involved in the construction. The contract document shall include all necessary terms for ensuring the safety at site or follow the safety criteria as per NNBC 114. Following are the points to be confirmed at working site.

- Site Barricading (safety for manpower and construction material)
- PPE (hard Helmet, Hand gloves, Face mask, boot/closed shoes)
- First Aid Kit at site

Section 4. Technical details for Contractor

4.1. Site Clearance Work/ Setting Out

4.1.1. Confirmation of Building Position (Setting out)

- The building layout is first and crucial step of building construction. Proper marking of the grid lines should be done.
- The center lines of grids at x and y direction should be at accurate right angle. The grid lines should be cross checked for right angle with diagonal dimensioning.
- End points of grid lines should be fixed permanently using wooden pegs/posts enclosed by brick/stone masonry at certain distance from the foundations as the reference points for construction of substructure and superstructures.
- The columns and walls should be in grid at both orthogonal directions.
- During the period of Commencement of works the Contractor shall survey the constructionarea and confirm the levels. The Contractor shall immediately notify the Supervision Consultant of any discrepancies and shall agree with the Supervision Consultant any amended values to be used during the contract, including replacements for any stations missing from the original stations.
- The Contractor shall check, replace and supplement as necessary the station points andagree any revised or additional station details with the Supervision Consultant.
- All stations and reference points shall be clearly marked and protected to the satisfactionof the Supervision Consultant. The Contractor shall establish working Bench Marks tied with reference stations soon after taking possession of the site. The coordinates and the elevations of the reference stations shall be obtained from the Supervision Consultant. The working Bench Marks shall be near all major/medium

structure sites. Regular checking of these Bench Marks shall be made and adjustments, if any, got agreed with the Supervision Consultant and recorded.

- The Contractor shall be responsible for the accurate establishment of the center linesbased on the Drawing and data supplied. The centerlines shall be accurately referenced ina manner satisfactory to the Supervision Consultant. A schedule of reference dimensions shall be prepared and supplied by the Contractor to the Supervision Consultant.
- The existing profile and cross-sections shall be taken jointly by the Supervision Consultant and the Contractor. These shall form the basis for the measurements and payments.



Source: Training Manual for Urban Masons, DUDBC

4.2. Groundworks

The contractor shall coordinate with supervision consultant for ensuring that the bearing method specified in the design drawing adequately shows the bearing capacity. In case there is any inadequate situation, the contractor shall inform the supervision consultant and follow the instruction by the supervision consultant.

4.2.1. Excavation works

To lay the foundation below the existing ground level, trenches and pits of adequate dimension should be dug up to required depth. The depth shall be conformed on reference to benchmark. Trenches and pits are excavated to a width greater than that for the foundation and should be sufficient to provide workspace during laying of foundation.

Timbering shuttering and shoring shall be provided in excavated area considering type of excavation soil and boundary condition of site. For hard soils where the sides of trenches can stand themselves, there is no need of lateral support. But in case of loose and soft soil, the sides of pits and trenches should be held in position by adequate lateral support.

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Excavated soil should be laid at least 1.5 m apart from excavation line.

4.2.2. Confirmation of bearing method and its capacity

- Confirmation of bearing of footing soil is most important stage of construction. Because defective work at this stage of construction is the most critical and the most difficult to repair.
- Basically, geo-technical investigation confirms the bearing capacity of the site and it determine type of foundation selection.
- However, for the buildings of low budget, geo-technical investigation may not be conducted, and the structure design of foundation may had been done with assumed bearing capacity.
- In the situation, Supervision Consultant should confirm considered bearing capacity of footing base by the structural designer for foundation design and basis of the assumption.
- The information should be available in design report/Structure design of foundation. Considered bearing capacity may be confirmed at the site can be done as follow:
  - Dig at least 2 pits of size 1mx1mx up to 0.5m below footing bottom level and inspect type of soil.
  - Observe ground water level.
  - The observed soil in the pit shall be classified as per the table of NBC 205.
- Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils.
- Type of the soil should verify with soil assumption of design report.
- If soil of site is found suspicious then recommend asking owner to conforming with design engineer.
- A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.
  - Dig a pit of 1mx1mx1m
  - Fill the pit with the same soil with simple compaction.
  - If pit is not filled with the soil, then soil is weak
  - If pit is just filled with the soil, then soil is medium type
  - If soil remains after filling the same pit, then soil is hard.

S. No.	Type of Foundation Material	Soil Classification
1	**Rocks in different state of weathering, boulder bed, gravel, sandy gravel and sand-gravel mixture, dense or loose coarse to medium sand offering high resistance to penetration when excavated by tools, stiff to medium clay which is readily indented with a thumb nail.**	**Hard**
2	**Fine sand and silt (dry lumps easily pulverised by the finger), moist clay and sand-clay mixture which can be indented with strong thumb pressure**	**Medium**
3	**Fine sand, loose and dry; soft clay indented with moderate thumb pressure**	**Soft**

S. No.	Type of Foundation Material	Soil Classification
4	**Very soft clay which can be penetrated several centimetres with the thumb, wet clays**	**Weak**

4.2.3. Piling works

Based on method of construction piles may be

a) Driven piles and
b) Bored/Drilled and cast-in-situ piles.

Driven piles is more mechanical and shall be done as per standard specification.

The description of installation of Bored/Drilled and Cast-In-Situ Piles are as follows:

- Before starting of drilling, filling materials i.e., reinforcement cage, dry mixed concrete in mixture in ready condition and vibrators should be in ready position.
- Topsoil needs to be cut-off and levelled off to same plane so that the depth of the drilling remains constant throughout all area.
- Drilling may be mechanical or manual. The works shall be performed under recognized and approved methods, using materials and equipment meeting specifications. Casing pipe shall remove after completion of drilling work.
- Any disturbance that occurred due to the condition of the soil, i.e., hard strata found, shall be reviewed and decided to compliance of design. Provisions to be made for other disturbance such as dewatering, erosions etc. which might occur during drilling of hole.
- The contractor should consult with supervision consultant to conduct a pre-construction survey of the nearby properties before commencing the piling work so that all pre-existing conditions are recorded.
- The owners of neighboring property should be given a copy of the survey report, which can be used as a reference for any future disputes or damage claims by any neighbors.
- The Supervision Consultant shall conduct close monitoring of the work and any unwanted effect should be proceeding with temporary halting of the work.
- In the case, shall review and consider other systems or additional measures to prevent further damage.
- Filling in the bored columns perform simultaneously as the drill works progress. Once the pile installation is completed, the site must be cleared and rendered level ready for the structure layout and the next phase to begin, as well as verification of proper placement of all piles in relation to the structural needs and drawings.

4.2.4. Laying of foundations

- Foundations should not be laid on the loose or fill up ground and should go up to firm ground.
- All foundations should be laid in a level

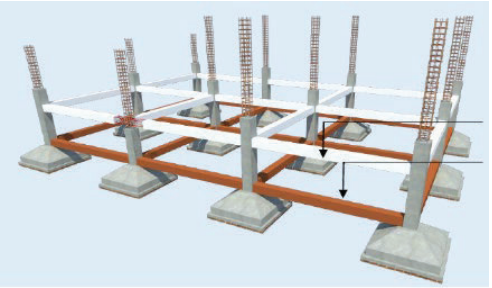
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- If the soil is very weak, it is recommended to provide 300 mm thick gravel packing before laying the foundation.
- Foundation should not be laid on water-logged soil. Water need to be pumped out and gravel packing can be provided if the soil is swampy.

4.2.5. Improving bearing capacity of Soil

If the foundations are left open for one rainy season it will enable the soil to settle down, and it will also be known whether the natural movements of the soil below due to increment of moisture are likely to cause any damage. Foundations in bad soil can be improved by:

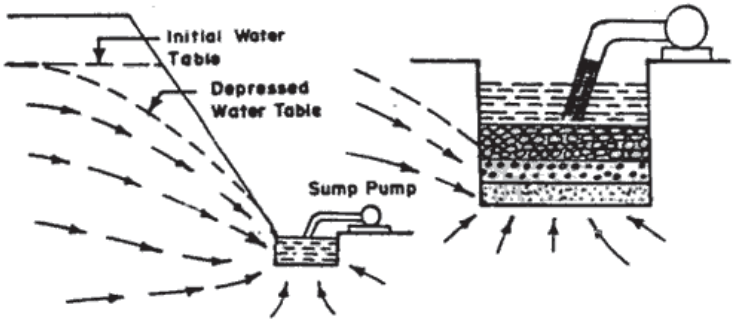
- Increasing the depth of the foundation except when the material grows wetter as the depth increases.
- Compacting the soil by ramming
- Ramming in sand, gravel, moorum, broken stone or brick bats in situ be. tween the foundation concrete and soil. This is useful for silt or black cotton, soils and also clayey soils.
- Removing the poor soil and filling the gap with sand, rubble stone, gravel or other hard material. This increase the bearing power to about twice its original value. This method is especially useful for black cotton soils. Cement grouting in rammed materials will make the foundations much harder.
- Draining out water from wet foundations.
- Driving piles, either of wood or concrete, or driving and withdrawing piles and filling the holes with sand or concrete. This will increase the density of the soil.
- Artificial stabilization can be used to seal off permeable strata for deep excavations or to give soft soils additional strength if they are likely to flow. Cement grouting: water bearing gravel and coarse sand can be made very much permeable by pumping cement grout into them.



Source: Guideline: Booklet of minimum requirement forR.C.C Framed structure, National Reconstruction Authority

4.2.6. Dewatering

Excavation of foundation trenches in ground having high water table, or in waterlogged area pose great problems because of water seeping in the trench from sides. The timbering, if provided, would become loose and collapse. It is desirable to maintain water table at least 0.5 m below the bottom of the excavation to undertake any excavation work under dry condition. The surficial subsoil water can be removed by perimeter trench and sump method or well point system. For complicated problems, may require applying deep well, vacuum or electro-osmosis methods.



Sheet piles need to be provided before starting of excavation as per provided design for deep excavation and excavation below the footing of adjoining structure shall execute.

4.2.7. Observe ground water level.

The observed soil in the pit shall be classified as per the table of NBC 205. Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils. Type of the soil should verify with soil assumption of design report. If soil of site is found suspicious then recommend asking owner to conforming with design engineer.

A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.

- Dig a pit of 1mx1mx1m
- Fill the pit with the same soil with simple compaction.
- If pit is not filled with the soil, then soil is weak
- If pit is just filled with the soil, then soil is medium type
- If soil remains after filling the same pit, then soil is hard.

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4.3. Materials

4.3.1. Rebar

Quality mark awarded re-bars should only be used in construction. Re-bars should be free from oil, rust, coats of paints, grease or other coatings, which may impair or reduce bond.

Physical characteristics of re-bars should be as follows:

S. No.	Property	MS	Fe415	Fe500
1	Ultimate	410	490	560
2	Yield (ϕ 6 - 40 mm)	250	415	500
3	Yield (ϕ> 40mm)	230	415	450
4	Elongation (ϕ< 10mm)	20%	14.5	7.5
5	Elongation (ϕ> 10mm)	23%	14.5	7.5
6	Weight (ϕ≤ 8mm)	± 4%		
7	Weight (ϕ> 8mm)	± 2.5%		
8	Diameter (ϕupto 25mm)	± 0.5%		

Rebars delivered in site should be in bundle with production tag with quality standard mark. Rebar for reinforcement should be stored in such a way as to prevent distortion and corrosion. Care should be taken to protect the reinforcement from exposure to adverse atmosphere during storage, fabrication and use.



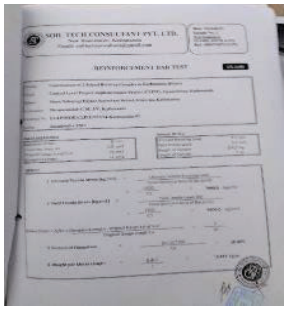


- Reinforcement shall be free from pitting due to corrosion, loose rust, mill scale, paint,oil, grease, adhering earth, ice or other materials that may impair the bond betweenthe concrete and the reinforcement or that may in the opinion of the Engineer causecorrosion of the reinforcement.
- This requires not only purchase of good quality steel reinforcement and proper storage of it, but also sequencing the construction process to minimize the exposure of the reinforcementStrength and ductility of the reinforcement to be used shall confirm to relevant NSstandard.

- Bars shall comply with the dimensions described in the drawings and shallnot break in single bending.
- The steel used for reinforcement shall be Thermo-mechanically treated (TMT) Bars with 0.2 Per cent Proof stress/ yield stress, Min, N/mm^2.
- The minimum tensile strength shall be 10 Per cent more than the actual 0.2 per cent proof stress/yield stress but not less than 565.0 N/mm^2.
- It shall have no crack, scale or rust. Binding wire used to bind reinforcements shall be annealed galvanized binding wire of 20 gauge.



The contractor shall submit to Supervision Consultant, sample of reinforcement bar brand intended to be used for independent testing of Tensile Strength. And, in case the test result is acceptable, and material is approved by Supervision Consultant. The contractor may procure the approved material provided manufacturer's test certificate conforming to the specification for the lot is submitted to the Supervision Consultant who reserve the authority to test each lot in case of suspect quality. U.T.M. tensile strength test should be conducted for reinforcing bars of sizes of8mm Ø, 10mm Ø, 12mm Ø, 16mm Ø, 20mm Ø, and 25mm Ø. It shall have 16.0 elongation, per cent, min. on gauge length 5.65 A, where A is the cross-sectional area of the test piece.





Sample Rebar Test Certificate (Source: Own)

4.3.2. Concrete

a) Cement

The cement used should be fine, uniform in color and should not contain any lump. Cement with production date should be supplied to site. Cement within 2 months from production date should be used in construction.

It is advised to use cement with quality standard mark- as NS mark. For project size 1000 sq.m. and above, an independent test as per NS:049-2041 should be performed. Minimum requirements of test standard provided below:

Required physical characteristics of ordinary Portland cement.			
S.N.	**physical Characteristics**	**OPC grade 43**	**OPC grade 55**
1	Fineness, m2/kg (By Blaine's Air Permeability method)	225	225
2	Setting Time: Minimum initial setting time (minutes) Maximum final setting time (minutes)	45 600	45 600
3	Soundness by Lechatlelier method, mm, maximum	10	10
4	Compressive strength: Minimum average compressive strength of three mortar cubes (n/mm^2) 3 days 7 days 28 days	23 33 43	27 37 53
5	Normal consistency	26 to 33 %	

53-grade cement should be used only where concrete of higher strength (in general practice M30 and above concrete) required and where proper precautions considerable to reduce higher heat of hydration through a proper curing process.



Source: Own

b) Sand

Sand particles should be crystal in shape. Sand should not contain organic and decomposable particles. Constraints of clay, silt and foreign materials should not exceed five percent by

volume. Supervision Consultant should check delivered sand from each source at site and approved sample of sand should maintain in display rack with source name.



Source: Own

Simple test can be carried out in field to determine the proportion of foreign particles in the site:

- Fill a jar or cylindrical shape glass up to 60 mm height.
- Fill water 25 mm above the sand.
- Add one spoon salt
- Shake until mixing is uniform and let the glass in still position for three hours.
- Pure sand will sedimented in lower level and foreign materials will sedimented above. Sedimented foreign material should not exceed five percent of sand.

Alternative method of testing sand in-situ condition:

- Take some volume of sand in clean hands.
- Rub both palms

If palms stay clean, accept sand is of good quality.

c) Aggregate

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Flake and elongate aggregate should not be used. It should be angular in shape. Aggregate of variable well graded. Specific gravity of aggregate should be within 2.6 to 2.7. Size of aggregate depends upon thickness of product item. For cement concrete with thickness of 100 mm or more, size should be limited to 20 mm and for the thickness up to 100 mm, grade from 12 mm aggregate to be used. Hardness, strength, grading of coarse aggregate should conform to the requirements of IS 383-1970 and IS:515-1959.

- Coarse aggregate shall be clean hard and durable crushed rock, crushed gravel or natural gravel
- All aggregates shall not contain any deleterious materials.
- The aggregate should be completely free from lumps of cray or organic and vegetable matter, fine dust etc.
- National occurring stone aggregates and gravel, and brick aggregate are commonly used as coarse aggregates.



Source:Own

d) Water

Water shall not produce any objectionable stain or unsightly deposit on the surface.

- Water to be used in mixing concrete shall be free from injurious amounts of oils, acids alkalis, organic material or other deleterious substances.
- It should be as clean as drinking water.
- Water shall not produce any objectionable stain or unsightly deposit on the surface. It should be clean, does not smell, No oil, acid, alkali, salt, organic materials that can affect the Re-bars

Source: Guideline: Booklet of minimum requirement forR.C.C Framed structure, National Reconstruction Authority



4.3.3. Bricks

The bricks shall be of a standard rectangular shape, burnt red. The colour of a good brick should be copp er red. A yellowish tint and dark blackish blue colour on brick indicate that it is under burnt and over burnt respectively. Crushing strength of bricks for load bearing wall should be 7.5 N/mm2 and for other cases-should not be less than 3.5 N/mm2. Standard brick size is 230x115x57 in mountain area and 250x120x65 in southern part of the country. Dimensional Tolerances of up to 5% shall be acceptable from standard size of the batch. For medium and small size construction works, in situ test procedure will be acceptable to check quality of bricks. Water absorption ratio of brick should not be exceed 20 % . Other requirements of brick should be as per NS 1-2035.

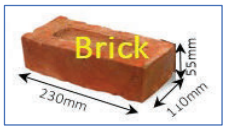
Place two bricks in T shaped and drop it on the hard ground from the height of 1m. A high quality of brick doesn't break. Bad quality brick will break into pieces.

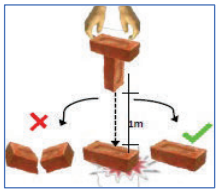
The brick should be uniform in color and size. It should produce metallic sound while two bricks are hit.

It should have uniform texture on broken surface.

- The bricks shall be free from cracks, flaws, grit and other impurities such as lime, iron and deleterious salts.
- All bricks shall be well burnt, sound and hard with sharp edges giving a ringing sound when struck with a mallet.
- Bricks shall not absorb water more than one sixth of their weight after one hour of soaking by immersion in water.







Own Source: Guideline: Booklet of minimum requirement for R.C.C Framed structure, National Reconstruction Authority

4.3.4. Stone

Stone should be tough, hard and strong. If boulder type stone to be used, then at-least 2 adjoining face (excluding exposable face) should be brake in orthogonal shape.





4.3.5. Scaffolding

- Scaffolding shall consist of timber and necessary battens and planks.
- All scaffolding members before installation shall be checked for their strength and stiffness and tied up properly.
- Steel scaffolding if available is preferred and be used where necessary. It shall be erected on double supports.
- Holes shall not be made in wall for supports.
- Planks shall be fitted and tied together. In case of finishing work such as plastering, painting, and distempering, no part of the scaffolding should touch the structure.
- Where ladders are used, gunny bags shall be tied up at the ends to prevent any damage to work by sliding or tipping.



Source: Own

4.3.6. Timber/wood

Structure timber shall be matured Sal Wood unless otherwise stated. At least 6 rings should be visible in 25x25 mm sectional area of timber to be used in structural member. Timber for structure shall be straight and free from twist, large knots, concentrated knots, sapwood, dead and loose knots, signs of decay and other defects. It should comply with the requirements of IS 883-1994. The minimum compressive strength of the timber shall be 7 N/mm2 parallel to grain. Recommended maximum moisture content for structure element is 20 % and for door and windows is 16%.



Source: Own

4.3.7. Formwork

Formwork shall be off plywood, steel or any other material capable of resisting damage to the concrete faces under normal conditions of erecting, fixing and placing concrete. However, the material should be as specified in BOQ. Timber and batten wood used for formwork should be easily workable and stable. It should be Hard, durable, enough thickness and of required size. It should not be liable to warp when exposed to sun and rain

or wetted during concrete. Plywood used for formwork should complying with is 4990 and make approved by Supervision Consultant. Steel formwork should have minimum 2 mm thickness or more as required. Plate should be stiffened with MS angel 40mm x 6 mm at distance 300 mm c/c in short direction. Erecting of Watertight, regular shape and size, smooth surface. Formwork should have Sufficient strength to withstand the concrete and worker's load

4.3.8. Material storage

a) Storage of Cement

Cement should be stored in a dry place, stacked in regular piles not exceeding ten bags and should be effectively protected from moisture and contamination so that there are no losses, formation of lumps and to ensure that proper quality is maintained. Pile of cement in storage should be at least 450 mm apart from walls.

Cement piles should maintain in the sequence of entry date and first in first out from store should be maintained.

b) Storage of Rebar

Rebar for reinforcement should be stored in such a way as to prevent distortion and corrosion. Care should be taken to protect the reinforcement from exposure to adverse atmosphere during storage, fabrication and use.

c) Storage of Timber with seasoning provision

Fresh timber has water in the form of sap and moisture inside it. Hence, timber needs to be dried before being used. The process of drying of timber is known as the seasoning of timber and the moisture should be removed during seasoning under controlled conditions as nearly possible at a uniform rate from all parts of the timber.

d) Stacking of Timber

- Timber should be arranged in stacks with minimum height of 150mm above the ground level.
- The height of stacks should be 1.5 – 2.0 meter.
- Place heavy weights on the top of the stack to prevent warping

4.4. Rebar arrangement

Reinforcement layout shall be erected as per following order of priority:

1) Detail drawing provided in contract document
2) NBC 105:2020, Annex A: Design and detailing of reinforcement concrete structures for earthquake loads

3) IS 13920:2016: Ductile detailing of Reinforced Concrete Structures Subjected to Seismic Forces

4) SP: 34 (S&T)-1987 Handbook on Concrete Reinforcement and Detailing

This guideline summarize reinforcement detailing requirements including cover to reinforcement, minimum requirements of quantity and sizes and spacing, extension and curtailment positions for anchoring. The procedure for detailing of reinforcement for each structural member is described in brief.

4.4.1. General requirements

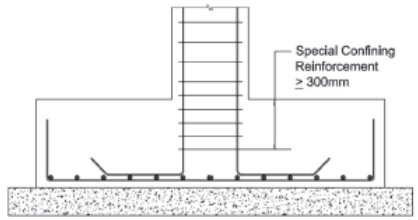
- Reinforcement Grade and Type should be as per specification, structure drawings and design report
- Reinforcement should be cut and bent and erected as per design specification and detail drawing.
- All main bars shall be truly straight and in line
- Lapping shall be only at the specified location.
- Stirrups shall comply all the requirements and tied to all main reinforcement.
- Top and bottom bars shall be spaced with the help of chairs.
- Clear cover shall be truly maintained.
- Cover blocks of specified size shall be used.
- Development length Ld/□ of deformed bars in tension should not be less than

Grade of Steel	Grade of Concrete				
	M 20	M 25	M 30	M 35	M40 and above
Fe 250	45	39	36	32	29
Fe 415	47	40	38	33	30
Fe 500	57	49	45	40	36

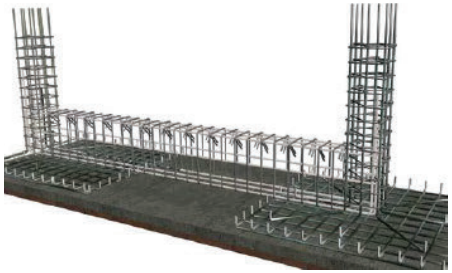
4.4.2. Foundation

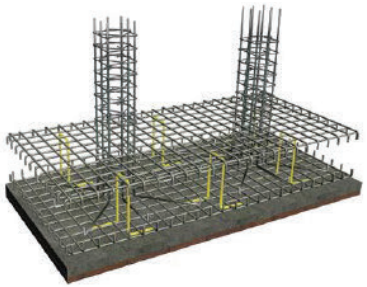
- Minimum cover to main reinforcement shall not be less than 50 mm for surface in contact with earth face. However, it may extend up to 75 mm when bottom of the footing is in direct contact with the soil.
- Minimum diameter of main bar is 12 mm.
- Minimum area of reinforcement in footing slab is 0.12% of concrete area.
- The reinforcement bars of columns should be extended into the footing to a distance not less than development length of the bar. However, the development length can be modified in ratio by providing more reinforcement than required.

- (Sketch showing development length and minimum dimensions of legs for cubical isolated footing and other detailing)
- Special confi11ning lateral ties provided to the column shall extend at least 300 mm into the footing and should not more than 100 mm c/c.
- If footing pads of two columns overlap each other, combine footing will be provided. In the case, foundation will be one of following two types:
  - Combine Footing pad with reinforcement mesh in bottom plus strip beam
  - Combine footing pad with Two layers of mesh in top and bottom of the footing pad



- In case, column locate in boundary of property land, strap or cantilever footing will be provided combining the footing with footing of adjacent column via strap beam.
- For combine footing with strip beam, detailing of longitudinal and transverse bars is similar to that of beams.
- All footing of a building should be kept as same horizontal level as far as possible unless designed and prescribed by the structural designer.

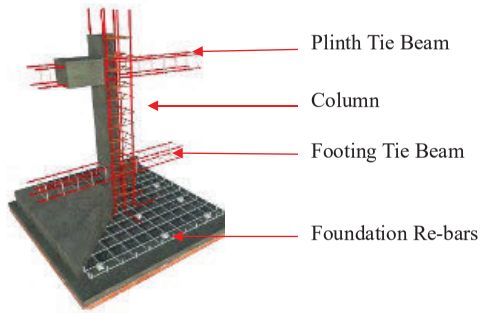




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4.4.3. Column

- Minimum dimension of a column shall not be less than 20xdb, where db is diameter of the largest diameter of longitudinal reinforcement bar in the beam passing through or anchoring at the joint. However, minimum dimension of column shall be 300 mm.
- Rectangular columns shall have a minimum of 8 numbers of bars.
- Minimum diameter of the longitudinal bar shall be 12 mm
- Transverse reinforcement shall have 135° hook ends with as extension of 6 times its diameter (but not less than 65 mm) at each end, which are embedded in the confined core of the column. Minimum diameter of hoop shall be 8 mm.
- Maximum spacing of parallel legs of the links/hoops shall be minimum of 300 mm c/c and half the least lateral dimension of the column.
- Spacing of the confining reinforcement shall be minimum of Bc/4; 6db and 100 mm, Bc is smallest cross-sectional dimension of column, db=diameter of smallest longitudinal bar of column
- Special confining reinforcement shall be provided over a length (lo) minimum of Dc (Largest cross section dimension of the column); Clear length of the column lcl/6; 450 mm from the face of the joint towards mid height of the column on either side of the joint.
- Actually, length of column re-bars needs to calculated properly to avoid the lap positions near or at the joint.



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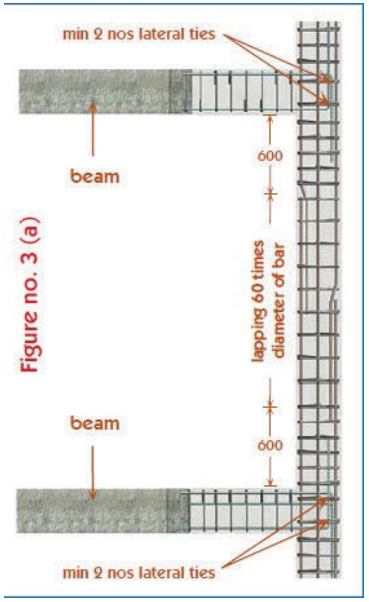
Guideline: Booklet of minimum requirement for

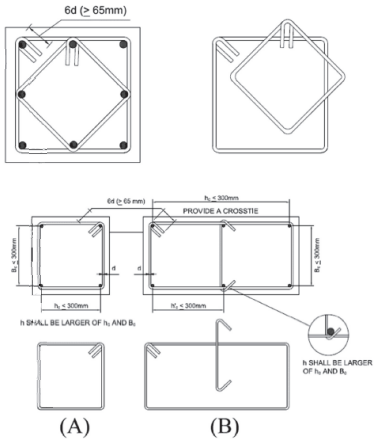
R.C.C Framed structure, National Reconstruction Authority

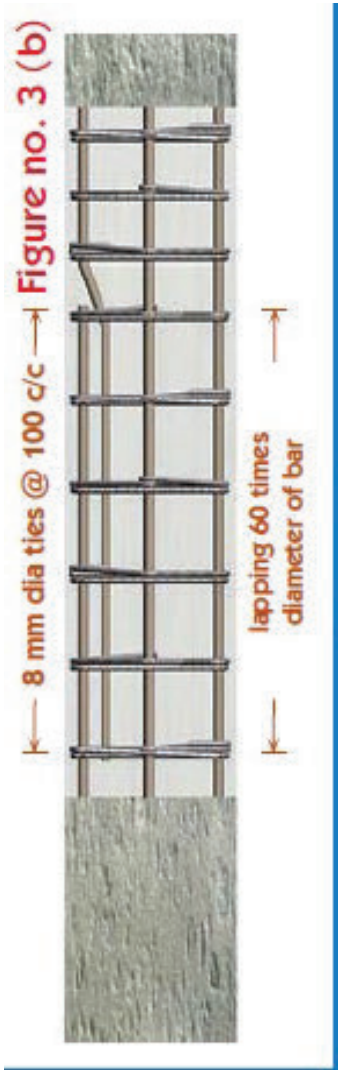
- The lapping in columns should be at the mid height of column starting from 600 mm from top of beam or ending up to 600 mm from bottom of beam.
- The reinforcement bars should not be lapped at one level i.e. should be lapped in staggered position aligned in a vertical line.

- The lapping length should be 60 times the diameter of reinforcement bars. The spacing of lateral ties should be 100 mm c/c throughout the length of lapping.
- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
- Within a joint
- Within a distance of 2d from face of the column/beam
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced.
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.
- The spacing of these links shall not exceed 150 mm.

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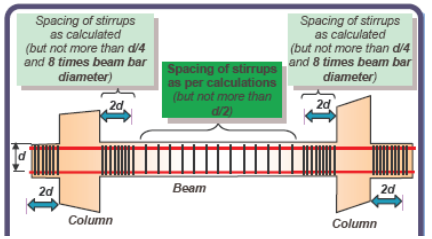




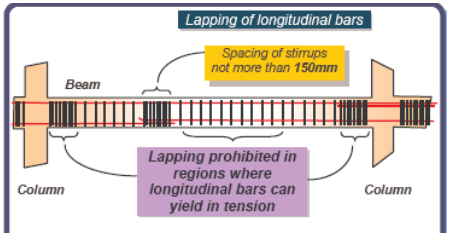
Source: Technical Poster, DUDBC

4.4.4. Beam

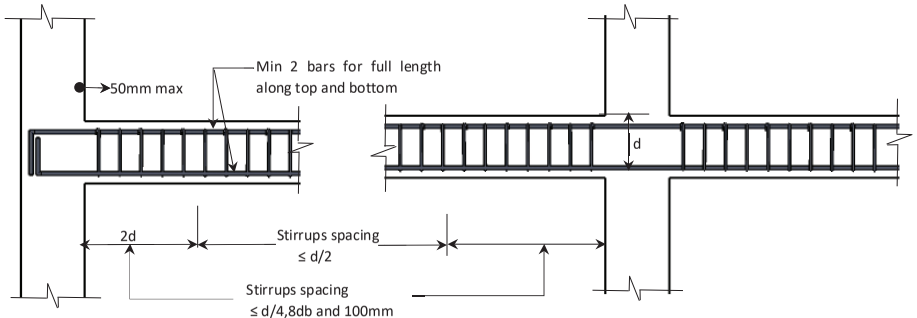
- Longitudinal steel on bottom face of a beam framing into a column shall be at least half the steel on its top face at the same section.
- Longitudinal steel in beams at any section shall be at least 1/4th of maximum longitudinal steel provided at the beam.
- Vertical stirrups shall be used in beam as transverse reinforcement.
- Stirrups are permitted to be made of two pieces of bars also namely U-link with a 135° hook with an extension of 6 times diameter, but not less than 65 mm, imbedded in the core concrete and across-tie.
- The hooks of the stirrups and cross-ties shall engage around peripheral longitudinal bars. Consecutive cross ties engaging the same longitudinal bars shall have their 90° hooks at opposite sides of the beam.
- The minimum diameter of a transverse reinforcement shall be 8 mm.
- Closely spaced links shall be provided over a length equal to 2d from column face on either side. Spacing of links over the 2d length shall not exceed the minimum of (d/4; 8db; 100 mm). The first link shall be at a distance not exceeding 50 mm from the joint face.

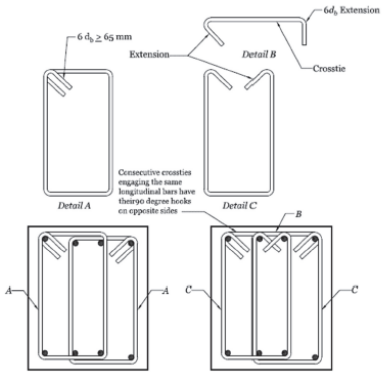


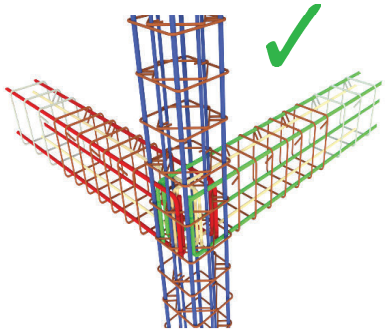
Source: IITK, BMTPC/Earthquake Tip

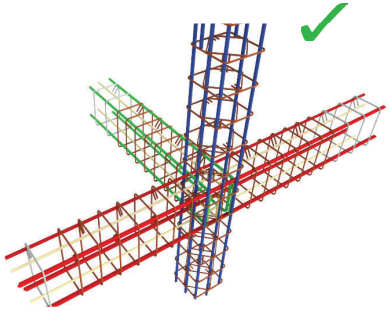


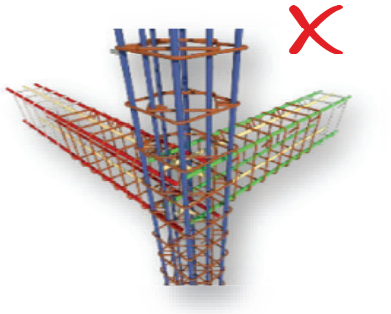
Source: Technical Poster, DUDBC





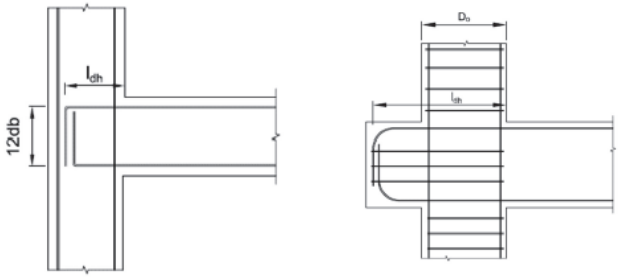




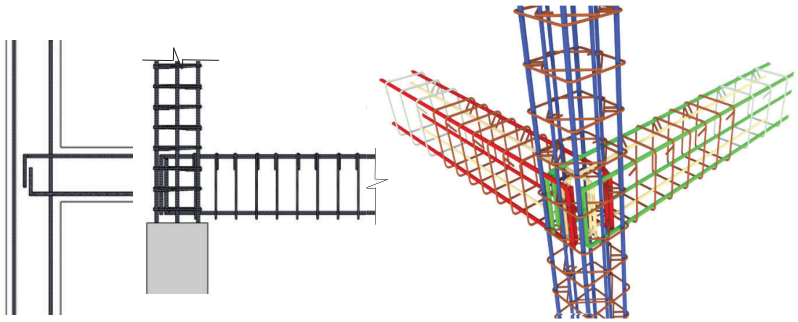


4.4.5. Beam and Column Joint

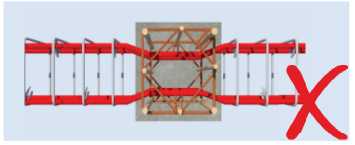
- At an exterior joint, top and bottom longitudinal bars of beams shall be provided with horizontal length beyond the inner face of the column, equal to horizontal development length (l_{dh}) terminating in a standard hook of length $12d_b$.The hook shall be located within the confined core of a column or of a boundary element with hook bent into the joint.
- If the requirements for l_{dh} cannot be satisfied in the exterior beam-column joint, the beam can be extended horizontally in the form of exterior stubs.
- Shear reinforcement should be provided at the interval of 4 inch within joints

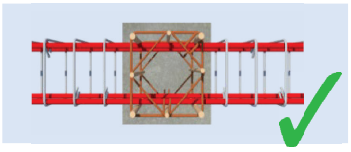


aa) Source: NBC 105:2020, MOUD/DUDBC



Anchorage of beam longitudinal bars in column

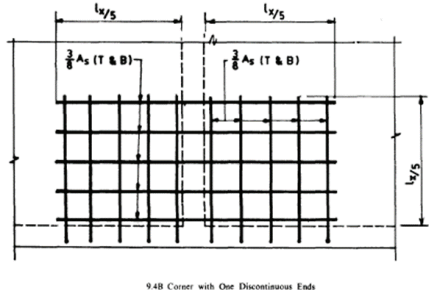




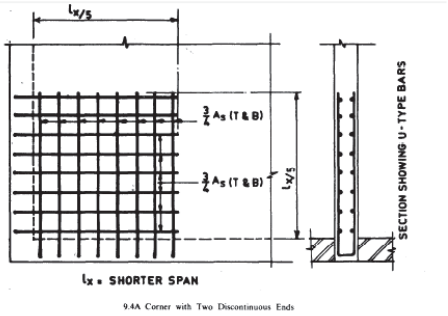
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4.4.6. Slab

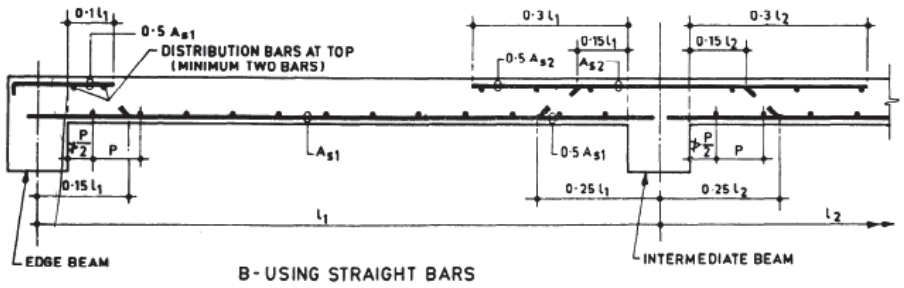
- Minimum cover to reinforcement shall be not less than 15 mm.
- The bottom bars in the shorter direction are placed in the bottom layer.
- At least 50 % of main bars provided at mid span should extend to the support.
- Torsional reinforcement shall be provided at any corner where the slab is simply supported along the direction. It shall consist of top and bottom reinforcement. The bars shall be extended from the edges a minimum distance of 1/5th of shorter span. Torsional reinforcement need not be provided at any corner contained by edges over both of which the slab is continuous.
- Adequate chairs shall be provided to maintain top bars in positions.
- Curtailment distance shall me maintain as in figure …



9.4B Corner with One Discontinuous Ends

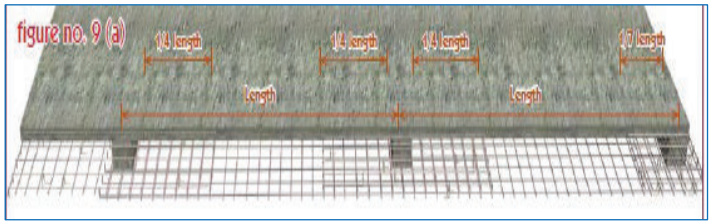


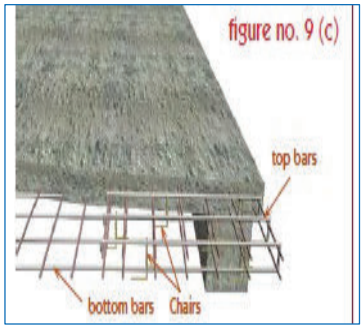
9.4A Corner with Two Discontinuous Ends

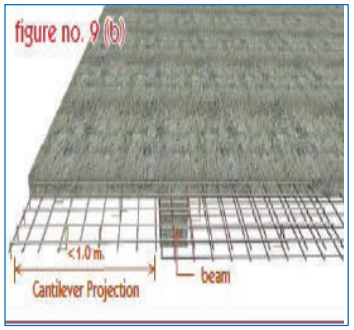


B - USING STRAIGHT BARS

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4.4.7. Splicing of bars

- Maximum 50% of bar numbers can be splice in a location.
- Lap splices shall not be provided
  - Within a joint
  - Within a distance of 2d from face of the column/beam
  - Within a quarter length of the beam adjoining the location where flexural yielding may occur under earthquake effects
- Lap splices shall be provided only in the central half of clear column height
- Closed links/stirrups/hoops shall be provided over the entire length of the beam/column over which the longitudinal bars are spliced. The spacing of these links shall not exceed 150 mm.
- The lap length shall not be less than the development length of the largest longitudinal reinforcement bar in tension.

4.5. Concrete works

4.5.1. Concrete Mixing

- The cement and aggregates shall be thoroughly mixed together in the specified proportions, in a batch type mechanical mixer.

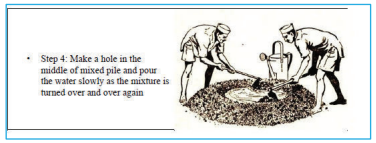
- All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than one minute.
- If the drum rotates at lower speeds, the minimum period shall be increased inversely proportional to speed.
- The period of mixing shall be measured from time when all the materials including water are put in the drum.
- The entire contents of the drum shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
- No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.





Source: Own

- Manual Concrete mixing is no longer allowed for RC structures following NBC 110. The Contractors shall carry mixing of concrete only with the mechanical mixer.

Source: Manual for Mason Training on Earthquake Resistant

Construction of Buildings, DUDBC

- However, for remote and hilly areas of Rural Municipalities where the mechanical mixer machines are hardly available or very difficult to transport, the manual mixing may be allowed only on the following condition.

1) The mixing condition, equipment and mixed proportion including extra cement shall be confirmed by the Supervision Consultants in advance.
2) The cement, sand, aggregates and water shall be thoroughly mixed together in the specified proportioning **an enclosed waterproofed box suitable for the batch size**.
3) All the cement and aggregates constituting a batch is mixed till the mix is of uniform colour. The mixing time in no case shall be less than two minutes by two persons.
4) If the manpower is short, the minimum period shall be increased inversely proportional to manpower.

5) The period of mixing shall be measured from time when all the materials including water are put in the drum.
6) The entire contents of the enclosed box shall be discharged before materials for the succeeding batch are fed into the drum. Materials spilled from the skip or other container shall not be used.
7) No partly set or frozen concrete shall be used in the work. Partly set concrete shall not be remixed with the addition of cement or aggregate.
8) Compressive strength test shall be conducted as well as Mechanical mixing concrete.

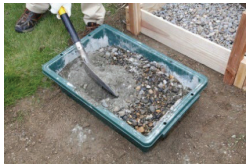
- The steps of manual mixing are illustrated as below.



1. Prepare an **"Enclosed Waterproofed Box"** suitable for the batch size



2. Mix cement **and** measured sand in dry condition



3. Mix measured aggregated and shovel from the bottom to surface



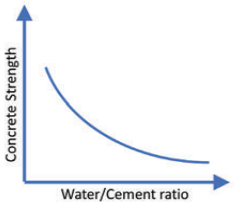
4. Pour the measured water slowly



5. Mixture is turned over again until certain workability comes up

4.5.2. Water/Cement Ratio

Water/ cement Ratio is the most critical factor for concrete strength. The more water concrete contains, the less strength concrete results. It was frequently observed on site that the too much water for concrete workability result in the shortage of concrete strength. So, the Contractor shall strictly pay attention to measure the water according to the specifications.



- Water–cement ratios of 0.40 to 0.60 are more typically used.
- Density of water is 1 kg per liter. The quantity of water required is a product of water cement ratio and the weight of cement.
- For example, if a water/cement ratio of 0.55 is specified, the quantity if mixing water required per bag of cement is 0.55x50 = 27.6 litters.
- For volume batching, cement is measured by bag, and water in liter. A 50 kg bag of cement is taken as 35 liters.
- Standard batching box shall be use for measuring the exact quantity of materials. Batching by weight preferred. Size of standard cube box shall be 300x300x375 mm.
- Mix the concrete until it is uniform but not less than 2 minutes
- The quantity of water for nominal mix of concrete is tabulated in the table below. The nominal mix concrete may be used for concrete of M20 or lower.
- However, for design mix the quantity of water depends on kind of sand, aggregates, cement and type mixes. So, the Contractor is strongly recommended to conduct Trial Mix for the confirmation of concrete strength in advance of actual casting.

	Cement x 1bag =50kg=35liter	Sand	Aggregates	Water (litter)	Remarks
M15	1	2	4	32	The quantity of water is given for reference only. The exact quantity of water shall depend on the trial mix to get the required strength
M20	1	1.5	3	30	
M25	1	1	2	28	

Example of Typical Mix proportion for reinforced concrete

Source: IS 456:2000

4.5.3. Placing & Compaction of concrete

- Concrete shall not be allowed to fall freely through a height of more than 1.5m. Fresh concrete shall not be placed against concrete that has been in position for more than 30 minutes unless a construction joint is formed.
- The placing and compaction of concrete shall at all times be under the direct supervision of supervisionconsultant.
- Regular Slump test should be carried out to control the addition of water and to maintain required consistency.
- Slump testing of concrete should be carried out minimum one test at the commencement of each casting and one each time a to prepare a strength test specimen. Slump of the concrete mix should range between 100□25 mm for ordinary concrete without mechanical vibrator and 75□25mm with mechanical vibrator. Standard size of slump test cone is 300 mm height with 100 mm top diameter and 200 mm bottom diameter. Source: Own





- Concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against the formworkand around any reinforcement and other embedded item, without displacing them. Care shall be taken at arises or other confined spaces. Successive layers of the same pour shall be thoroughly worked together. Concrete shall be compacted with the assistance of mechanical immersion vibrators.

4.5.4. Curing of Concrete

- Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperatures differentials within the concrete sufficient to cause cracking.
- Curing shall be continued for as long as may be necessary to achieve the above objectives but not less than seven days
- The curing process shall commence as soon as the concrete is hard enough to resist damage from the process.
- Exposed concrete surfaces shall be closely covered with impermeable sheeting, properly secured to prevent its removal by wind and the development of air spaces beneath it.
- If it is not possible to use impermeable sheeting, the Contractor shall keep the exposed surfaces continuously wet by means of water spray or by covering with a water absorbent material which shall be kept wet.





4.5.5. Remedial Treatment of Concrete Surfaces



- Any remedial treatment to concrete surfaces shall be inspected immediately after the stripping of formwork and shall be carried out within 2 hours.
- Surface defects such as small areas of honey-combing cavities, large isolated blow holes, broken corner edges, etc., shall be repaired with mortar consisting of a cement and sand ratio equal to that of the concrete being repaired.
- Under no circumstances will surface repairs be allowed where reinforcing steel is exposed. In this case the Contractor shall put extensive remedial works, such as demolition of concrete, forward.

4.5.6. Cover of Concrete

- Cover is defined as the distance between the outer surface of the concrete to the inserted reinforcement.
- Cover to concrete is provided to protect the steel reinforcement bars (re-bars) from environmental effects to prevent their corrosion; to provide thermal insulation, which protects the reinforcement bars from fire, and; to give reinforcing bars sufficient embedding to enable them to be stressed without slipping.

Unless otherwise described, the clear cover of concrete to the reinforcement shall beas follows:

- Horizontal, vertical or inclined slabs: 15 mm or the size of the main barswhichever is greater.
- Lintels: 20 mm or the size of the main bars whichever is greater.
- Beams: 25 mm or the size of the main bars whichever is greater, 15 mmminimum for binders.
- Columns: For all columns having any diameter of reinforcement, the clearcover shall be 40 mm or the size of the main bars whichever greater
- Foundation: 50 mm for normal soil



Cement Cover Blocks (Source: Own)

4.5.7. Concrete strength test

IS 516 Clause 2.1 specifying the procedure for making and compression test specimens of concrete. For samples to be used for strength test, a minimum quantity of 0.02 m3 will be essential.

a) Testing frequencies

Normal and Accelerated Strength Tests should be conducted for concrete.

Testing of 28-day crushing strength of concrete shall be controlled not less than the following frequencies:

Quantity of concrete in the Work, m^3	Number of Samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional 50 m^3 or part thereof

Source: IS 456:2000

A test shall be the average test value for three cubes prepared from the same batch of concrete, the samples being consolidated in the moulds by Roding as per BSI 1881.

b) Compressive Strength of Concrete

- Compressive strength of Concrete can be defined as the ability of material or structure to carry the loads on it without any crack or deflection.
- A material under compressive load tends to reduce the size, while in tension, size elongates.
- The compressive strength of concrete can be calculated by dividing the load applied on the concrete cube at the point of failure by the cross-section area of the cube (15x15x15 cm) on which load was applied.
- The concrete compressive strength for normal construction work varies from 15 MPa to 30 MPa and more in commercial and industrial structures.
- The strength of concrete depends on factors such as water-cement ratio, the strength of cement use, quality of concrete materials, quality control during production of concrete, etc.
- A compressive strength test of concrete is performed to check the compressive strength of concrete.
- There are various standard codes that recommend concrete cylinder or concrete cube as the standard specimen for the test.





Concrete Cube Mould Standard Compression Testing Machine

Source: Own Source: Civiconcepts

- For cube test **cubical moulds of size**, 15cm x 15cm x 15cm **are commonly used. T**his concrete is filled in the mould and tempered properly so as to minimize any air voids available in concrete.
- After 24 hours these moulds are opened and test specimens are soaked in water for curing. The upper surface of these specimen should be made even and smooth. This is done by spreading cement paste on the whole area of the specimen.
- These cubes are tested by a compression testing machine after 7 days curing or 28 days curing.
- The Load on the cube should be applied gradually at the rate of 140 kg/cm2 per minute till the specimen fails.
- Load at the failure of a cube divided by area of specimen gives the compressive strength of concrete.
  Percentage of Strength Gain by Cubes in Days

The following table shows the percentage gain of compressive strength of concrete at 7 days, 14 days and 28 days

Days	% Gain Strength
1 Day	16 %
3 Day	30 %
7 Day	65 %
14 Day	90 %
28 Day	99 %

- While placing concrete, make six (6) 150 mm test cubes from particular batches of concrete as desired by the Supervision Consultant.
- The1cubesmustbeprepared,curedandtestedaccordingtoIS516.Outofthesix(6)test cubes,test3cubesforcompressivestrengthat7daysaftercastingandtheremaining3at 28daysaftercasting.Maintainaregisteratsitewiththefollowingdetailsandsignbyboth the Contractor and theEngineer.
  a) Reference to the specific structuralmember
  b) Mark oncubes
  c) The grade of concrete
  d) The mix of concrete
  e) Date and time

  f) Crushing strength at 7 days
  g) Crushing strength at 28days

4.6. Form works

Formwork shall be erected in such a way that concrete cab be properly placed and compacted in a manner that the hardened concrete conforms to the required shape, position and level subject to the specified tolerances and standards of finish.

- Formwork should be in line, level and plumb considering the tolerance as per IS 14687.
- The tolerance on the shapes, lines and dimensions shown in the drawings shall be within the limits given below:
  - Deviation from specified dimensions of cross-section of columns and beams: +12 to -6 mm;
  - Deviation from dimensions of footing in plan: 50 to -12 mm,
  - Eccentricity: 0.02 times the width of the footing in the direction of deviation but not more than 50 mm;
  - Thickness □0.05 times the specified thickness.
- Adequate number and size of struts, braces, ties and props must be provided as per design. For a height exceeding 3.5 m, signed drawing of formwork should be provided.
- Soil should be compact enough where props rest on natural or filled-up ground to avoid any settlement. Post should be supported over continuous sole over filled-up ground.
- Formworks at top shall be provided where the slope of the formed surface exceeds one in four.
- All joints in the formwork shall be watertight.
- Where reinforcement projects through formwork, the form shall fit closely round the bars. Formwork shall be so designed that it may be easily removed from the work without damage to faces of the concrete.
- Formwork shall not be re-used after it has suffered damage which is sufficient to impair the finished surface of the concrete.
- Before any reinforcement is placed into position within formwork, it shall be thoroughly cleaned and dressed with release agent.
- All rubbish, particularly, chippings, shavings and sawdust shall be removed from the interior of the forms before the concrete is placed. The face of formwork in contact with the concrete shall be cleaned and treated with form release agent. Release agents should be applied so as to provide a thin uniform coating to the forms without coating the reinforcement

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Coating of formwork with form oil (Source: Own)

- The period which shall elapse between completion of placing concrete and removal of formworks are given in following table.

Table: Period of Removal of Formwork

S.N.	Description of Structural Member	Period of Time
1.	Walls, columns, and vertical sides of beam	16 – 24 hrs
2.	Slabs (props left under)	3 days
3.	Beam soffits (props left under)	7 days
4.	Removal of props to slabs	
	a) For slabs spanning upto 4.5 m	7 days
	b) For slabs spanning over 4.5 m	14 days
5.	Removal of props to beams and arches	
	a) Spanning up to 6 m	14 days
	b) Spanning over 6 m	21 days

Source: IS 14687: 1999 Guidelines for Falsework for Concrete Structures

4.7. Brickwork

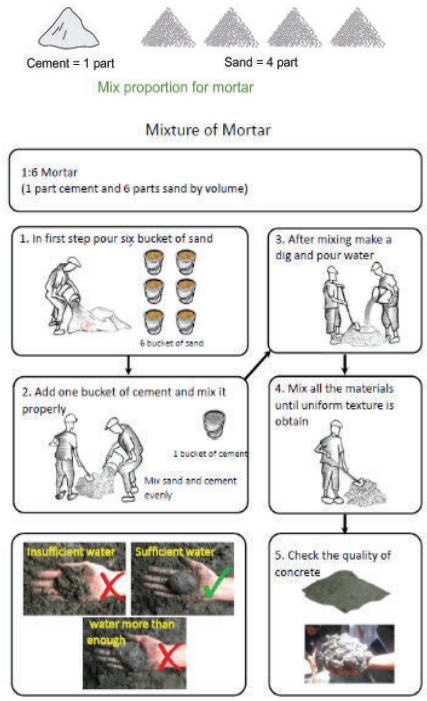
- Before brick laying, immersed it in water at least for 7 hours and make the surface dry before laying in course
- Mortar Preparation:
  - Batch the cement and sand in a desired ratio accurately with the help of batching box.
  - Mix the batch in dry condition at least three times until it becomes homogeneous.
  - Add water as per water cement ratio and then mix properly.

  - Use the mortar within half an hour after adding water.
- Wall shall be construct not more than 1.5 m height in a day
- Avoid continuous vertical joints in masonry works.
- maintain level for whole length in at every 2 feet height
- Curing minimum 5 days
- No lateral load within 14 days of construction

a) Preparation of Cement Mortar

Mortar: Cement and sand should not be leaner than 1:4 (1-part cement and 4-parts sand) for masonry and 1:6 for plaster. Use cement mortar 1:6 or less on masonry works.

Concrete: The concrete mix for RCC members should not be lean than 1:1.5:3(1-part cement, 2- parts sand and 4-parts aggregate). Water for mixing should be limited to 60 % of the weight of cement for hand mixing i.e. 30 liters of water for making 1 bag of cement. Concrete should be cured with water for at least 14 days after casting. Use concrete mortars or wallmortar within 45 minutes of mixing.



Source: Guideline: Booklet of minimum requirement forR.C.C Framed structure, National Reconstruction Authority

b) Soaking of Bricks

Bricks shall be soaked in water for a minimum of one hour before their use. Soaked bricks shall be taken out from the soaking tank sufficiently in advance so that the skin of bricks would be dry at the time of laying. Such soaked bricks shall be stacked on a clean place where they will not be spoiled by dirt, earth, etc.





Source: Integrated Training Manual on Building By-Laws and Building Code, MoFAGA

c) Laying

The brickwork shall be laid true to line, plumb, radiated or curved as required, built solid throughout. Prior to laying all bricks are to be thoroughly soaked in water until all air pockets are removed. Bricks are to be laid in a full cement mortar bed and when bonding, the brickwork is to be set back every course. The mortar joints shall be approximately 10 mm thick with a tolerance of (□) 2 mm and broken vertically. All exposed brick faces shall have the joints raked out to a depth 15 mm to receive plaster.

d) Protection and Curing

Masonry work shall be protected from rain and other adverse weather condition by suitable covering when the mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period

4.8. Stone Masonry Works

- Except for dry rubble walling, all joints (gaps) shall be sufficiently thick to prevent stone to stone contact and the gaps shall be completely filled with mortar. Stones shall be clean and sufficiently wetted before laying to prevent absorption of water from mortar.
- Placing loose mortar on the course and pouring water upon it to fill the gaps in stones shall not be allowed. Mortar shall be fluid, mixed thoroughly and then poured in the joints. No dry or hollow space shall be left anywhere in the masonry and each stone shall have all its faces completely covered with mortar of the thickness as specified for joints.



Source: Integrated Training Manual on Building By-Laws and Building Code, MoFAGA

4.9. Construction site preparation check

The Building Owner shall be responsible for the safety of surrounding property and environment effected by construction of the infrastructure made by him. The Supervision Consultant shall provide technical support to owner to intact the surrounding properties and environment. Hence in commencement of work, he must consider required site preparation

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works to protect environment, surrounding properties, and safety and comfort workers and stakeholders.

a) take all measures for the protection of public properties such as public roads, electricity and telephone lines, sewer lines, cables, drains, etc. due to the construction work. In the event of any damage to such structures or properties, the Building Owner shall bear the cost to rectify the damages done and pay compensation to the owners of the respective private & public properties. The completion certificate should issue only maintaining the public infrastructures etc.
b) Ensure that the contractor will provide suitable sanitary facilities for all persons concern to the works in a appropriate location. Such toilet facilities shall be cleaned daily and all sanitary waste be disposed appropriately
c) The Supervision Consultant shall ensure that the Contractor will make adequate arrangements to the satisfaction of the Supervision Consultant for the disposal of all waste, storm run-off and sub-soil water, sewage and all other waste materials arising from or connected with the execution of the Works.
d) The Supervision Consultant shall ensure that the Contractor will clean equipment used for the Works in locations where debris and run-off will be prevented from gaining access to storm water and drainage courses. The Supervision Consultant shall also ensure that the Contractor will preserve existing trees as practically as possible and that will not trim damage or remove trees, including their roots, unless previously authorized by the Supervision Consultant.

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4.9.1. Construction site safety

Supervision Consultant shall assist Building Owner to maintain the safety of all workers, supervisors & third party involved in the construction. In case contract agreement is signed between the Building Owner& the Contractor for the construction of the building, the contract document includes all necessary items for the ensuring the safety of the workers, supervisors, third party and the supervision consultant team. For the construction of large or important structures, provision of safety supervisors shall be made by the Building Owner

The safety work must maintain following general conditions, but not limited to:

a) Provision of the safety gears and personal protective equipment shall be made at the site for the safety of all workers engaged in the construction work. Minimum level of protection on most construction sites is an approved Hardhat, Safety glasses, Leather boots and full shirt extending 4 inches over the shoulder and Long pants. Construction work shall not be carried out unless such provisions are made at the site.
b) Provision of first-aid box shall be always made at the construction site.
c) Insurance of workers shall be made against construction accidents as per the prevailing laws.
d) Personal hygiene services such as wash and toilet, dressing facilities. No other area is to be used for toileting.

e) Protection against pandemic- Registry with contact address in site entry point, Body temperature measurement, Handwash/sanitizer, safety distance
f) Protection and prevention of fires;
g) Protection barrio in scaffolding: Handrails in scaffolding with above 1.8 m fall height; Safety belts in high work condition
h) Proper housekeeping of the site;
i) Proper barricading construction area;
j) Awareness of safe driving and securing safe access ways;
k) (Prevention of dropping objects;
l) Prevention of collapses;
m) Protection and prevention of accidents involving construction equipment;
n) Protection from and prevention of electric shock; Wires of electrical instruments should be conducted.
o) Dust control measures should be implemented
p) All employees must know the emergency response and notification procedures of the jobsite.
q) Employees on a walking/working surface (horizontal and vertical) with an unprotected side or edge which is 2 meters or more above a lower level must be protected from falling using a personal fall arrest system, railings, spotters, warning devices or other means.
r) Employees involved in activities that may subject the hands to injury (e.g., cuts, abrasions, punctures, burns, chemical irritants, toxins, vibration and forces which can restrict blood flow) must use hand protection appropriate for the hazard.
s) Protect excavations and openings in the working surfaces of an area with a barricade or hole cover. Hole covers must be marked and cleaned to prevent accidental displacement. No excavation should be left open overnight, it must be barricaded or backfilled prior to close of business.
t) Excavations, trenches or cuts that are 1.5m or more in depth in soft or unstable ground should be shored, sloped to the angle of repose, or stepped back with berms (benched).
u) A stairway, ladder, ramp or other safe means of access and egress must be in trench excavations that are 1.5m or greater in depth.
v) Keep heavy equipment back from edges of excavations. Materials, tools and spoil piles must be kept at least 1m from the edge.
w) Construction site should be covered with safety net in public traffic area.
x) Conduct a 5-10 minute pre-start talk with all workers before commencing specific safety required works.
y) As far as possible, carry out the roofing work only during good weather conditions and avoid extreme heat/cold. Better side with caution and always waits for ideal weather before begin roofing work.
z) Follow r1ecommendations of IS 5216 1952 Safety procedure and practices in electrical works

4.9.2. Construction Safety against Deep Excavations and Earth Filling Works

a) All precautions shall be taken when excavation is made for foundation. Arrangements shall be made against the possibility of caving in of soil, rise in water table and settlement of adjoining areas and structures. Building Owner shall take the help of technicians to ascertain the risk involved in deep excavations. For deeper excavations such as multiple level basements or excavations in very weak soil, provisions of sheet pile walls, concrete protection piles or other geotechnical measures shall be made. Such structures shall be designed by professional engineers.
b) The Building Owner shall use the technology of deep foundations such piles with full technical support of a geotechnical engineer so as to avoid detrimental effect to the adjoining property such as vibration during driving, soil upheave, caving in from sides, high water accumulation, etc. In case of any unforeseen event, the Building Owner shall be fully held responsible to take immediate remedial actions and pay compensation to the private & public properties. It is strongly recommended to do insurance of the surrounding properties before starting the deep excavation works.
c) When earth filling work is to be done to raise the finished level in comparison to the adjoining areas, permanent retaining structures shall be erected before commencing such earth filling work. Such retaining structures shall be designed by professional engineers.
d) The Building Owner shall make all necessary arrangements for the safety of structures and buildings existing in the land parcels abutting to the land parcel of the Building Owner. If any problem arises due to the excavation work at the construction site, the Building Owner shall rectify such problem on its own cost.

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4.9.3. Construction Safety of Adjoining & Public Properties

a) In case there is any possibility of settlement or damage to the adjoining properties due to the excavation or construction activities carried out by the Building Owner, the Building Owner shall carry out insurance against safety of such structures prior to the commencement of the excavation work.
b) The Building Owner shall take all measures for the protection of public properties such as public roads, electricity and telephone lines, sewer lines, cables, drains, etc. due to the construction work. In the event of any damage to such structures or properties, the Building Owner shall bear the cost to rectify the damages done and pay compensation to the owners of the respective private & public properties. The completion certificate should issue only maintaining the public infrastructures etc.
c) In case the contract agreement is signed between the Building Owner& the Contractor for the construction of the building, insurance clauses shall be introduced in the contract clauses and the cost of insurance shall be borne by the Building Owner as a provisional item in the contract

4.10. Confirmation of Completed Works

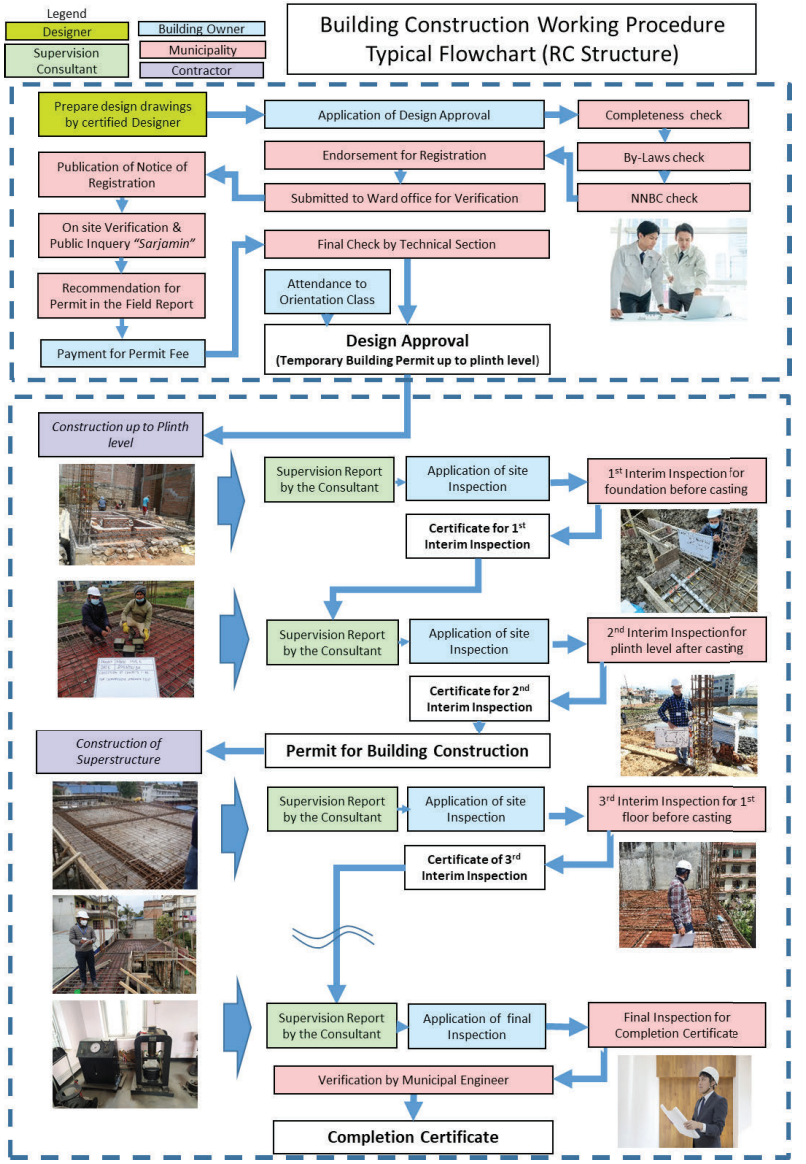
Contractor shall notice to owner on Completion of construction work. Receiving the work completion notice from contractor, owner/Supervision Consultant/contractor shall verify jointly the executed works including function status of sanitary and electrical works. Punchlist of observed defects/remaining finishing works shall be prepared jointly at the verification. Contractor's obligation deemed completed after rectifications of works mentioned in the punch list. It conforms the work completion status.

Contract between contractor and owner may specify defect liability period for a specified period. The period starts from work completion date. During this period, the contractor is obliged to make good any work that is determined to have been defects, which develops during the DLP that is no caused, by neglect or abuse. Supervision Consultant will attempt to correct all defects and outstanding works by the end of the period.

ANNEXES

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Annex I: Detailed Flowchart& Responsibilities of each stakeholder



Annex II-a: Sample form of Supervision

Supervision Consultant Contract Agreement

THIS CONTRACT **"Provide technical services to Supervise Construction work"** is entered into this. ……., by and between **person intended to construct house (Client) M/S ……** in location: ……and **M/S** .... **("Supervision Consultant").** WHEREAS, the Client wishes to have the Consultant to perform the services hereinafter referred to, and WHEREAS, the Supervision Consultant is willing to perform these services,

NOW THEREFORE THE PARTIES hereby agree as follows:

1. Services

The Consultant shall provide technical supervision services to construct Client's construction work as per design approved by Municipality which is made an integral part of this Contract.

The Consultant shall submit to the Client the reports in the form and within the time periods specified in Annex C, "Consultant's Reporting Obligations."

2. Term

The Consultant shall perform the Services during the period commencing **.....** and continuing through **.....** or any other period as may be subsequently agreed by the parties in writing.

3. Payment

A. Ceiling
For Services rendered pursuant to Annex A, the Client shall pay the Consultant Total Amountnot to exceed Rs. ..... **(In words: NRs. ..... Only)**(inclusive all Tax) and Contingencies. This amount has been established based on the understanding that it includes all of the Consultant's costs and profits as well as any tax obligation that may be imposed on the Consultant.

B. Schedule of Payments:
After commencement of municipal 1st inspection approval: …….. %
After complement of municipal 2st inspection approval:
After complement of municipal 3rd inspection approval: ……. %
After complement of municipal final inspection approval: …….. %
After completion of Work as mentioned in clause 3.3.6 ……%

C. Payment Conditions
Payment shall be made inNepali Rupees, no later than 15 days following mentioned in Schedule of payment

4. Project Administration

A. Reports.
The reports listed in Annex 3 shall be submitted in the course of the assignment and will constitute the basis for the payments to be made under paragraph 3.

5. Performance Standards

The Supervision Consultant undertakes to perform the Services with the highest standards of professional and ethical competence and integrity. Construction documents (Specification, Drawings SOV) and this guideline shall be the guiding documents to perform the services.

9. Responsibility

The Consultant shall be responsible to fulfil his obligations as per the requirement of the Contract Agreement, RFP documents and Procurement Act and Regulations.

10. Termination

Both parties may terminate this agreement for convenience and/or without cause upon one month's written notice to the opponent. In the case of such termination, client shall pay for all undisputed amounts due and payable as of the date of termination. Lump sum amount based on work completion shall be prorated.

11. Law Governing Contract and Language

The Contract shall be governed by the laws ofNepal and the language of the Contract shall be English.

12. Dispute Resolution

Any dispute arising out of the Contract, which cannot be amicably settled between the parties, shall be referred to adjudication as per contract act.

FOR THE CLIENT	FOR THE SUPERVISION CONSULTANT
Signed by _____	Signed by _____
Client M/S:	Mr. For M/S. **.....**

Annex II-b. Registration Form for Supervision Consultant

APPLICATION FOR REGISTRATION AS A SUPERVISION CONSULTANT IN THE MUNICIPALITY

To.
…….. Municipality/ Rural Municipality
District: ……..
Province: ……

Photograph of the Applicant

Re: Application for enlisting as a Registered Supervision Consultant in the Municipality

Dear Sir/ Madam,
I/We have been involved in planning, designing & construction of buildings in Nepal and now wish to provide similar services in the sector of **Construction Supervision of Buildings** to the interested building owners in the municipality. Pursuant to the Clause 20 of the Building Construction Working Procedure, I/we hereby request for enlisting me/us as the registered designer in the municipality with the following details & supporting documents.

1. Personal Details:

a) In English:
Forename: Middle Name: Surname:
b) In Nepali:
……
c) Gender: ☐ Male ☐ Female ☐ Others
d) Date of Birth (in BS): ……../……/…… day/month/year
e) Place of Birth:……Municipality/VDC ……District ……..Province
f) Citizenship: ☐ Nepali ☐ Others (specify):
g) Date of Issue of Citizenship (in BS): ……/……/…… day/month/year
h) Place of issue of Citizenship:
i) Current Address:
……Municipality/VDC …… District ……Province
j) Permanent Address:
……Municipality/VDC …… District ……Province
k) Contact number: mobile no. ……Landline no……
l) PAN number: ……..
m) Firm Registration no. (only for consulting firms): ……..
n) Firm Registration Date (only for consulting firms): ……/……/…… day/month/year

2. Academic Qualifications:

Academic Level	Subject (Civil/Arch./Mech./ Elec./etc)	Institution	Country	Completion Year
SLC				
Certificate/Diploma Level				
Bachelor				
Masters				
PhD				

3. Nepal Engineering Council Registration (mandatory for engineers/ architects):

NEC Registration No.: …… NEC Registration Year: …….. BS

4. Attached Documents:

a) Copy of Citizenship Certificate- 1 (one) copy
b) Copy of Nepal Engineering Council Registration Certificate- 1 (one) copy
c) Copy of Bachelors' Degree Certificate- 1 (one) copy
d) Copy of PAN Registration- 1 (one) copy
e) Passport size Photographs (3 copies)
f) Sample Signature- 1 (one) copy
g) Copy of Firm Registration Certificate (only for consulting firms)- 1 (one) copy
h) Copy of VAT Registration Certificate (only for consulting firms) – 1 (one) copy
i) Copy of Business Registration Certificate (only for consulting firms) - 1

5. Declaration for Authenticity and non-blacklisting

I hereby declare that the above- mentioned details and documents are true and authentic and fully understand that in case of any discrepancy, I will be held fully liable as per the prevailing laws of the country. I further declare that I have not been blacklisted by the municipality in connection with my service as a designer.

Left Right

Thumb Prints of the Applicant

……..
(Signature of the Applicant)
Name: ……..
Date: ……

Annex III: Checklist of Supervision

Checklist for Municipal inspection

1st inspection Checklist:

Checklist status	Municipality 1st inspection (Foundation)
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	There is no deviation on layout from approved design.	☐ Yes	☐ No	☐ N/A	
2	The diameter of re-bars bars, spacing, embedment, and bearing on Foundation according to the approved drawings, and Guidelines.	☐ Yes	☐ No	☐ N/A	
3	Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.	☐ Yes	☐ No	☐ N/A	
4	Excavated area barricaded.	☐ Yes	☐ No	☐ N/A	
5	Isolation of Seepage water due to high water table has been done. Safety against underground utility lines maintained.	☐ Yes	☐ No	☐ N/A	
6	Re-bars are maintained in its position by providing sufficient steel chairs, cover blocks, spacers, supports and binding wire etc as per specifications and guidelines.	☐ Yes	☐ No	☐ N/A	
7	Anchor development provisions, Length and location of lap splices are as specified in the drawings and specifications and the guideline.	☐ Yes	☐ No	☐ N/A	
8	Legs of stirrups and rings are as per the guideline and drawings.	☐ Yes	☐ No	☐ N/A	
9	Spacing of stirrups and rings in confined zone and other area are as per the drawings and the guideline.	☐ Yes	☐ No	☐ N/A	
10	The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident.	☐ Yes	☐ No	☐ N/A	
11	Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

2nd Inspection Checklist

Checklist status	Municipality 2nd inspection (Plinth Level)
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	There is no deviation on layout from approved design in this level	☐ Yes	☐ No	☐ N/A	
2	Below plinth Brickwork done in plumb, true line and level, proper interlocked and vertical joints broken.	☐ Yes	☐ No	☐ N/A	
3	The brickwork is constantly kept moist on all faces for a minimum period of seven (7) days.	☐ Yes	☐ No	☐ N/A	
4	Backfill for foundations, walls and other structures is carried out from the approved source of soil/materials.	☐ Yes	☐ No	☐ N/A	
5	The backfilling is done in the layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/ mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.	☐ Yes	☐ No	☐ N/A	
6	Remaining excavated area barricaded.	☐ Yes	☐ No	☐ N/A	
7	The diameter of re-bars bars, spacing, embedment, and bearing according to the approved drawings, and Guidelines.	☐ Yes	☐ No	☐ N/A	
8	Re-bars are maintained in its position by providing sufficient steel chairs, cover blocks, spacers, supports and binding wire etc as per specifications and guidelines.	☐ Yes	☐ No	☐ N/A	
9	Anchor development provisions, Length and location of lap splices are as specified in the drawings and specifications and the guideline.	☐ Yes	☐ No	☐ N/A	
10	Legs of stirrups and rings are as per the guideline and drawings.	☐ Yes	☐ No	☐ N/A	
11	Spacing of stirrups and rings in confined zone and other area are as per the drawings and the guideline.	☐ Yes	☐ No	☐ N/A	
12	The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident.	☐ Yes	☐ No	☐ N/A	
13	Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

3rd Inspection Checklist

Checklist status	Municipality 3rd inspection (Floor Level)
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	There is no deviation on layout from approved design in this level	☐ Yes	☐ No	☐ N/A	
2	All open sides or openings are covered or guarded by effective means to prevent falls. High voltage city distribution line area barricaded.	☐ Yes	☐ No	☐ N/A	
3	Formwork has sufficient structural integrity and compliance to the formwork drawing. Line and level have been checked.	☐ Yes	☐ No	☐ N/A	
4	Formworks including post, bracing and shores are sufficient and well-fixed to resist concrete poring and compaction activities and leakage possibilities	☐ Yes	☐ No	☐ N/A	
5	The diameter of re-bars bars, spacing, embedment, and bearing according to the approved drawings, and Guidelines.	☐ Yes	☐ No	☐ N/A	
6	Re-bars are maintained in its position by providing sufficient steel chairs, cover blocks, spacers, supports and binding wire etc as per specifications and guidelines.	☐ Yes	☐ No	☐ N/A	
7	Anchor development provisions, Length and location of lap splices are as specified in the drawings and specifications and the guideline.	☐ Yes	☐ No	☐ N/A	
8	Legs of stirrups and rings are as per the guideline and drawings.	☐ Yes	☐ No	☐ N/A	
9	Spacing of stirrups and rings in confined zone and other area are as per the drawings and the guideline.	☐ Yes	☐ No	☐ N/A	
10	The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident.	☐ Yes	☐ No	☐ N/A	
11	Service conducts are properly provided and provisions to maintain strength of structure members possibility of electric short circuit are considered.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

4th Inspection Checklist

Checklist status	Municipality 4th inspection (Completion level)

Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	As built construction does not deviate from approved design.	☐ Yes	☐ No	☐ N/A	
2	Complies code andBy-Laws requirements.	☐ Yes	☐ No	☐ N/A	
3	The structure is free from undue cracks, settlements, leakage, damping etc.	☐ Yes	☐ No	☐ N/A	
4	All hinges, Tower bolts, handles are as per specification. Shutters are properly fixed in frames.				
4	All electric power points are checked for full capacity functioning and short circuit.	☐ Yes	☐ No	☐ N/A	
5	Earthing function tested OK.	☐ Yes	☐ No	☐ N/A	
6	Sanitary lines checked in designed pressure and found OK. No leakage or damping observed in structure.	☐ Yes	☐ No	☐ N/A	
7	Sanitary fixtures functioning satisfactorily.	☐ Yes	☐ No	☐ N/A	
8		☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

Checklist for quality assurance
Checklist for Excavation

Checklist status	Excavation and Backfilling Works
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	Bench mark levels are checked and fixed through joint inspection with Contractor. Designed site plan verified	☐ Yes	☐ No	☐ N/A	
2	Prior to start excavation, Construction platform to be prepared or on which embankment to be placed, are cleared, grubbed, scalped, and made suitable to allow efficient and uninterrupted progress.	☐ Yes	☐ No	☐ N/A	
3	site survey has been checked, all lines set, and the levels established before excavation.	☐ Yes	☐ No	☐ N/A	

	Isolation of Seepage water due to high water table has been done. Safety against underground utility lines maintained.	☐ Yes	☐ No	☐ N/A	
4	Excavations, adjacent areas, and protective systems inspected daily before start of the work.	☐ Yes	☐ No	☐ N/A	
5	Excavated materials are not deposited within 1.5m from the top edge of the excavation and head of downward steep slope.	☐ Yes	☐ No	☐ N/A	
6	Excavated area barricaded.	☐ Yes	☐ No	☐ N/A	
7	Surface water or runoff is diverted or controlled to prevent accumulation in the excavation. Inspections made after every rainstorm or other hazard-increasing occurrence.	☐ Yes	☐ No	☐ N/A	
8	Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.	☐ Yes	☐ No	☐ N/A	
9	Backfill for foundations, walls and other structures is carried out from the approved source of soil/materials.	☐ Yes	☐ No	☐ N/A	
10	The backfilling is done in the layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/ mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

Checklist for Formworks

Checklist status	Formwork
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	Material of formwork is acceptable.	☐ Yes	☐ No	☐ N/A	
2	A formwork drawing, to show the formwork system and its set up, is available at the site.	☐ Yes	☐ No	☐ N/A	
3	Horizontal/diagonal bracings are provided in both longitudinal & transverse directions.	☐ Yes	☐ No	☐ N/A	
4	Shores of the formwork structure are of adequate size and spacing. Shores are properly seated top and bottom to prevent displacement.	☐ Yes	☐ No	☐ N/A	
5	Inspections done after the completion of the formwork structure and recorded into a register.	☐ Yes	☐ No	☐ N/A	

6	All open sides or openings are covered or guarded by effective means to prevent falls. High voltage city distribution line area barricaded.	☐ Yes	☐ No	☐ N/A	
7	There is suitable access and egress to the formwork areas.	☐ Yes	☐ No	☐ N/A	
8	Before starting the concrete works, the formwork has been inspected and signed off / certified for its structural integrity and compliance to the formwork drawing. Line and level have been checked.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

Checklist for Rebar Layout

Checklist status	Re-bars layout
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	Reinforcements approved, test results and/or Factory batch test certificates are available at site.	☐ Yes	☐ No	☐ N/A	
2	The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident.	☐ Yes	☐ No	☐ N/A	
3	The diameter of re-bars bars, spacing, embedment, and bearing on a wall, beam or slab are according to the approved drawings, BCWP Guidelines for supervision consultant and specifications.	☐ Yes	☐ No	☐ N/A	
4	Re-bars is accurately cut and bent to the shapes and sizes shown on the drawings and approved rebar schedule prior to using them in the work.	☐ Yes	☐ No	☐ N/A	
5	Re-bars are maintained in its position by providing steel chairs, cover blocks, spacers, supports and binding wire etc. during pouring of concrete. The specified cover and clearances are satisfied.	☐ Yes	☐ No	☐ N/A	
6	Length and location of lap splices are as specified in the drawings and specifications and the guideline.	☐ Yes	☐ No	☐ N/A	
7	Legs of stirrups and rings are as per the guideline and drawings.	☐ Yes	☐ No	☐ N/A	
8	Spacing of stirrups and rings are as per the drawings and the guideline.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

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Checklist for Concrete Works

Checklist status	Concrete works
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	Concrete mix design / trial mix is approved and copy available on site.	☐ Yes	☐ No	☐ N/A	
2	Cement has been stored properly and has been used in order of First arrived, First used. Different types & brand of cement are stored separately, and the moisture-affected cement are not used.	☐ Yes	☐ No	☐ N/A	
3	Sieve Analysis has been conducted for fine &course aggregates and found in conformance to the specs.	☐ Yes	☐ No	☐ N/A	
4	At minimum, the slump tests are carried out: • One test at the commencement of each casting. • One each time a strength test specimen is taken.	☐ Yes	☐ No	☐ N/A	
5	Vibrator use is uniform, sufficient no. of vibrators and its leads are available,	☐ Yes	☐ No	☐ N/A	
6	The mixer drum is cleaned thoroughly before starting new mix and mixing time is Min 60 Seconds for each batch.	☐ Yes	☐ No	☐ N/A	
7	Cement and sand properly dry mixed prior to mix aggregate in hand mixing. 10% more cement added than specified.	☐ Yes	☐ No	☐ N/A	
8	Freshly laid concrete is protected from rain by suitable covering e.g polythene sheets.	☐ Yes	☐ No	☐ N/A	
9	Embedded Items like Water Stopper, Electrical conduits and Plumbing items are plugged and fixed properly. Electrical conduits are placed not in tensile zone concrete cover area.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

Checklist for Brick Works

Checklist status	**Brick works**
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	Manufacturer/Sample of Brick has been approved.	☐ Yes	☐ No	☐ N/A	
2	Setting out and alignment of wall has been marked.	☐ Yes	☐ No	☐ N/A	
3	Horizontal and vertical band rebar are of specified size and at proper location.	☐ Yes	☐ No	☐ N/A	
4	Cement sand mortar has been mixed on a clean and hard platform. Mixing ratio is as per specs and is used within half an hour of mixing.	☐ Yes	☐ No	☐ N/A	
5	All the bricks are thoroughly soaked in clean water before use.	☐ Yes	☐ No	☐ N/A	
6	Bricks are laid in plumb, true line and level, proper interlocked and vertical joints broken.	☐ Yes	☐ No	☐ N/A	
7	Tooth joints are avoided in corner and cross connections between walls. Rack back joints are provided in corner and cross connections. Wall is in slope when work needed to be stopped for next day.	☐ Yes	☐ No	☐ N/A	
8	Thickness of joint is not more than 10-12mm.	☐ Yes	☐ No	☐ N/A	
9	"English Bond/French Bond" is used for full brick and thicker walls.	☐ Yes	☐ No	☐ N/A	
	Vertical joints are properly packed with mortar.				
10	Joints of brickwork are raked out to a depth of 6mm at the time of laying. Joints are 'struck' with a metal tool producing a smooth and hard weather resistant surface.	☐ Yes	☐ No	☐ N/A	
11	No mortar applied on the exposed face of bricks.	☐ Yes	☐ No	☐ N/A	
12	The brickwork is constantly kept moist on all faces for a minimum period of seven (7) days.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

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Checklist for Plaster Works

Checklist status	**Plaster works**
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	**Description**	**Status**			**Comments**
1	Approved sand is available on site along with its sieve analysis report.	☐ Yes	☐ No	☐ N/A	
2	Substrates are cleaned off for any deposit or finish which may impair adhesion of plaster.	☐ Yes	☐ No	☐ N/A	
3	The concrete surface has been roughened / Chipped completely.	☐ Yes	☐ No	☐ N/A	
4	The joints are raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any are removed by brushing and scrapping.	☐ Yes	☐ No	☐ N/A	
5	The surface is thoroughly washed with water, cleaned and kept wet before plastering is commenced.	☐ Yes	☐ No	☐ N/A	
6	The mortar for cement plaster of specified proportion is mixed as specified in the specifications for Brickwork.	☐ Yes	☐ No	☐ N/A	
7	Ceiling plaster is completed before commencement of wall plaster.	☐ Yes	☐ No	☐ N/A	
8	Electrical, plumbing and other embedded items are fixed in position.	☐ Yes	☐ No	☐ N/A	
9	Chicken wire mesh with approved size is used between junctions of column/beam and walls.	☐ Yes	☐ No	☐ N/A	
10	Cement sand mortar has been mixed on a clean and hard platform. Mixing ratio is as per specs and is used within half an hour.				
11	The plaster is finished to a true and plumb surface and to the proper degree of smoothness, as required.	☐ Yes	☐ No	☐ N/A	
12	Plaster finishes are: • Resistant to impacts expected in use. • Free of irregularities. • Consistent in texture and finish. • Firmly bonded to substrates for the expected life of the application. As a suitable substrate for the nominated final finish.	☐ Yes	☐ No	☐ N/A	
13	Plaster of thickness 20mm or more is applied in two layers. Surface of first layer is roughed wavy to receive next layer.				
14	Curing is started as soon as the plaster has hardened sufficiently and continued for at least 7 days.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant		Contractor's representative			

Signature:	Signature:

Checklist for Metal Works

Checklist status	**METAL WORK**
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	**Description**	**Status**			**Comments**
1	Approved Shop Drawings are available at site.	☐ Yes	☐ No	☐ N/A	
2	Manufacturer/Sample of MS Steel/cover sheets has been approved.	☐ Yes	☐ No	☐ N/A	
3	Metal has been assembled and welding done according to the approved drawing.	☐ Yes	☐ No	☐ N/A	
4	All materials are free from twists and damage.	☐ Yes	☐ No	☐ N/A	
5	No member is cut, notched, drilled, spliced or altered, unless approved by Supervision Consultant.	☐ Yes	☐ No	☐ N/A	
6	All the bolts for the whole are tightened at one time.	☐ Yes	☐ No	☐ N/A	
7	All the member is painted with one coat of specified primer followed by two coats of specified paint.	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

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Annex IV: Photo report form

- Each photo shall have following annotations:
- Photo number:
- Title of photo,
- Location of photo as named in approved architectural drawing (X-axis grid name, Y axis grid name, Floor name)
- Date and time of photography
- Photographer:

Description	**Sample Photograph**
Sample Photo of Rebar check at foundation with following information **Project brief detail with data** **Rebar detail at footing**	
Sample Photo for Concrete Cube preparation at site with following information **Project brief detail with data**	
Sample Photo for Column rebar check including information: **Project brief detail with data** **Longitudinal rebar detail** **Stirrups rebar detail**	 
Sample Photo for Beam and Slab rebar check including information: **Project brief detail with data** **Rebar detail of Beam** **Rebar Detail of Slab**	 

Annex V: Form of Supervision report

Formats shall be provided in this section for the Supervision Report to be submitted by the Supervision Consultant. The reporting shall be made at the following milestones:

1. For RCC buildings: After the completion of Foundation excavation, soling works, PCC for foundation and rebar cage placing for foundation & columns.
2. For Masonry Buildings: After the completion of Foundation excavation, soling works, PCC for foundation, vertical reinforcement placing, footing construction and wall construction below the plinth level.
3. Construction up to the Plinth Level in RCC Buildings & up to the DPC Band in Masonry Buildings.
4. Construction up to the First Floor Level.Construction for each floor for multi-story buildings
5. Building Construction Completion Report

Report First inspection request

Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of temporary permit of Municipality
c) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
d) Checklist for 1st inspection
e) Photographs: Photographs of up to date completed works (showing Reinforcement of tie beam and column extended)
f) Material information reports:

- Approved Cement brand
- Source name of sand
- Source name of aggregate
- Report of Concrete cube test using approved cement
- Brand of approved reinforcement with Factory batch test report(Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m^2)

Report second inspection request

Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of 1st inspection approval of Municipality
c) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
d) Checklist for 2st inspection
e) Photographs: Photographs of up to date completed works (showing Reinforcement of each footing and column)
f) Material information reports:

- Report of cube test of Concrete used in footing casting period
- Name of Approved Cement brand, if changed
- Source name of sand, if changed
- Source name of aggregate, if changed
- Brand of approved reinforcement with Factory batch test report (Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m2), If changed

Report Third inspection request

Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of 1st inspection approval of Municipality
c) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
d) Checklist for 3rd inspection
e) Photographs: Photographs of up to date completed works (showing Reinforcement of beam, slab and extended columns)
f) Material information reports:

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- Report of cube test of Concrete used in tie beam casting period
- Name of Approved Cement brand, if changed
- Source name of sand, if changed
- Source name of aggregate, if changed
- Brand of approved reinforcement with Factory batch test report (Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m2), If changed

Building Construction completion report

The Supervision Consultant shall submit Building Construction completion report that shall be included in application for building completion inspection. Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Plinth area
- Total floor
- Total floor area
- Total floor considered in design
- First approval date, Floor/Area of first approval
- Revised approval date, Floor/Area of revised approval
- Construction starting and completion date, Gapping period
- Starting engagement date of supervision consultant

b) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.

c) As built drawings: In general, the Supervision Consultant shall ensure the production and submission of the as-build drawings by the contractor. In absence of provision to prepare 'as build drawing' in contractor's part, the Supervision Consultant must prepare the document. The drawing should cover as-build architectural drawings, reinforcement detailing of major structural components,

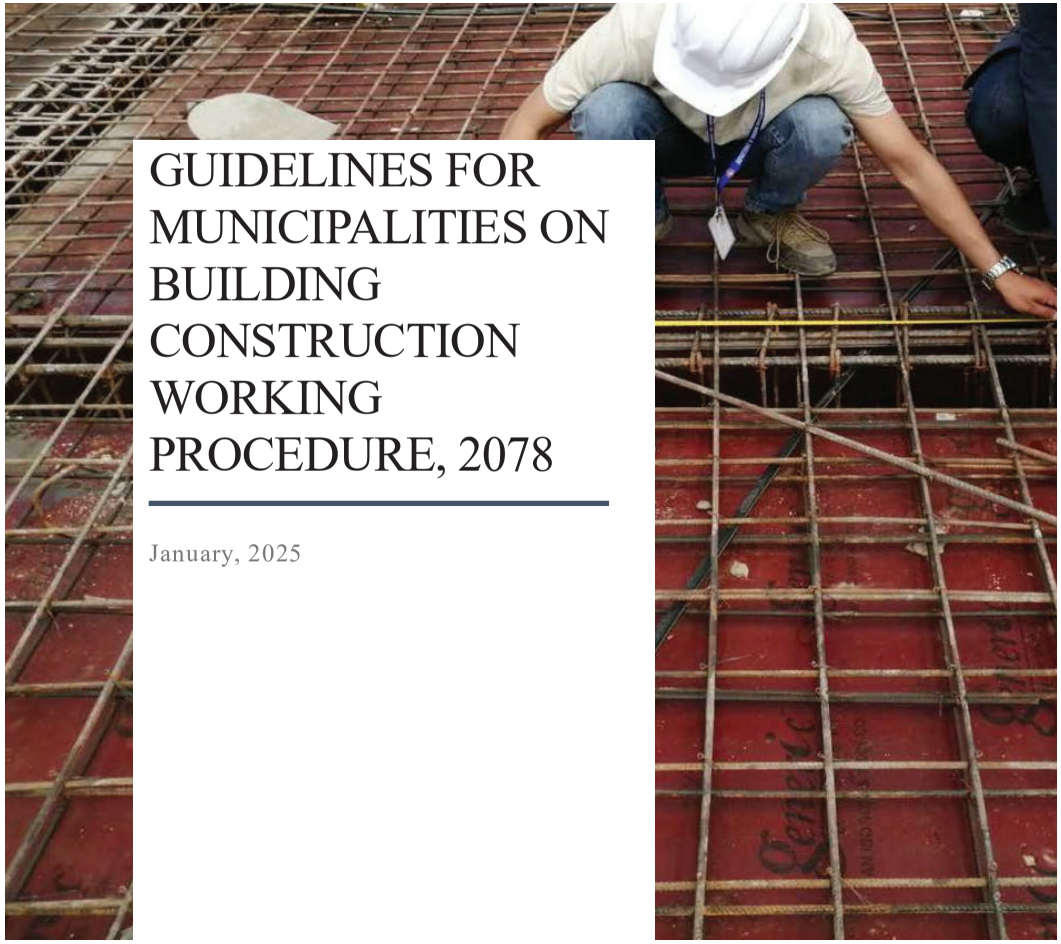
d) Photographs: Photographs of municipalities' monitoring stage and completion stage shall include in the report.

e) Structural characteristics of constructed buildings such as design parameters and capacity of building, final structural analysis input file, specification of major construction materials, Geo-technical investigation report, and other miscellaneous information related to services and strength.

- Test Report of the main construction materials (rebar, cement, bricks, sand, aggregates, etc)
- Test Report of Concrete Quality (cube test reports as per IS 456:2000)
- Photographs showing details and construction progress at each milestone mentioned above.

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3-6. For Municipalities



GUIDELINES FOR MUNICIPALITIES ON BUILDING CONSTRUCTION WORKING PROCEDURE, 2078

January, 2025

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Under the project "The Project for Promotion of Nepal National Building Code Compliance for Safer Building Construction"

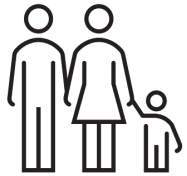
Department of Urban Development and Building Construction, Babarmahal, Kathmandu

Technically Supported by Japan International Cooperation Agency (JICA) Nepal



Attention to Municipality

The Municipality is responsible for issuing the building permit for building construction works at the design phase while it is responsible for issuing the inspection certificates and completion certificates as well during and after the construction respectively. The Municipality shall be responsible for the strict enforcement of the building By-Laws & the building code in the municipality during the design phase as well as during construction.



Building Owner

The Building Owner is the main body for Building Application who shall makes the final decision of the building design and its construction. The Building Owner is responsible for employing the Designer, the Supervision Consultant and the Contractor as well as application to Municipality.



Designer

The Designer is responsible for preparing design documents for building construction. The Designer must be qualified for defined category of Building and registered to the Municipality. Construction and Supervision are implemented based on the design documents prepared by the Designer.



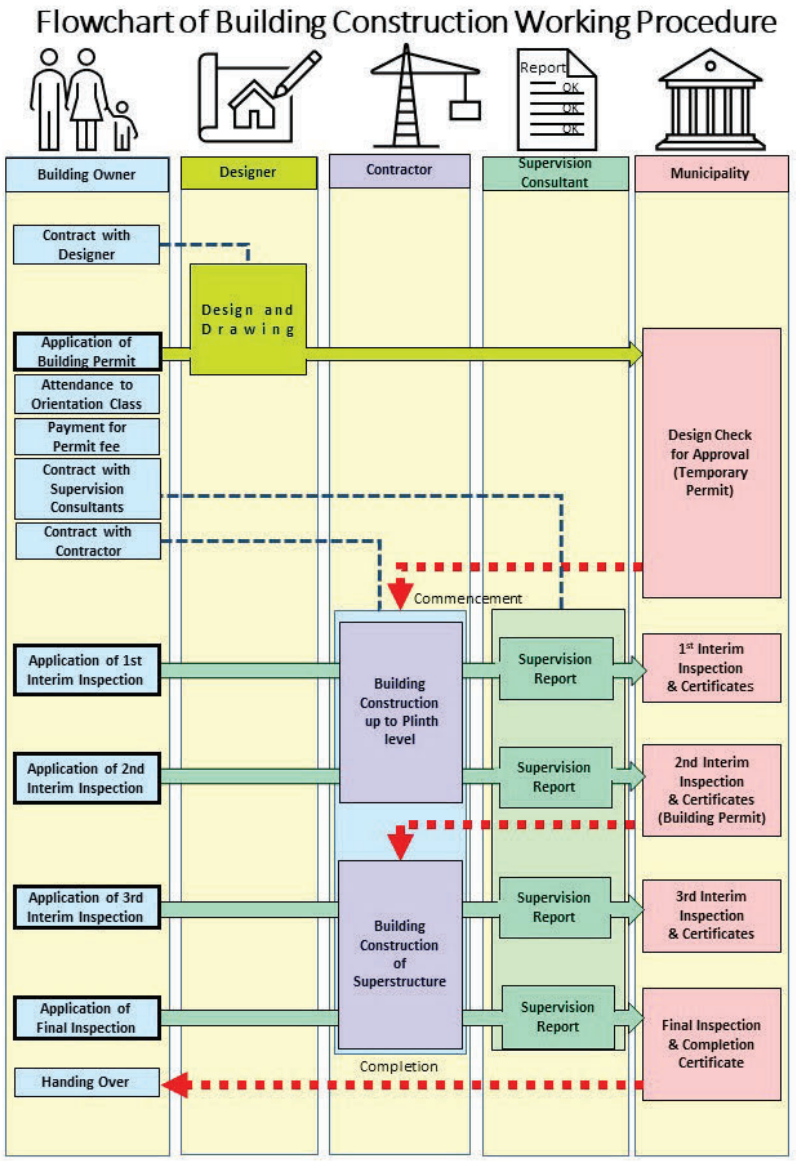
Contractor

Contractor is responsible for carrying out the construction work according to the design & drawing documents within the construction period specified in the contract as well as safety control on site. The Mason/Contractor must be qualified for defined category of Building and registered to the Municipality



Supervision Consultant

The supervision consultant is responsible for confirming that the construction work is being carried out according to the design documents and for reporting to the Municipality. The supervision consultant must be qualified for defined category of Building and registered to the Municipality.



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Preamble

Government of Nepal has enacted the Building Construction Working Procedure (BCWP) in all municipalities of Nepal with the objective of effective implementation of building By-Laws and building code. This guideline has been prepared to guide the municipalities in various steps as stipulated in the working procedure to be understood and practiced by the municipality staff in day-to-day works in connection with the issue of building permit. It is hoped that the detailed steps given in this guideline will help the municipality staff in effective interpretations of the clauses given in the BCWP and thus lead to efficient service delivery.

Section 1. Preliminary

1.1. Short title, Commencement & Application

a) These guidelines shall be called "The Guidelines for Municipalities on Building Construction Working Procedure, 2078 (2022 AD)".
b) This guideline shall extend to the whole territory of Nepal.
c) This guideline shall come into operation immediately.
d) This guideline shall be applicable for the issue of building permit from the municipality to all kind of the Building Construction including repair, retrofitting, renovation, expansion, addition of storeys and changing of occupancy type, compound wall.

1.2. Definition

In this guideline, unless the context otherwise requires, the expressions given below shall have the meaning indicated against each of them.

a) "Building" means any closed structure constructed using various construction materials for the purpose of human habitation.
b) "Building Construction" means construction of new building, reconstruction after demolition of the old building, expansion of building, addition of storeys, change of façade of the existing building, additions or alterations of windows, doors, parapets, balconies, height, porticos, etc and other related works.
c) "e-BPS" means the Electronic Building Permit System through which building permit is issued online by the municipality.
d) "Drawing" means all drawings and relevant documents pertaining to the construction of building.
e) "Designer" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of the preparation of drawings & designs and/or construction.
f) "Supervision Consultant" means individuals or consulting firms or institutions registered in the municipalities or individuals registered in Nepal Engineering Council (NEC) for the purpose of carrying of construction supervision of the building as prescribed by the municipality.
g) "Deed of Public Inquiry (Sarjamin Muchulka)" means the document prepared after the public inquiry on the land plot, access road, neighboring plots with regard to the construction of building conducted by the ward chairman or his representative in presence of the land owners of the adjoining plots including the signatures of the present.
h) "Storey" means the portion of building between two floors or between the floor and the ceiling.
i) "Plinth" means the portion of a structure between the surface of the surrounding ground and surface of the floor immediately above the ground.
j) "Plinth Level" means the level of the floor of a building immediately above the surrounding ground.

k) "Plinth Area' means the built-up covered area of the building / buildings immediately at plinth level.
l) "Superstructure" means the portion of the building above the Plinth Level.
m) "Occupancy Type" means the "use to which the building is put, such as residential, commercial, cold storage, warehouse, apartment, hospital, hostels, institutional, etc.
n) "Occupancy Change" means change of occupancy type of the building from the approved occupancy type at the time of building permit issuance.
o) "Building Code" means National Building Code of Nepal enacted by the Government of Nepal.
p) "Building By-Laws" means the building By-Laws of the respective municipality
q) "Municipality" means the municipalities in Nepal established as per the Constitution of Nepal and also denotes Metropolitan City, Sub-metropolitan City and Rural municipality in the country.
r) "Mayor" means the Mayor of the respective municipality.
s) "Chief Administrative Officer" means the Chief Administrative Officer of the respective municipality.
t) "Act" means Local Government Operations Act, 2074 (2017 AD).
u) "Municipal Assembly" means the municipal assembly of the respective municipality.
v) "Financial Act" means the approved financial act approved each year by the municipal council of the respective municipality.
w) "Building Owner" means every person, company or institution, who intends to construct or re-construct a building or make material alterations or cause the same to be done.
x) "Mason" means masons engaged in the building construction activities.
y) "Contractor" means contractor engaged by the Building owner for the building construction activities.
z) Application form: means the documents prepared for getting building permit from the municipality for Class A, Class B, Class C and Class D buildings separately

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Section 2. General information of BCWP

2.1. Background and Purpose of BCWP

The building construction practices in Nepal is improving drastically in recent decades. New construction materials, equipment, technologies are being introduced in the construction sector for carrying out the sophisticated construction works smoothly, properly and timely. That is in the case of the bigger and large-scale building construction projects such as high-rise apartments, group housing, commercial complexes, corporate office buildings and so on. The qualified technical team and professional contractors are involved in such large-scale building projects. Quality tests and technical supervision and monitoring are carried out in a professional way. However, for most of residential buildings which are comparatively small scale in terms of cost and volume of works, the professional qualified technicians are rarely involved and quality works mostly depends on the informal contractors and semi-skilled masons. Construction details are not followed and the new technologies and testing methodologies are rarely used to assure the quality constructions. Building act, 1999 and Building Regulation, 2009 of Nepal has made mandatory provision of technical supervision of building construction works with qualified technicians. However, these are not being enforced by most of the municipalities. There is lack of standard working procedures and guidelines to carry out inspection works as per prevailing building By-Laws and building code. The role and responsibilities of the major stakeholders of building constructions are not clearly defined. There are no cross checking and monitoring mechanism to regulate the building constructions in the urban and rural municipalities. Moreover, the informal stakeholders of building sectors are not trained, capacitated and sensitized on building norms, criteria, quality control and detailing to safeguard the building stocks from possible natural disasters mainly the earthquakes. Realizing these adverse situations on building sector, DUDBC has taken initiation to develop Building Construction Working Procedures (BCWP) based on Building Act 1999 to support municipalities to enforce building regulations following building By-Laws and building code of Nepal. The main purpose of the BCWP is to make uniformity in the building permit process in the municipalities all over the country with introduction of interim inspections of building constructions by municipal technicians. The other purposes of developing and enforcing new BCWP are as follows:

- To make the municipal technicians, designers, supervision consultants, contractors and masons and Building owner more responsible on overall building permit system of municipalities.
- To make the technical supervision mandatory for all new building constructions in municipalities
- To improve the quality of construction works with introduction of compulsory lab testing of construction materials and concrete works
- To improve compliancy of building By-Laws and building code in design and construction

- To safeguard the building stocks in urban and rural areas of the country from probable earthquake disasters

2.2. Flowchasrt of BCWP



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2.3. General information of Building By-Laws and building code in Nepal

2.3.1. Earthquake Risk in Nepal

- Nepal is ravaged by multiple natural hazards annually resulting in significant number of loss of lives and properties. Epidemics, floods and landslides are among the most frequent natural hazards with high magnitudes and intensities occurring throughout the country. Earthquake, cyclonic wind, thunderstorm, drought, famine, cloudburst, fire, avalanche is often recurring natural disasters in the country. In terms of vulnerability to natural disasters, UNDP/BPCR has ranked Nepal as the eleventh in terms of risk from earthquakes and thirtieth in terms of risk from flood (UNDP/BCPR 2004).
- Nepal's location in a highly active tectonic region of the Himalayan belt has increased the risk of earthquake disaster in the region. The subduction of Indian plate under the Tibetan plate is considered as the major source of seismicity in the region. Over the last century, great earthquakes in the Himalayan region occurred in 1803, 1833, 1897, 1905, 1934 and 1950 (Bilham ,Gaur, and Molnar 2001). Seismic records showed the 1833 earthquake in Nepal, 1879 earthquake in Shilong, 1905 earthquake in Kangra, 1934 earthquake in Bihar-Nepal and 1950 earthquake in Assam also caused deaths of thousands of people.

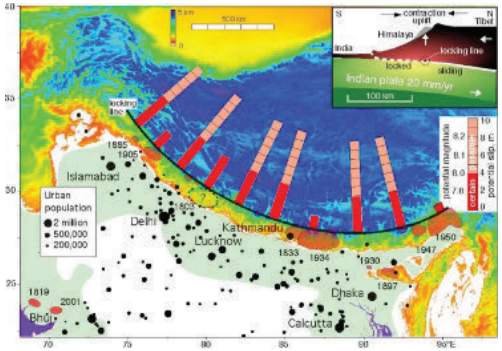


Figure 1: Estimated slip potential along the Himalaya and urban populations south of the Himalaya (Bilham, Gaur, and Molnar 2001)

- Seismic records for Nepal date back to 1255 and since that time several destructive earthquakes have occurred in 1408, 1681, 1810, 1833, 1866, 1934 and 2015. The 1934 Bihar-Nepal earthquake with magnitude of 8.4 took a toll of 4,300 people, destroying about 20 percent of all structures and damaging another 40 percent of buildings in Kathmandu Valley. This earthquake was believed to rupture a 200-300 km long segment to the east of Kathmandu(Pandey and Molnar 1988). In recent decade, Nepal experienced four major earthquakes: a 6.5 magnitude quake in Bajhang district on 29 July 1980 that killed 178 people and destroyed about 40,000 buildings and a 6.6 magnitude quake in Udayapur district that killed 721 people and destroyed 65,000 buildings.

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- Similarly, an earthquake of 6.9 Richter Scale hit at eastern border of Nepal between Taplejung and Sikkim on 18 September 2011. The earthquake had affected eight districts of eastern region caused 5000 building totally collapsed and 6500 buildings partially damaged including many school buildings.
- On 25 April 2015, a huge 7.8 magnitude earthquake (Gorkha earthquake) struck Barpak in the historic district of Gorkha, about 76 km northwest of Kathmandu. Nepal had not faced a natural shock of comparable magnitude for over 80 years since the Bihar earthquake. And numerous aftershocks have occurred since the Gorkha earthquake, the largest aftershock is a magnitude 7.3 on May12, 2015. The Gorkha earthquake and aftershocks caused massive damages and losses, a lot of collapse of the buildings of high vulnerability which increased the number of death. Remarkable and regrettable damages extended many historical buildings including world heritage sites. A damage and loss assessment showed that over 8,831 people lost their lives and 22,309 were injured. An over 602,000 private houses and 2,600 public buildings were completely collapsed. 285,000 private houses and 3,700 public buildings were damaged partially. 19,000 classrooms were completely damaged and more than 11,000 classrooms were damaged partially.
- In 2005, the Western Himalaya was hit by an earthquake with magnitude 7.4 killing more than 74,000 people in Pakistan and India. The location of ruptured areas shows a gap along the mountain range between the location of the 1905 Kangra and 1934 Bihar-Nepal earthquakes. It is believed that this region has not experienced such an earthquake since the last large earthquake. This portion of the arc is thus referring to as a *'seismic gap'* (Figure 2), a potential location for the next large earthquake. This earthquake scenario evidently indicates that the entire Himalayan belt is one of the most vulnerable zones in terms of seismic hazard. The works on fault modelling (Chamlagain and Hayashi 2007) of Nepal Himalaya has shown continuous accumulation of elastic strain to reactivate older geological faults to generate earthquake of different magnitude. Moreover, several other lines of evidence (e.g. neo tectonic, geomorphological, geophysical, geological, and seismological) also show that one or more mega-earthquakes may be overdue in a large fraction of the Himalaya (probably area between Kathmandu and Dehradun), threatening millions of people in the region.

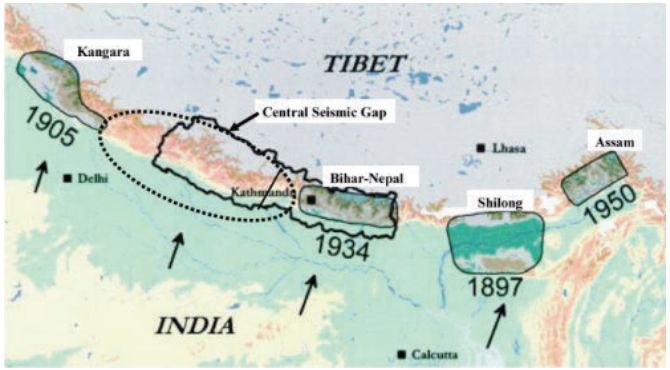


Figure 2: Distribution of probable rapture zones of 1879, 1905, 1934 and 1950 earthquakes along the Himalayan arc. Modified from (Yeats and Lillie 1991; Yeats et al. 1992)

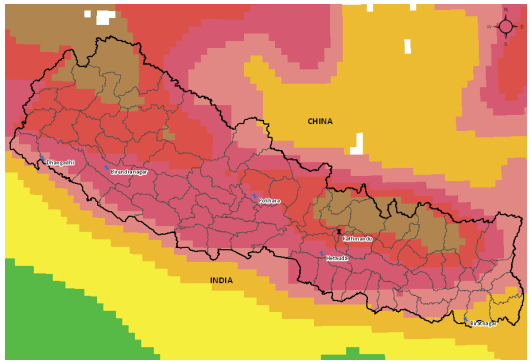


Figure 3: GSHAP seismic hazard map of Nepal [Adopted from (Giardini et al. 1999)]

- The GSHAP seismic hazard map shows that the entire country falls in a high earthquake intensity region of seismic risk scale corresponding to MMI, IX and X. The far western and eastern mountainous regions are the most hazardous regions with rest of entire hilly and the Terai regions lying in a high earthquake hazard zone. The hilly regions and the southern Terai region are the most densely populated areas of the country with a probability of very high population loss in an event of a major earthquake in the region.
- The level of risk has been increased further in our cities due to high urban growth rates and consequent high physical exposure and lack of preparedness. There are number of factors that contribute to the configuration of risk in cities. Firstly, the location of the city in terms of geology and seismological hazard; secondly the urbanization process which leads to the concentration of populations in risk-prone cities, and risk–prone locations within cities.



Figure 4: Some pictures of Building Damages in Kathmandu during Earthquake of April 2015 (Source: Google)

2.3.2. Background of NBC

That earthquake of 6.7 Richter scale that struck in eastern Nepal in 1988 drew attention of the Ministry of Urban Development (Former Ministry of Physical Planning and works), need for changes and improvement in current building construction practices in Nepal. It was recognized and request of Government of Nepal, technical assistance from UNDP and UNCHS (Habitat) had set up a three-year program "Policy and Technical Support to the Urban Sector" within the ministry. Then the sub-project "National Building Code Development Project" (UNDP/UNCHS/(Habitat)NEP/88/054) was formulated in 1992-93 within the Department of Urban Development and Building Construction (DUDBC) (former Department of Buildings) including with the government counterpart from the department. The Project developed Nepal National Building Code of Nepal which included 20 volumes of the different kinds of the Codes.

Building code is a set of standard practice adopted by engineering community for designing and constructing buildings and backed by legislation. It is an engineering tool for ensuring structural safety of buildings and convenience of occupants. In other words, in context of Nepal, building code is an official document which comprises of earthquake resistant design and construction technology considering suitability of Nepal's geology, environment using locally available construction materials and technology as far as possible. The main purpose of the building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law

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of a particular jurisdiction when formally enacted by the appropriate authority. Thus, in context of Nepal implementation of National Building Code is mandatory in all Urban and Rural Municipalities of Nepal according to Building Act 1999 (First Amendment 2007). Building code is not changeable according to the location or topography of municipalities. The code is unique for all over Nepal as it covers all categories of buildings especially structural design part which are constructed in the country.

Although too late, initiations have been taken to implement the National Building Code in municipalities of Nepal. Many municipalities have been implementing Nepal National Building code in building permit process. And DUDBC is strictly applying NBC in government buildings. Other municipalities and rural municipalities are trying to apply NBC gradually.

Department of Urban Development and Building Construction (DUDBC) had added three additional codes in 2003 besides the existing 20 volumes of the codes. They are Architectural (NBC 206), Sanitary (NBC 207) and Electrical code (NBC 208). After the Earthquake of 2015 NBC 202, 203, 204 and 206 have been updated. NBC 205: Mandatory Rules of Thumb for RC Buildings without masonry infill has been updated in 2012 as NBC 205: Ready to use detailing for RC Buildings without masonry infill. The present 23 volumes of codes have been formerly approved by the Government in the year 2003. The name list of Nepal National Building Codes is as follows:

- NBC 000: Requirement of State-of-the-Art Design and Introduction:
- NBC 101: Materials Specifications
- NBC 102: Unit Weight of Material
- NBC 103: Occupancy Load (Imposed Load)
- NBC 104: Wind Load
- NBC 105: Seismic Design of Buildings in Nepal
- NBC 106: Snow Load
- NBC 107: Provisional Recommendation on Fire Safety
- NBC 108: Site Consideration for Seismic Hazards.
- NBC 109: Masonry: Unreinforced
- NBC 110: Plain & Reinforced Concrete
- NBC 111: Steel
- NBC 112: Timber
- NBC 113: Aluminium
- NBC 114: Construction Safety
- NBC 206: Architectural Design Requirement.
- NBC 207: Electrical Design Requirements for (Public Buildings)

- NBC 208: Sanitary and Plumbing Design Requirements)
- NBC 201: Mandatory Rules of Thumb: Reinforced Concrete Building with Masonry Infill
- NBC 202: Mandatory Rules of Thumb: Load Bearing Masonry
- NBC 203: Guidelines for Earthquake Resistance Building Construction: Low Strength Masonry
- NBC 204: Guidelines for Earthquake Resistance Building Construction: Earthen Buildings (Eb)
- NBC 205: Mandatory Rules of Thumb: Reinforced Concrete Building without Masonry Infill

2.3.3. Background of Building By-Laws

- Building By-Laws refer to the set rules and regulations for building planning architectural designing enforced by municipalities which are mandatory to be obliged by building owners during building application and building construction.
- Ministry of Urban Development (MoUD) had developed and circulated "Model building By-Laws (2014)" as a reference document for new municipalities to formulate building By-Laws.
- The Ministry of Federal Affairs and Local Development (MoFALD), immediately after the major earthquake of April 2015, had circulated basic directives (2015) for housing development, urban planning, and building construction for all municipalities to upgrade and formulate building By-Laws considering resilience of the cities from earthquake and other natural disasters.
- Similarly, Ministry of Urban Development (MoUD) had published and circulated the Basic Standards on Settlement Development, Urban Planning & Building Construction (2015) (BSSDUPBC 2015) as a guiding document for the new municipalities to formulate complete building By-Laws as per their geo-physical circumstances and conditions. This standard was approved by Government of Nepal on 30 September 2015 was published in Nepal Gazette on 8th April 2016. The first amendment on this standard was prepared and published in Nepal Gazette on 10 April 2017.
- Building By-Laws may vary in different municipalities according to the local context, geography, topography such as provision of floor area ratio as per the land use zones, right of ways for local roads etc. However, municipalities cannot make weaker By-Laws than BSSDUPBC 2015 of MoUD.
- If any municipality has already applied stronger By-Laws than the BSSDUPBC 2015, the municipality one will prevail.
- Building By-Laws for the Construction in Kathmandu Valley, 2064 was approved by Government of Nepal on 1st May 2007 which was effective from 15 may 2007. This By-Laws was amended by the Government of Nepal on 16th November 2008 and 28 June 2010.
- The basic criteria of building By-Laws are Right of ways (ROW), front Setbacks, side setbacks, setbacks from river, lake, pond, forest, high tension electric lines, ground

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coverage, floor area ratio (FAR), light planes, rules for open spaces and so on. The detail description of the basic criteria of building By-Laws has been provided in Annex-2.

- Deviations from the building By-Laws may lead not only to the rejection of the building permit during application process but also to the rejection of certifications for the construction of superstructure and issuance of building completion certificates if the construction is found to violate the provisions of the building By-Laws.
- Apart from the building By-Laws, provisions of the building code should be followed during construction of buildings.
- Masons should understand that violation/ignorance of building code is violation/ignorance of the law of the country and negligence in structural safety of buildings.
- Undermining building code means compromising safety of its inhabitants from earthquake disasters which is inevitable in earthquake prone country like Nepal.
- Thus, masons should strictly follow Building Construction Working Procedures (BCWP) for getting compliance of both building code and building By-Laws in design/ drawing and in actual construction.

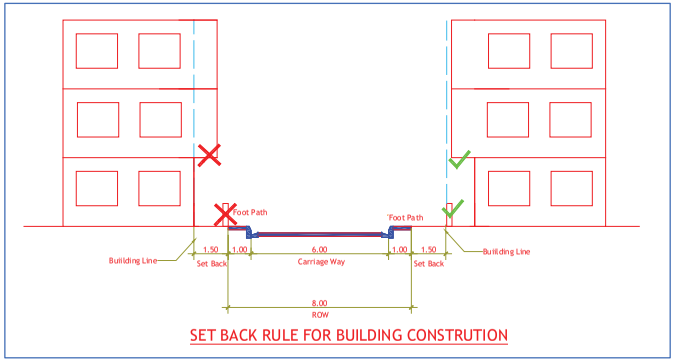


Figure 5: Set back rule for building construction

2.3.4. Category of buildings

Building Act, 1998 categorizes design and construction of buildings into four types according to their level of sophistication.

Classification of National Building Code according to their use

S. No.	Type of Building Code	Purpose
1	**International State-of-Art** **Applicable codes:** NBC 000	**Modern building to be built, based on the international state-of-the-art, also in pursuance of the building codes to be followed in developed countries.** **For Example: Constitutional Assembly Building at Baneshwor, Kathmandu** 
2	**Professionally Engineered Buildings** **Applicable codes:** NBC 101, NBC 107, NBC 113 NBC 102, NBC 108, NBC 114 NBC 103, NBC 109, NBC 206 NBC 104, NBC 110, NBC 207 NBC 105, NBC 111, NBC 208 NBC 106, NBC 112	**Buildings with plinth area of more than one thousand square feet or with more than three floors including the ground floor or with structural span of more than 4.5 meters.** **These are the buildings designed and constructed under the supervision of engineers.** **For example: Multi-Storied Commercial Buildings** 

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S. No.	Type of Building Code	Purpose
3	**Mandatory Rules of Thumb** **Applicable codes:** **NBC 110** **NBC 201** **NBC 202** **NBC 205**	**Buildings with plinth area of up to one thousand square feet, with up to three floors including the ground floor or with structural span of up to 4.5 meters.** **These are the buildings with regular configurations designed and constructed by technicians in the areas where professional engineers' service is not available.**  **For Example: Three Storied RCC framed Structured Residential Buildings.**
4	**Guidelines for Remote Rural Buildings (Low Strength Masonry/ Earthen Buildings** **Applicable codes:** **NBC 203** **NBC 204**	**Small houses, sheds made of baked or unbaked brick, stone, clay, bamboo, grass etc., except those set forth in clauses (a), (b) and (c).** **These are the buildings constructed by local masons in remote areas and not more than 2 stories in height.**  **For Example, Brick or Stone in mud mortar Rural Building with slate/CGI Sheet roofing.**

Category A: Buildings constructed as per the International State-of-the-Art

- Under the first category International State-of-the-Art, if consultants/ designers ensure that their designs meet the corresponding international standard, the designs are considered to be in conformity with NBC.

Category B: Professionally Engineered Buildings

- The second level refers to Professionally engineered structures and covers all usual structures such as hospitals, meetings halls, factories, warehouses, multi-storey buildings and residential buildings.

Category C: Buildings designed & detailed to the Mandatory Rules-of-Thumb

- The third category refers to buildings of restricted size designed with simple Rules-of-Thumb, and mostly applies to remote areas where simpler buildings are prominent. The

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explanatory documents are such that an experienced Sub-Engineer will be able to understand them and present sufficient details at the time of permit application to prove to a skilled appraiser at the Local Authority that the requirements have been met. The requirements are in terms of limits on spans and heights, minimum reinforcing and member sizes, positioning of earthquake-resisting elements and other such rules.

Category D: Buildings detailed to the Guidelines for Remote rural buildings

- The fourth category is guidelines for remote rural buildings. These guidelines address about a dozen typical building styles that have been condensed from an inventory of approximately fifty-five building types surveyed in 1993.
- These structures are normally of earthen construction (e.g. unburned masonry, mud-mortar, rubble, dry stone, wattle and daub). Whereas these recommendations are described as guidelines, it is intended to be mandatory for such structures built in areas controlled by a building permit-issuing local authority.

2.3.5. Classification of Building according to the Occupancy Type described in the Building By-Laws:

For the purpose of implementation of building By-Laws, buildings are classified into the following categories:

a) **Conference/ Community Hall:** buildings where people gather for the purpose of getting entertainment, recreation, social functions, political programs, physical fitness, etc. such as dance theatre, cinema halls, city centers, museums, exhibition hall, fitness centres, gymnasiums, auditoriums, pray areas, restaurants, bus terminal, airport terminals, railway terminals, discotheque centers, etc.
b) **Commercial Buildings:** buildings used for the display and selling of retail or wholesale goods including their storage, such as shops, malls, departmental stores, etc.
c) **Academic Buildings:** buildings used for the academic teachings to students under the authority of education boards and universities, such as schools, colleges, coaching centers, research centers, hostel facilities of the educational institutions, etc.
d) **Industrial Buildings:** buildings used for the processing, assembly and manufacture of various goods, generation of electricity, etc. such as assembly plants, refineries, dairies, factories, power plants, etc.
e) **Institutional Buildings:** buildings used for the management, care and treatment of people such as hospital buildings, jail buildings, center for taking care of senior citizens, facilities housing single women, children or differently-abled persons, etc.
f) **Business Buildings:** buildings used for business activities such as business firm offices, auditing offices, professional firms, banks, etc.
g) **Warehouse:** buildings where storage of various goods and materials is done, such as goddamn house, store house, warehouse, garage, hanger, cold store building, etc.
h) **Residential Buildings:** buildings used for common residential purpose including facilities for cooking, living and sleeping, such as common residences, apartment buildings, group housing buildings, etc.

i) **Mixed Use Buildings:** buildings used for more than one use, such as those buildings in which lower stories are used for commercial purposes and upper ones are used for residential purposes.

2.3.6. Steps in Building permission process

The steps in Building Permit Process in municipalities as per the new BCWP are as follows:

Step 1: Selection of Designer, Supervision Consultant & Contractor / Masons from the list published by the municipality

- The building owner will hire registered Designer from the roster published in the municipality for the planning & design of building.
- The building owner will hire registered supervision consultant from the roster published in the municipality for technical supervision of building construction
- Likewise, the building owner will hire registered contractor or masons from roster published in the municipality for carrying out the construction work

Step 2: Preparation and submission of Application Documents, Designs and Drawings at Registration Desk

- Preparation of designs, drawings & details through the registered designers in the municipality
- Checking and verification of the application form, designs and drawings by the building owner
- Signatories of the building owner or his/her authorized representative and the designer in application form and design/drawings along with the names, addresses and contact numbers
- Submission of Building application to registration desk of the Municipality

Step 3: Approval of Submitted Designs, Drawings & Details

- Completeness check of design drawings and required documents by registration desk
- Checking of design drawings as per prevailing building By-Laws by Building By-Laws Section/Unit of Municipality
- Checking of design drawings as per building code by Building Code Section/Unit of Municipality
- Suggestion to building owner/designer for corrections of design drawings, if any
- Endorsement building application for Registration

Step 4: Field Verification and Public Inquiry:

- Sending the submitted application form with designs & drawing from the Registration Desk to the ward office
- 15 days' notice to neighbors for registering complaints, if any
- Complaint Processing by technical/legal section of municipality, if any
- On-Site verification and Public Inquiry by Ward Office

- Field Report Submission by Ward Office Technician and Admin staff
- File Submission to Technical Desk/Section by the Ward Office

Step 5: Payment of Building Permit Fee

- Recommendation by technical desk/section for payment of building permit fee to the Revenue Desk
- Payment of Building Permit Fee by Building Owner
- Final verification of design drawings and copies of required documents with original one by the Technical Desk/Section

Step 6: Attendance to the Orientation Class on NBC &Earthquake Resistant Building Construction by the Building Owner:

- Attend by building owner in the orientation class on National Building Code & Earthquake Resistant Building Construction along with the hired masons/contractors
- Forward the name list of the building owners who have attended orientation classes to the Technical Desk/Section

Step 7: Temporary Building Permit for the Construction up to Plinth Level 1

- Design final check & recommendation for issuing Temporary Building Permit to Chief Administration Officer (CAO) by Technical desk/Section
- Verification building application and approval by CAO
- Issuance of temporary building permit along with a set of approved drawings by Technical Desk/Section

Step 8: Construction up to the Plinth level

- Commencement of the Building Construction Works
- Layout and preparation of foundation works
- Supervision report about the preparation of foundation works by the Supervision Consultant

Step 8(a): First Interim Site Inspection by municipality

- Construction up to foundation and column re-bars
- Application for first interim site inspection with Supervision Report by the Registered Supervision Consultant
- The first interim site inspection is carried out by the municipal technician for the construction arrangement of foundation before casting.
- Verify that the actual layout of the foundations and columns along with their rebar arrangements has been done as per the approved designs & drawings.
- In the case of masonry structures, layout of masonry foundations and walls shall be checked.

Step 8(b): First Interim Site Inspection Certification

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- If the construction below plinth level is confirmed with approved designs and drawings, then first Inspection Certificate is issued
- Notice to proceed will be issued to Building Owner for construction works up to plinth level

Step 8(c): Second Interim Site Inspection

- Construction up to plinth level casting
- Application for second interim site inspection with Supervision Report by the Registered Supervision Consultant
- The second interim site inspection is carried out to verify the actual construction up to the plinth level including the plinth beam as per the approved designs & drawings after casting.

Step 8(d): Second Interim Site Inspection Certification:

- The municipal technician shall recommend for the issuance of second Inspection Certificate along with recommendation for the issuance of Permanent Building Permit if the actual construction has been done up to the plinth level as per the approved design drawings.

Step 8(e): Permanent Building Permit for the Construction of Superstructure

- Chief Administrative Officer (CAO) issues the Permanent Building Permit for the construction of superstructure of the building upon receiving the recommendation from the Technical Desk

Step 9: Construction of Superstructure of the Building

- Commencement of the Superstructure Construction
- Supervision Report by Registered Supervision Consultant

Step 10(a): Third Interim Inspection by Municipality

- Construction up to first floor beam and slab re-bars.
- Application for third interim site inspection with Supervision Report by the Registered Supervision Consultant
- The 3rd interim site inspection is carried out at first floor level to verify that the actual construction has been done as per the approved designs and drawings before casting.
- Interim inspections for upper storeys may be carried out by the municipality to verify that the construction is being undertaken in full compliance with the approved designs & drawings.

Step 10(b): Third Interim Inspection Certification:

- The municipal technician shall recommend for the issuance of Third Interim Inspection Certificate if the actual construction has been done up to the first-floor level as per the approved design drawings.
- The Technical Section issues the 3rd Inspection Certificate

Step 11: Building Completion Certificate

Step 11(a): Final Inspection for the Completion Certificate by Municipality

- Completion of Construction
- Application for Building Completion Certificate with Supervision Report by the Registered Supervision Consultant
- Municipal technician carries out final inspection of the building, review technical supervision report and verify that the actual construction has been done as per the approved designs and drawings and maintenance of public infrastructure road, drain etc. have been completed.

Step 11(b): Issuance of the Building Construction Completion Certification:

- If the inspection report indicates that the building has been completed as indicated in the Supervision Report and the building has been painted at least one coat on the inside and outside surfaces and maintenance of public infrastructure road, drain etc have been completed, then the building construction completion certificate shall be issued to the Building Owner by the Chief Administrative Officer (CAO).
- The Chief Administrative Officer (CAO) issues Building Construction Completion Certificate upon receiving recommendation from technical desk/section.

Section 3. General Role and Responsibility of Municipality

3.1. Legal Position of Municipality

As mandated by the clause 11 sub-clause 2(F) of the Local Government Operations Act, 2074, municipalities are responsible for the issuance of the building permit, monitoring and regulation in compliance with the Building Code and Building By-Laws. Clauses 27 to 45 of the same act stipulates in detail the procedures, actions and responsibilities of the municipality in connection with the building construction works which can be summarized as below:

a) Building permit to be obtained mandatorily for building construction
b) Standards to be developed for building construction on the basis of risk sensitive land use
c) Directives to be issued for retrofitting or demolition of hazardous buildings after classifying the buildings within the municipality
d) Specify standards on building construction incorporating detailed specifications on building height, set back, roof, front elevation, construction materials, colour and art for the construction of buildings to be constructed in a historical, cultural, touristic or archeological settlement or a part of the settlement.
e) Prepare and specify model design & drawings on the basis of the nature of land and building, size & shape and plot area for the construction of similar type of buildings in all or specified area of the municipality.
f) Carry out the checking of application along with drawings & supporting documents received for getting building permit.
g) Carry out field investigation and public enquiry on objections of land owners abutting to the land plot of the building owner for the proposed construction.
h) Get the report on field investigation & deed of public inquiry on the proposed building construction.
i) Issue building permit in case there is no objection from the land owners abutting to the land plot of the building owner or such objections have been resolved as per the prevailing laws. Approve the designs & drawings received with the application.
j) Monitor the construction of buildings being carried out in the municipality to check that the construction is being done after getting building permit, in compliance to the approved designs & drawings and not encroaching public lands & properties. If not, take actions against the building owner as per the prevailing laws.
k) Enforce the compliance of the Building Code while issuing the building permit.

The Building Act 2055 (2007 AD) has also mandated the municipalities for the implementation and enforcement of the National Building Code in building construction through the clauses 10 to 17 of the act which are summarized below:

a) All buildings to be constructed in compliance to the Building Code.
b) Application for building permit to include designs and drawings. Such designs & drawings to have endorsement from the specified level of designers.

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c) Designs & drawings not to be approved by the municipality if they do not comply with the Building Code.
d) Municipality itself is responsible for carrying out supervision with regard to the compliance of the Building Code within the jurisdiction of the municipality area.
e) The Building Construction Management Strengthening Committee (BCMSC) can issue directives to the DUDBC to carry out checking with regard to the compliance of the Building Code and submit the report on the same.
f) In the case of Rural Municipalities (earlier called “Village Development Committees”), DUDBC is responsible for carrying out supervision with regard to the compliance of the Building Code.
g) Carry out inspection of buildings being constructed or already constructed to check that such constructions are being undertaken as per the approved designs & drawings.
h) Issue necessary directives after field inspection to the building owners for undertaking corrections in construction of buildings to bring it in compliance with the Building Code.
i) Issue directives to stop the construction of building which is being done without getting building permit or being done not as per the approved designs & drawings.
j) Issue directives to demolish whole or part of the building which have been constructed without getting building permit and impose fine to the building owner as per the provision of the act. If such building owner does not carry out demolition as per the directives issued, municipality can undertake the demolition and get the cost of demolition reimbursed from the building owner.

Section 4. Registration System of Stakeholders involved in BC

4.1. General

The Building Construction Working Procedure requires that the designer, masons, contractors and the supervision consultants, who provide services to the building owner for the construction of building, are registered in the municipality. The purpose of such registration is twofold - the first one is to regulate the required qualifications and desired services provided by them and secondly, to build a roster of these service providers for easy accessibility to the building owners. The registration shall be one-time process and free-of-cost for each service providers. Municipality shall provide standard format for the registration application and also the list of supporting documents required for the verification of qualifications. This information shall be available in the website of the municipality.

4.2. Registration System of Designers

4.2.1. Minimum Qualification:

The minimum qualification of a designer shall be a graduate in civil engineering or architecture from an accredited university recognized by the Nepal Engineering Council (NEC) plus registration in the NEC as per Nepal Engineering Council Act. At present, no special qualification or experience will be required but this may be revised in future depending upon the easy availability of engineers/ architects in the country and the formulation of specific working areas by NEC. Consulting firms who want to be registered as a designer need to provide the evidence that the firm has the service of a permanent staff who is an engineer or architect and copies of qualification certificates plus NEC registration of the engineer or architect need to be submitted along with the application form.

4.2.2. Application for Registration:

Engineers or architects with qualifications mentioned above and who are desirous for providing service as a designer shall apply for registration in the municipality. For this purpose, application form, copies of the certificates showing academic qualifications, registration certificates of NEC and company registration and tax clearance certificates in case of a firm, need to be submitted. Submission of application can be done at any time. Technical section of the municipality shall collect all such applications and scrutinize them to verify that they meet the required qualifications. Then the application is forwarded to the Chief Administrative Officer (CAO) for approval. Once the application for registration as a designer is approved, list of registered designers is updated. The technical section shall keep all these applications safely for later reference. Designers who wish to also provide the service as a supervision consultant need to separately apply for the same. The sample application form for the registration as a Designer in the municipality is given in appendix-

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4.2.3. Publication of the List of Registered Designers:

Municipality shall publish the list of registered designer in its website. A notice showing such list shall also be displayed in the notice board of the technical section. Such list shall be updated regularly as and when more designers get registered.

4.2.4. De-listing of Designers:

In case the municipality has taken action against a designer to blacklist him/her for a specified period due to the unethical activity on the part of the designer, name and address of such designer is removed from amongst the list of registered designers. The record of black-listed designers are to be maintained in a separate file for future reference. After the expiry of the blacklisting period, the designer's name is then updated in the list of the registered designers.

4.2.5. Recommendation for Action against Defaulter Designers:

The technical section needs to keep record of the designers on whom the municipality has taken action due to the unethical activity done by them. When a designer is found to have repeated such activity even after being black-listed for a specified period, then the Technical section shall recommend to the CAO for forwarding the name of the designer to the NEC along with the description of the unethical activity committed and supporting documents for action as per the Nepal Engineering Council Act. Once the decision on sending for action from NEC is taken by the municipality, the name of the designer is removed from list of registered designer unless the NEC gives a clean chit to the designer after thorough investigation.

4.3. Registration System of Masons

4.3.1. Minimum Qualification:

The minimum qualification of a mason who is desirous of getting registered in the municipality and provide service to the building owner shall be to be literate person and having obtained five-day training program on "Earthquake Resistant Construction of Building" from an organization or firm.

4.3.2. Application for Registration:

For the registration, masons need to submit an application form along with a copy of the certificate showing his/her participation in a five-day training program on Earthquake Resistant Construction of Buildings" from an organization or firm. Such application firm shall also be made available for downloading from the website of the municipality along with the description of the required documents. Hard copy of the application form shall also be available in the technical section. The sample application form for the registration as a Mason in the municipality is given in appendix-2.

4.3.3. Publication of the List of Registered Masons:

The technical section shall scrutinize the application forms received for registration as masons for eligibility. List of names of all eligible masons shall then be compiled and then forwarded to the CAO for approval. Once approved, the list of the registered masons shall be published in the notice board as well as the website of the municipality. In case the applications do not meet the required criteria, the Technical Section shall notify the masons with description on why the application was rejected. If the application was rejected due to the lack of supporting document, the masons can submit the missing document and then get registered after the review by the technical section for completeness.

4.4. Registration System of Contractors

4.4.1. Minimum Qualification:

The minimum qualifications for a contractor to get registered in the municipality are to be literate person, has experience in building construction works and has a minimum of two masons trained in "Five-day training program on Earthquake Resistant Construction of Buildings" in his/ her team. Those firms who are already registered as Class A, Class B, Class C or Class D contractors as per the Construction Business Act also need to apply for getting registered in the municipality but the minimum qualification shall be experience in building construction works, copy of the firm registration and the copies of certificates of participation in "Five-day training program on Earthquake Resistant Construction of Buildings" of the at least two masons in the firm's team.

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4.4.2. Application for Registration:

Persons or firms who wish to get registered as a contractor need to file an application form in the municipality with documents mentioned above. The technical section will then verify that the applicant meets the requirement needed for registration. The names of the applicants along with the applications and supporting documents are then forwarded with recommendation to the CAO for approval. If any supporting documents are missing on the part of some applicants, then they are notified accordingly and upon submission of the missing document, the applications are again processed forward for approval. The sample application form for the registration as a Designer in the municipality is given in appendix-3.

4.4.3. Publication of the List of Registered Contractors:

The names of all contractors whose applications have been approved for registration are published in the notice board as well as in the website of the municipality. The list is updated on regular basis as soon as new contractors get registration.

4.5. Registration System of Supervision Consultants

4.5.1. Minimum Qualification:

Engineers and architects who wish to provide services as a supervision consultant shall be a graduate in civil engineering or architecture respectively from a recognized university and shall have registered in the Nepal Engineering Council. In the case of a firm, it should at least have an engineer or architect meeting the above-mentioned criteria as an associate or permanent staff along with the company registration certificate and Tax clearance certificates. For the supervision of Category C & Category D buildings, diploma engineers or draftsperson who have completed certificate or diploma level in civil engineering or architecture respectively can apply.

4.5.2. Application for Registration:

The persons or firms who wish to provide services as a supervision consultant and have qualifications and documents mentioned above shall file an application for registration. The form for registration and the list of necessary documents shall be available from the technical section as well as from the website of the municipality. The registration shall be free of cost. If the persons or firms wish to provide services as designers as well, then separate registration for the same shall be done. The sample application form for the registration as a Designer in the municipality is given in appendix-4.

4.5.3. Publication of the List of Registered Supervision Consultants:

The technical section will review the application received for registration and the names of those persons or firms meeting the minimum qualification shall be forwarded with recommendation to the CAO for approval. The applicants with missing documents are notified to submit the missing documents and upon receipt of the same, application is processed for approval again. Once the list have been approved, the technical section shall publish the list in the notice board as well as in the website as well.

4.5.4. De-listing of Supervision Consultants:

In case any supervision consultant has carried out unethical activity during its service to the building owner and it is repeated for the second time, municipality shall blacklist the consultant for a specified period. In that case, the name of the consultant is removed from the list of registered supervision consultants. The records of black-listed supervision consultants are kept in a separate file for future reference.

4.5.5. Recommendation for Action against Defaulter Supervision Consultants:

When the supervision consultant is noticed to have carried out unethical activity for the third time, then the technical section shall recommend to the CAO for forwarding the name of the supervision consultant to the NEC along with the description of the unethical activity committed and supporting documents for action as per the Nepal Engineering Council Act.

Once the decision on sending for action from NEC is taken by the municipality, the name of the supervision consultant is removed from list of registered consultants unless the NEC gives a clean chit to the consultants after thorough investigation.

Section 5. Standard Formats of Drawings, Details and Reports required for Application Submission for Building Permit

5.1. General

For the submission of application form for getting building permit for a new building construction, the Designer needs to prepare designs & drawings in the specified format. The Designer shall undertake full consultation with the Building Owner to understand the functional requirement of the owner. The Designer also needs to make site visit and make detailed measurements of the site so that the site plan can be made as per the actual site condition. Municipality shall specify the following requirements of the drawings to be submitted by the Designer along with the application form for getting building permit. At the time of checking in the municipality, these requirements need to be verified. If the submitted drawings do not comply with the requirement, the designer shall be instructed to submit revised drawings.

5.2. Architectural Drawing Requirements

a) Scale of the Drawings & Sheet Size:

The architectural drawings shall generally be prepared with the following scales:

General drawing:	1" = 8'-0" or 1" =4'-0" 1:1000 or 1:50 scale
Details:	1:100 or 1:50 scale
Sheet size:	
General:	A1=840 mm x 594 mm
	A2=594 mm x 420 mm
	A3=297 x 420 mm
	A4=210 mm x 297 mm
Site Plan Scale:	
For plot size up to 1 Ropani in area	1"= 8'-0" or 1:100
For plot size up to 3 Ropani in area	1"=16'-0" or 1:200
For plot size more than 3 Ropani in area	1"=32'-0" or 1:400

b) Standard Sheet Layout & Details

Details to be shown in the Site Plan and Location Plan:

- The site plan should be shown with diagonal lines with measurements shown in feet or meter so as to enable the calculation of the area of the plot as measured in the site.

- The location plan shall be drawn as a free-hand sketch with north direction pointing upwards in the drawing sheet. The location plan shall indicate the access to the building from main streets.
- If there are existing buildings in the proposed site, plinth area, floor area and ground coverage of the same shall also be shown.
- If there is city sewer line, connection to the sewer line along with flow direction shall be indicated in the drawing.
- If there is no city sewer line, position and dimension of septic tank and soak pit shall also be shown.
- Site plan shall show right-of-way line, set back line, road width, distance from the boundary of the plot to the road edge and distance of the building from the road boundary.

c) Plans:

Floor plans of all floors shall be included.

d) Elevations:

Elevations of all sides shall be shown along with indication of direction of elevations.

e) Sections:

Cross-section shall be taken for the highest part through staircase.

f) Dimension Style:

Dimensions in all floor plans shall be shown for a) element to element, b) centre-to-centre, c) overall dimension and d) internal room size.

5.3. Structural Drawing Requirements

a) Scale of the Drawings & Sheet Size:

General drawing:	1" = 8'-0" or 1" =4'-0"
Details:	1:1000 or 1:50 scale
Sheet size:	
General:	A1=840 mm x 594 mm
	A2=420 mm x 594 mm
	A3=297 mm x 420 mm
	A4=210 mm x 297 mm

b) Standard Sheet Layout & Details:

The main sheets shall be named as Sheet 1, Sheet 2, etc while the additional sheets for providing more details to the main sheet shall be named as Sheet 1(a), Sheet 1(b), etc.

c) Structural Drawings showing Reinforcement Arrangement for Reinforced Concrete Framed Building:

Sheet no.	Reinforcement Details

Sheet 1	i. Trench Plan (with c/c dimensions, grid names, sizes of footings) ii. Column Layout Plan (with grid names and naming of columns) iii. Column Sections (storeywise in tabular form) iv. Foundation details (Plans & Sections for each type) v. Toe Wall Sections vi. Tie Beam Details
Sheet 2	a) Slab Details i. Slab Reinforcement Plans (with c/c dimensions and grid names) ii. Slab Sections end-to-end (in x-x & y-y directions) b) Beam Details i. Storeywise Longitudinal Sections (in x-x & y-y directions) ii. Cross Sections at mid-spans and supports c) Staircase Details i. Staircase Plan with dimensions ii. Staircase Sections of every flight with dimensions iii. Staircase Landing Beams (Longitudinal Sections and Cross Sections)
Sheet 3	i. Sill, Lintel and Parapet Band Details ii. Ductile Detailing of Joints iii. Reinforcement Lap Details in Beams & Columns iv. Vertical Section of Column showing Spacing of Lateral Ties
Sheet 4	i. Additional Details of Structure as per Design Requirement ii. Any Other Additional Details as felt necessary by the Designer

d) Structural Drawings showing Reinforcement Arrangement for Load Bearing Masonry Building:

Sheet no.	Details
Sheet 1	i. Trench Plan (with c/c dimensions, grid names, sizes of footings) ii. Foundation Wall Sections (each type) iii. Plinth Tie Beam Details iv. Architectural Plan of Each Floor showing Vertical Reinforcement layout v. Sill, Lintel and Parapet Band Details vi. Corner Stitch Details for T-Junctions and L-Junctions vii. Vertical Section of Wall from Foundation to the Topmost Terrace
Sheet 2	a) Slab Details i. Slab Reinforcement Plans (with c/c dimensions and grid names) ii. Slab Sections end-to-end (in x-x & y-y directions) b) Beam Details i. Longitudinal Sections (in x-x & y-y directions) ii. Cross Sections at mid-spans and supports c) Staircase Details i. Staircase Plan with dimensions ii. Staircase Sections of every flight with dimensions iii. Staircase Landing Beams (Longitudinal Sections and Cross Sections)
Sheet 3	i. Additional Details of Structure as per Design Requirement ii. Any Other Additional Details as felt necessary by the Designer

5.4. Structural Design Report Requirements

Sample Table of Content of the Structural Design Report is given below:

1) Introduction
2) Building Plans & Elevations
3) General Information of the Construction Site
4) Structural System

5) Section & size of the structural elements
6) Software used
7) Design Codes
8) Materials
9) Cover to Reinforcements
10) Loads & Load Calculation
11) Dead loads
12) Imposed Loads
13) Seismic loads- Seismic Weight, Base Shear, Vertical Distribution of Lateral Force
14) Other Loads
15) Load Patterns
16) Modal Response Spectrum Analysis for Irregular Buildings
17) Load Combinations
18) Analytical Modeling of Building
19) Typical Analysis Results of Various Frames
20) Check for Modal Mass participation
21) Check for inter-storey drift in Ultimate & Serviceability Limit States
22) Check for Strong-Column-Weak Beam
23) Check for Torsion
24) Typical Design Results for Critical Elements-Beams, Columns
25) Manual Design of Slabs, Staircase, Foundations
26) Design of Confinement Reinforcement for Columns
27) Check for deflection of beams of span > 6 m with detailed calculations
28) Design of Shear Walls (if provided in the structure)

Software analysis file shall be provided along with digital copy of the structural design report.

5.5. Geotechnical Investigation Report Requirements

Sample Table of Content for the Geotechnical Investigation Report is given below:

1) Introduction
2) Objectives of the Geo-technical Investigation
3) Scope of Work
4) Description of the Site
5) Geological & Seismological Features of the Site
6) Methodology of Geotechnical Investigation
   a. Field Investigation through Standard Penetration Test
   b. Monitoring of Ground Water Table
   c. Laboratory Tests-natural moisture content, bulk density, specific gravity, grain size distribution, Atterberg limits, consolidation test, unconfined compression test, direct shear test,
7) Analysis of Allowable Bearing Capacity
   a. Allowable bearing pressure based on Ultimate Bearing Capacity

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b. Allowable bearing pressure based on Tolerable Settlement
c. Liquefaction Analysis

8) Conclusion & Recommendations
9) References
10) Annexes- Bore Hole Log, Site Bore Hole Plan, Lab Test Reports, Photographs of Work in Progress

5.6. Sanitary Drawing Requirements

a) Scale of the Drawings & Sheet Size

General drawing:	1" = 8'-0" or 1" =4'-0"
Details:	1:100 or 1:50 scale
Sheet size:	
General:	A1=840 mm x 594 mm
	A2=420 mm x 594 mm
	A3=297 mm x 420 mm
	A4=210 mm x 297 mm

b) Standard Sheet Layout & Details:

The main sheets shall be named as Sheet 1, Sheet 2, etc. while the additional sheets for providing more details to the main sheet shall be named as Sheet 1(a), Sheet 1(b), etc.

c) Sanitary & Plumbing Details:

- Floor Plans showing layout of water supply pipelines, sanitary appliances (wash basins, commodes, urinals, pans, bidets, showers, etc.)
- Floor Plans showing layout of soil and waste pipelines, floor traps, etc.
- Terrace plans showing arrangements of overhead water tanks and control valves
- Site plans showing locations of manholes, soak pits, septic tank, under-ground water tanks, fire tanks (if applicable)
- Site drainage plans showing rainwater pipes, inlets and manholes
- Typical sections showing the layout of fixtures
- Isometric drawing showing the schematic arrangement of water supply pipelines, drain valves, control valves, waste pipelines, soil pipelines, connections to the underground and overground water tanks, connection of the soil and waste pipelines to the septic tank & soak pit or sewerage line if available.
- Plans, sections and rebar details of septic tank, soak pit, underground and overhead tanks (RCC), if applicable.
- Positions of dry or wet risers and fire hydrants, if applicable.

5.7. Electrical Drawing Requirements

a) Scale of the Drawings & Sheet Size

General drawing:	1" = 8'-0" or 1" =4'-0"

Details:	1:100 or 1:50 scale
Sheet size:	
General:	A1=840 mm x 594 mm
	A2=420 mm x 594 mm
	A3=297 mm x 420 mm
	A4=210 mm x 297 mm

b) Standard Sheet Layout & Details

The main sheets shall be named as Sheet 1, Sheet 2, etc while the additional sheets for providing more details to the main sheet shall be named as Sheet 1(a), Sheet 1(b), etc.

c) Electrical Details:

- Floor plans showing Light Circuit Layout: General wiring diagrams for light points
- Floor plans showing Power Socket Circuit layout: General wiring diagram for power socket points
- Floor plans showing Fire detection & alarm system layout, if applicable.
- Floor plans showing wiring diagram for telephone socket points
- Floor plans showing wiring diagram for TV and internet network socket points
- Single line distribution plan of the overall electrical system of the building
- Earthing details
- Transformer connection details, if applicable
- Connection detail from NEA distribution line

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Section 6. Application Document for Building Permit

6.1. General

The municipality shall clearly specify the application form, designs & drawings and the supporting documents required for getting building permit. Separate sets of supporting documents may be required depending open whether the building permit is required for new construction, addition of storeys, repair/ maintenance, retrofitting or only transfer of building permit in the name of new owner. In the following sections, the documents are specified.

In the e-BPS system, the application form is filled in online by the Designer with required details while the supporting documents are submitted online. After the online submission, the application form is to be printed. Copies of all supporting documents are also to be prepared. Once the registration desk completes the completeness check for all documents, printed copies of the application document and the copies of the supporting documents together with the designs & drawings are to be submitted to the Registration Desk.

In the non-e-BPS system, the application document is to be purchased by the Building Owner from the Technical Section of the Municipality after paying specified fee. The application document will be in two sets- one for the Building Owner and another for the Municipality. Then the Building Owner with the help of the Designer needs to fill-in all the details required in the application form and prepare copies of all supporting documents together with designs & drawings. Next, the application document, designs & drawings and copies of the supporting documents are submitted to the Registration Section of the Municipality.

6.2. Documents Required for application submission

a) Application Form for Building Permit

Application form to be filled up by the building owner is given in appendix-6(a) while the form to be filled up by the Designer is shown in appendix-6(b). In the e-BPS system, these forms are to be filled up online and later to be printed and submitted to the Registration Desk/Section. In the non-e-BPS system, these forms are available in the application document to be purchased from the municipality.

b) Details to be Filled-in by the Building Owner

The Building Owner has to fill-in the following details and then put the signature in the main application form:

S.N.	Title of the Detail	Description of the Details
1.	Details of Land Owner	• Name • Address • Citizenship no.
2.	Details of the Building Owner	• Name • Address • Citizenship no. • Name of Father/ Husband/ Wife
3.	Details of the Site	• Ward no., • Locality • previous ward no. • name of the access road • name of nearest main road • surface type of the access road
4.	Cadastral Information of the land Plot	• Sheet no. of cadastral map • parcel no. • ownership type • plot area as per land ownership certificate • names of the owners & parcel numbers of land abutting to the land of the building owner
5.	Details of Proposed Construction	• Occupancy type-residential, commercial, others • Proposed construction- new construction, façade change, addition of storeys, boundary wall, roof change, addition of building blocks, new construction after demolition of old building • Date of issue of Building Permit received earlier
6.	Details of Sewerage System	• Septic Tank • Soak Pit • city sewer line
7.	Details of Solid Waste Disposal	• Municipality container • own land • others
8.	Details of Water Supply System	• City water supply line • Tube well • Dug well • others
9.	Details of Electricity Supply	• Distance from the nearest electricity line, • whether HT line is going over the land plot
10.	Applicant's Signature, Contact Address, Phone	• Signature • Name • Age • Address • phone no.
11.	Signature of the Person who brought the application for registration	• Signature • Name • Age • Address • phone no.

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6.3. General Details on Building Construction

a) Details to be Filled-in by the Designer

S.N.	Title of the Detail	Description of the Details
1.	Details of Land Owner	• Name • Address • Citizenship no.
2.	Details of the Building Owner	• Name • Address • Citizenship no. • Name of Father/ Husband/ Wife
3.	Land Use Zone	
4.	Type of Construction	
5.	Plot no. of the Land Parcel in which the construction is proposed	
6.	Area of the land parcel as per the land ownership certificate (in sq. ft.)	
7.	Actual area of the land parcel as per the field measurement (in sq. ft.)	
8.	Plinth area of the proposed building (in sq. ft.)	
9.	Ground coverage of the proposed building (in percentage)	
10.	Details of floor areas of the new construction and existing building	

	Storey	Area of the proposed building (sq. ft./ sq. m)	Area of the existing building (sq. ft/ sq. m)	Total floor area (in sq. ft/ sq. m)
i)	Basement			
ii)	Ground Floor			
iii)	First Floor			
iv)	Second Floor			
v)	Third Floor			
vi)	Fourth Floor			
vii)	Fifth Floor			
viii)	Sixth Floor			
	Total			

11.	Area covered by other constructions like compound wall, shade, etc	Compound wall: Shade:
12.	Ground coverage after the new construction including existing buildings and other new construction	In sq. ft.: In percentage:
13.	Permissible Ground Coverage	In sq. ft.: In percentage:
14.	Number of storeys in the proposed building	☐ basement ☐ ground floor ☐ first floor ☐ second floor ☐ third floor ☐ fourth floor ☐ fifth floor ☐ sixth floor ☐……..

15.	Floor height of each storey in the proposed building	Storey	Height	Unit in m/ ft
		Basement		
		Ground		
		First		
		Second		
		Third		
		Fourth		
		Fifth		
		Sixth		

16.	Total height of the building (in m/ ft):	
17.	Type of Structure	☐ Temporary ☐ Permanent ☐ Reinforced Concrete Framed ☐ Load Bearing (brick masonry) ☐ Load Bearing (stone masonry) ☐ Steel Framed ☐ Timber Framed ☐ others: ……..
18.	Type of Mortar used in masonry wall	☐ cement sand mortar ☐ mud mortar ☐ lime surkhi mortar ☐ other: ……..
19.	Type of Roofing Material	☐ RCC ☐ RBC ☐ Tile ☐ CGI Sheet ☐ Thatched Roof ☐ Others: ……..
20.	Right-of-way (ROW) of the roads abutting to the land parcel in metre/ feet	Frontside: Backside: Left side Right side:
21.	Setback distance from the road to the proposed building (in m/ feet)	

Side	distance from the centre line of the road		distance from the edge of the existing road		Distance from the edge of the ROW	
	actual	minimum as per By-Laws	actual	minimum as per By-Laws	actual	minimum as per By-Laws
Front						
Back						
Left						
Right						

22.	Distance between outer face/wall and boundary of the plot				
	Facade of the building	Road existing or not	Door/window opening existing or not	Minimum required distance between the outer face of the building and plot boundary	Existing distance between the outer face of the building and plot boundary
	North				
	South				
	East				
	West				
23.	Distance from the bank of the river/ canal/ public land to the face of the building (if applicable)				
	Permissible distance from the bank of the river/stream/canal/public land to the face of the building (in metre/feet)				
	Actual distance from the bank of the river/stream/canal/public land to the face of the building (in metre/feet)				

24.	Length of cantilever projection or chhajja beyond the face of the building (in m/ feet)				
		Front side	Back side	Left side	Right side

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	Proposed				
	Permissible				
25.	Distance between the edge of the high tension line and the building (if applicable)				
	Permissible distance (in m or feet)				
	Proposed distance (in m or feet)				
26.	Declaration from the designer: I have prepared the designs and drawings after studying the applicable building By-Laws, building code & other prevailing laws. I shall be fully liable if the designs & drawings are found to be not compliant as per specified By-Laws, building codes & prevailing laws. Signature: Name: Designation: Educational qualification: Name of the consulting firm (if applicable): Designer registration no: Stamp of the firm: Date:			Declaration from the building owner: I/we fully agree to undertake construction of the building as per the approved designs & drawings in full compliance to the technical details described above, building By-Laws of the municipality and building code. I shall be fully liable as per the prevailing laws in case the construction is found to be done in violation of the By-Laws, building code and encroaching public land. Signature: Name: Address: Date:	

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6.4. Affidavit Form to be filled-in by the Building Owner

The application document also contains the affidavit form to be filled up by the Building Owner in which the Building Owner has to give assurance that the construction will be carried out in compliance with the building By-Laws & the National Building Code The affidavit form is given in the appendix-7.

6.5. Affidavit Form to be filled-in by the Structural Designer

The application document contains the affidavit form to be filled up by the structural designer in which the structural designer has to give assurance that the structural design will be carried out in compliance with the National Building Code of Nepal. The affidavit form is given in the appendix-8.

6.6. Affidavit Form to be filled-in by the Designer (Architectural Part) & the Supervision Consultant

The application document contains the affidavit forms to be filled up by the Designer carrying out the architectural design in which the Designer has to give assurance that the architectural design will be carried out in compliance with the building By-Laws & National Building Code of Nepal. The affidavit form is given in the appendix-9. Similarly, the affidavit form to be filled in by the Supervision Consultant assuring professional service and supervision in conformance to the building By-Laws & the Building Code is given in the appendix-10.

6.7. Appointment of Authorized Representative by the Building Owner

In case the Building Owner is unable to be physically present for the submission of the application document for building permit to the municipality, he/she may appoint his/her authorized representative for the submission of the application document who shall henceforth carry out all actions with regard to the processing of the building permit application on behalf of the Building Owner. Such authorized representative shall also be authorized by the Building Owner to respond to any complaint received during the 15-day complaint filing period as well as respond to legal matters in connection with the building permit process. Authorization letter shall be submitted by the Building Owner in the format given below. Municipality shall check that the authorization letter is duly filled in by the Building Owner with all necessary details. Sample of the authorization letter is given in the appendix-11.

6.8. Authorization Letter from the other Land Owner for Building Construction

In case the Building Owner wants to construct whole or part of his/her building in a land parcel whose ownership is with another person, then the Building Owner shall submit letter of authorization from such owner.

The format of the authorization letter is shown in the appendix-12.

Municipality shall check that the ownership of the land parcel for the proposed building construction is with the Building Owner who has submitted the application for the building permit. If not, the Building Owner shall submit the authorization letter from the legal owner of such land parcel in the prescribed format described above.

6.9. No Objection Certificates from other Agencies for Special Buildings

For obtaining building permit for special types of buildings described below, the Building Owner needs to obtain additional permits from the relevant agencies. It is the responsibility of the Building Owner that such additional permits are obtained. Municipality shall forward the application document of the Building Owner to the agency requesting the agency to review the documents and then issue the no objection certificate to the applicant. The Building Owner with the support of the Designer shall be in contact with the agency and provide all necessary documents and information requested by the agency. Different cases when such additional permits are required are described below:

a) No objection certificate from the Department of Archeology: As per the clause 3 sub-clause 7 of the Ancient Monument preservation Act 2013 (1956 AD), it is required to get permission from the Department of Archeology to construct a new building or to repair or modify, or for reconstruction of a new building in the Protected Monument Zone of a municipality and this shall be done prior to the issuance of building permit from the municipality. Hence the application document received for building permit from the Building Owner shall be forwarded to the DoA for getting building permit and municipality shall process the document only after receiving no objection certificate from the DoA. Any

clarifications or amendments or modifications requested by DoA on the submitted design & drawings shall be forwarded to the Building Owner by the municipality for necessary action.

b) No objection from Civil Aviation Authority of Nepal: As per the clause 7 sub-clause D of the Nepal Civil Aviation Authority Act 2053 (1996 AD), Civil Aviation Authority of Nepal (CAAN) is authorized to debar the construction of any building whose height restricts the flight path of aeroplanes. Hence for issuing the building permit for the construction of tall buildings, municipality shall forward the application document to CAAN for issuing the no objection certificate. In case the CAAN issues directives to lower the height of the building or any other instruction, municipality shall forward such directives or instruction to the Building owner for necessary action and then re-submit the application document for no objection from CAAN and get building permit from the municipality for the revised drawings.

c) Planning Permit from KVDA & Town Development Committee: As per the clause 12 (A) of Town Development Act 2045 (1988 AD), any institution which is desirous of implementing a physical development plan in a municipality, where town planning has come into force, shall obtain approval from the Town Development Committee. Similarly, the notice published in Nepal Gazette Section 55 Number 46 dated 6 March, 2006 (BS 2062/11/22) requires that any person or institution who intends to construct apartment buildings or lauch group housing scheme shall obtain planning permit from the Town Development Committee where such committee exists and from DUDBC where such committee does not exist. Hence municipality shall check that planning permit has been received by the Building Owner in case the Owner intends to get building permit for the construction of apartment building or for launching of Group Housing schemes. If not, the municipality shall notify the Building Owner to seek the planning permit from KVDA in case of buildings in the Kathmandu Valley and from the respective TDC in case of buildings outside the Kathmandu Valley.

d) No Objection from the Kathmandu Valley Water Supply Management Board (KVWSMB): As per the rule no. 12 of the Kathmandu Valley Water Supply Management Board Regulation 2064, any user who intends to withdraw water from underground water source shall get permission from the KVWSMB. Hence if the Building Owner is constructing a housing project or apartment building or a large building complex in the Kathmandu valley and wishes to use the underground water supply through deep tube well, then the Owner shall get approval for the same from the KVWSMB before getting building permit from the municipality.

e) As per the clause 14(A) of the Guideline for Health Institution Establishment, Operation and Upgrade Standards 2070, the building of any hospital shall be constructed as per the provision given in the Building Act 2055 and that for the establishment, operation or upgradation of such building, recommendation letter from DUDBC stating that such building has been designed & constructed in compliance with the building By-Laws & building code. Hence, municipality shall check that such recommendation letter has been obtained for DUDBC and attached with the application document for building permit.

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f) In case the building permit is required for the construction of school building, the permission to operate the school is to be obtained from the District Education Office as per the Education Regulation, 2059. As per the circular issued by the Office of the Prime Minister and Cabinet of Ministers, recommendation from DUDBC certifying that the building has been designed and constructed in compliance with the NBC is required. Hence municipality shall check that such recommendation letter is attached with the application for building permit of school buildings.

g) For the construction of Apartment Buildings, permission shall first be obtained for the construction and operation of the apartment building from the DUDBC as per the Section 2 clause 3 of the Ownership of the Joint Housing Act 2054 (1997 AD). Hence the municipality shall check that such permit letter has been attached with the application document for building permit in case of apartment buildings.

6.10. Brief Environmental Study (BES)/ IEE/ EIA Report for Large Buildings

Depending upon the height, built-up area or floor area of the building, or the number of people simultaneously entering or departing from the building or the volume of ground water withdrawal for the use of the building, the annexes 1, 2 and 3 of the Environmental Protection Regulation 2077 (2020 AD) has given criteria whereby it is required to carry out Brief Environmental Study (BES), Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) prior to the construction of the building. Hence the municipality shall check that such studies has been carried out by the Building Owner and the approved report issued by the relevant agency is attached with the application document for building permit.

The provisions of the EPR 2077 (2020 AD) are given in the appendix-13.

Section 7. Completeness Check of the Documents submitted for Building Permit by the Registration Desk

7.1. Verification of the Checklist

The Registration Desk/Section of the municipality shall check that application document is complete in all respects and that all supporting documents along with the application form has been submitted by the Building Owner through the Designer. The list of the documents is given in section 20. The checklist for completeness check is given in the appendix-14.

7.2. Notification for the submission of missing documents

In case the application form has not been filled properly or left incomplete or any of the supporting documents are found missing, the Registration Desk/Section shall notify the Building Owner to fill-in the missing details and submit the missing documents as soon as possible. The Registration Desk/Section shall verify that the digital versions of the documents such as architectural, structural, sanitary and electrical drawings are submitted in required format (AutoCAD dwg files), structural analysis files are submitted and the design reports in pdf format can be opened. In case any of the digital versions are missing or not in required format, the Registration Desk/Section shall inform the Building Owner & the Designer to submit the correct version immediately so that the building permit process can be expedited.

7.3. Forwarding the documents to the Technical Desk

In case the application document is found to be complete in all respects, the Registration Desk/ section shall forward it to the Technical Desk/Section for further processing.

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Section 8. Technical Check of the Documents submitted for Building Permit by the Technical Desk

8.1. General

The application document received from the Registration Desk/ Section shall be checked for all technical aspects such as land related issues, e.g., land parcel area, encroachment of proposed roads, public lands, public water channels, ponds, parks, By-Laws and building code compliance in the Technical Desk/ Section.

8.2. Verification by GLD Desk

a) Verification of the Compliance to the GLD Map by GLD Desk

The surveyor shall check that the proposed construction does not encroach upon the proposed roads such as Guided Land Development (GLD) roads or other planned roads. The surveyor shall tally the site plan submitted by the Designer with the alignment of such planned roads. If there is any encroachment observed in the site plan, then the Building Owner as well as the Designer shall be notified for correction in the drawing and its resubmission.

b) Verification for Land related Issues

The surveyor in the GLD desk shall also check for any discrepancy in the boundary of the land parcel and its area. This is done by comparing the land ownership certificate, cadastral map of the land parcel and the site plan. The site plan is prepared as per the actual field measurement by the Designer. There should be no conflict between the dimensions shown in the site plan and the measurements obtained from the cadastral map. In case of conflict in the area of land parcel, the lowest area amongst the area obtained from the land ownership certificate, cadastral map and the field measurement is adopted.

The surveyor shall also check that the proposed construction does not encroach upon the area of public lands, ponds, irrigation channels, parks or open spaces. In case any such occurrence is noticed after the study of cadastral map against the site plan, the Building Owner shall be notified for correction in the drawings.

The main parameters to be checked by the GLD unit are as follows:

S.N.	Description of the Parameter for Checking	compliance	
		Yes	No
1.	Area of Land Parcel is OK. (comparison of land registration certificate, cadastral map & site measurement)		
2.	Dimensions of the land parcel shown in the site plan is OK.		
3.	The site plan does not encroach upon any proposed roads such as GLD roads or others.		
4.	Access road exists up to the land parcel.		

5.	The site plan does not encroach upon public land and public property such as ponds, irrigation channels, parks, open spaces, etc.		
6.	Adequate distance has been maintained from the banks or rivers or streams (applicable for construction near the banks of rivers/ streams).		

c) Notification for the submission of missing documents

The surveyor in the GLD section shall also check that all legal documents for the verification of the land related issues have been submitted by the Building Owner. If not, the Building Owner shall be notified to submit the same.

d) Forwarding the documents to the Building By-Laws Unit

In case the site plan submitted for the proposed construction has been found to be OK from land related aspects and all legal documents have been found to be submitted and complete in all respects, the surveyor shall forward the application document to the Building By-Laws Unit of the Technical Desk/ Section for further processing. In case correction is required or missing documents are found, then the application document shall be forwarded only after the required correction and submission of the missing documents.

8.3. Verification by Building By-Laws Unit

a) Verification of the Compliance to the Building By-Laws

The Building By-Laws Unit shall check the application document for the compliance of the proposed construction against the provisions of the building By-Laws. Parameters to be checked are shown below:

S.N.	Description of the Parameter for Checking	compliance	
		Yes	No
1.	Ground Coverage Ratio		
2.	Right-of-way of the road adjoining the land parcel has been maintained and not encroached.		
3.	Front setback distance		
4.	Back setback distance		
	Side setback distance-1		
5.	Side setback distance-2		
6.	Gap between the property line and the outside walls of the building is sufficient to keep openings (doors/ windows) in the building faces		
7.	Proposed use or occupancy type of the building is in consonance with the land use zone.		
8.	Total height of the building from the ground level is permissible from light plane requirement, FAR and maximum permissible height.		
9.	Actual Floor Area Ratio in the proposed building is within the permissible FAR.		
10.	Sufficient gap has been maintained from the electricity distribution or transmission line.		

11.	Cantilever projections are within the permissible areas.		
12.	Septic tank and soak pit has been provided at appropriate location (applicable when no city sanitary sewer line is available at the site).		
13.	Provision for site drainage has been made.		
14.	Special requirement for buildings constructed in Protected Monument Sub-zone or Protected Sub-zone has been met.		
15.	Provision of underground parking in commercial or industrial buildings having plinth area larger than 2000 sq. ft..		
16.	Permission for the construction & operation of apartment building has been received from DUDBC.		
17.	BES. IEE or EIA report has been approved from the respective agency for buildings coming under the preview of EPA/ EPR.		
18.	Clearance or no objection certificate has been received from CAAN for tall buildings.		
19.	Recommendation letter on compliance of NBC has been received from DUDBC for the construction of health buildings.		
20.	Recommendation letter has been received from DUDBC on compliance of NBC for the construction of school buildings.		

b) Notification for the submission of missing documents

In connection with the checking for building By-Laws, if the building By-Laws unit finds any supporting document or no objection letters missing in the application document, then it shall notify the Building Owner and the Designer for the submission of the missing documents as soon as possible. Such notification shall be done in writing or through online system.

c) Notification for the correction of drawings/details

In case any discrepancy is observed in the submitted designs & drawings with respect to the compliance requirement of building By-Laws, the building By-Laws shall notify the Building Owner and the Designer to immediately carry out the correction and submit the revised drawings. Such notification for correction shall also be made in writing or through online system.

d) Forwarding the documents to the Building Code Unit

If the building By-Laws unit finds that the submitted designs and drawings are in consonance with the building By-Laws or the amended drawings & designs submitted by the Designer after notification from the unit are found to be in compliance with the building By-Laws, then the unit shall forward the application document with its note that the By-Laws requirement has been thoroughly checked from the unit to the Building Code Unit of the Technical Desk/ Section.

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8.4. Verification by Building Code Unit

a) Verification of the Compliance to the Building Code

The building code unit shall check the submitted designs & drawings for compliance with the provisions of the NBC. For this purpose, the checklists given in the Building Regulation 2066 as technical detail forms shall be used. There are four types of technical detail forms which are applicable for category A & category B types of buildings while two types of technical detail forms are to be used for category C type of buildings.

S.N.	Type of Technical Detail Form	Building Category			
		"A"	"B"	"C"	"D"
1.	Technical Detail Form no. 1 (A) NBC Code 206:2003- Architectural Design Requirements	✓	✓	✓	X
2.	Technical Detail Form no. 1 (B) NBC Code 208:2003- Sanitary & Plumbing Design Requirements	✓	✓	X	X
3.	Technical Detail Form no. 1 (C) NBC Code 208: 2003-Electrical Design Requirements	✓	✓	X	X
4.	Technical Detail Form no. 1 (D) NBC Code 000: 1994 to NBC Code 114: 1994 Structural Design Requirements	✓	✓	X	X
5.	Technical Detail Form no. 2 Structural Design Requirements	X	X	✓	X

The technical detail forms are given in the appendix. Revised version of technical detail form no. 1(D) has been prepared for checking the structural design aspects as per the recently revised NBC 105: 2020 and is also included in the appendix. The main parameters considered in the technical detail forms are listed below:

a) Technical Detail Form no. 1(A)- Architectural Design Requirements

Building Elements	
1.0 Classification of Building	
1.1 Building Purpose	
1.2 Sub-group	
2.0 Means of Exit	
2.1 Effective Occupant Load for exit calculation	
2.2 Max. travel distance to exit point in each floor (m)	
2.3 Min. width of exit door including frame (mm)	
2.4 Min. height of exit door including floor (mm)	
2.5 No. of staircase and Ramps (nos.)	
2.5 Total width of staircase/ ramps (mm)	
2.6 Tread of Staircase (mm)	
2.7 Riser of Staircase (mm)	
2.8 Max. no. of riser on one single flight (nos.)	
2.9 Height of the hand rail (mm)	
3.0 Component of Building	
3.1 Average Plinth Height	

3.2 Room height	
3.3 Light & Ventilation	
3.3.1 Min. ratio of opening area for natural light (O) to the area of habitable room (A)=(O/A)	
3.3.2 Min. ratio of opening area for natural ventilation (O) to the area of habitable room (A)=(O/A)	
3.4 Lifts	
3.4.1 Presence of Fire Lift (Y/N)	
3.4.2 Size of Lift Car (m)	
3.5 Basements	
3.5.1 Percentage of vent in Basement	
3.6 Parking	
3.6.1 Parking area allocated for each car (LxB) (mm)	
3.6.2 Gradient of ramp for vehicle use	
4.0 Building Category Based on Height	
4.1 Height of parapet wall or balcony handrail (m)	
4.2 Provision of Fire Escape & Fire Safety	
5.0 Disabled Accessibility Category	
5.1 No. of floors accessible to wheel chair bound people (nos.)	
5.2 Max. gradient ramp (%)	
5.3 Min. width of ramp (m)	

b) Technical Detail Form no. 1(B)- Sanitary & Plumbing Requirements

S.N.	Parameters to be checked	
1.	Assumed water consumption per capita for the design of water supply and sanitary systems	
2.	Capacity of underground water tanks	
3.	Capacity of overhead water tanks	
4.	Provision of dry & wet riser systems for firefighting purposes	
5.	Number of sanitary appliances such as urinals, wash basins, water closets, kitchen sinks provided in the building	

c) Technical Detail Form no. 1(C) – Electrical Design Requirements

S.N.	Parameters to be checked	
1.	Rating & Sizes	
	• Minimum sizes of copper cables in light & power circuits	
	• Wattage of ordinary 2 pin & 3 pin power sockets outlets	
	• Wall thicknesses of cast iron or mild steel sheet switch or regulator boxes	
	• Depth of switch or regulator boxes	
2.	Maximum number of cables in a conduit	
3.	Earthing System	
4.	Testing of Insulation Resistance	

d) Technical Detail Form no. 1 (D)- Structural Design Requirements

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S.N.	Parameter to be Checked	
1.	General Information – no. of storey, height, structural system, software used for structural analysis	
2.	Level of Design	
3.	Material Specifications- type of materials used in the construction	
4.	Unit weight of materials for dead load assessment	
5.	Occupancy load used for imposed load assessment	
6.	Wind zone & basic wind speed for wind load assessment	
7.	Parameters used for seismic design- method of analysis, sub-soil type, fundamental time period, spectral shape factor, seismic zoning factor, importance factor, ductility factor, overstrength factor, exponent for vertical distribution of lateral seismic forces in various storeys	
8.	Snowfall area, elevation, design depth & design density for snow load assessment	
9.	Use of fire safety requirement	
10.	Site considerations for seismic hazards- distance from the toe of downward slope, distance from river bank, soil type, safe bearing capacity, type & depth of foundation	
11.	Unreinforced masonry for load bearing structures- brick crushing strength, mortar ratio for load bearing masonry, wall thickness, wall height, wall lengths in different storeys, opening details in walls, provisions of horizontal bands & vertical reinforcements	
11.	Reinforced Concrete Structure	
	• Grade of concrete & rebar	
	• Critical size of slab panel, check for deflection	
	• Critical size of beam, check for deflection	
	• Critical size and height of column, check for maximum slenderness ratio	
	• Design philosophy used	
	• Load combinations adopted	
12.	Steel Structures	
	• Design assumption, yield stress used	
	• Least wall thickness for various exposure conditions	
	• Purlin size for critical span of purlin	
	• Slenderness ratio of critical steel post	
13.	Timber Structures	
	• Name of structural timber	
	• Modulus of elasticity	
	• Critical span of timber beam	
	• Check for deflection of timber beam	
	• Slenderness ratio of critical timber post	
14.	Aluminium Structures	
	• Name of design code for aluminium structure	
15.	Construction Safety	
	• Fulfillment of safety measures in construction	
	• Safety wares used- hard hat, goggles, boots, belt, first aid facility	

b) Verification of the Structural Analysis File and Reports

The Building Code Unit of the Technical Section/ Desk shall also review the structural design report and the structural analysis file submitted by the Designer. The structural design report shall be reviewed first to verify that the structural design has been carried out in full compliance with the building codes. The report shall be checked for material properties, loads, load combinations, modeling method, check for drift and modal mass participation, element design with all members passed, design of slab, staircase & foundations, etc. The design parameters given in the report shall tally with the parameters given in the Technical Detail Form no. 1(D). Thereafter, the structural analysis file shall be checked by opening in the corresponding software. The analysis file shall also be reviewed for various design parameters described in the design report and shall tally with the report. Next, the structural drawings are reviewed to verify that the design results as indicated by the analysis file match with the details shown in the drawings, such as grades of concrete & rebar, sizes and rebar details of columns, beams, slabs, staircase, foundations, etc. In case any discrepancy is found in between the checklist or technical detail form, structural design report, structural analysis file and the structural drawings, the Designer shall be notified in writing or through online system to make the corrections and submit the amended details, drawings or analysis file as the case may be.

c) Verification of Geo-technical Investigation Report

The Building Code Unit shall also check the geo-technical investigation report which is to be submitted for important buildings and those buildings which are more than 17 m in height or have more than 10,000 sq.ft. in floor area. It is to be verified that the report shows that all steps have been carried out in the geotechnical investigation as indicated in the sample TOC for the investigation. Furthermore, it is also to be verified that the recommendation for soil bearing capacity as given in the geo-technical investigation report has been used in the design of foundation of the building by the structural designer.

d) Notification for the submission of missing documents

In case any documents or details are observed to be missing, the building code unit shall notify the Building Owner & the Designer in writing to submit them as soon as possible to avoid delay in processing of the building permit application.

e) Notification for the correction of designs/drawings/details

While reviewing the application document, design & drawings and reports for building code compliance, the building code unit may find that some of the designs, drawings or details submitted by the Designer requires corrections. In such cases, the Building Code Unit shall notify the Building Owner & the Designer in writing or through online system to submit the corrected versions of the designs, drawings & details. The Designer shall respond promptly and shall provide the corrected versions of the same.

f) Forwarding the documents to the Executive Desk

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When the Building Code Unit completes the verification process for building code compliance after necessary corrections, if any, of the application document, it shall be forwarded to the Executive Desk or the CAO for getting it endorsed for registration.

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Section 9. Endorsement for Registration by the Executive Desk

9.1. General

When the Technical Desk/Section has completed all checks with regard to the building By-Laws and building code, the application document shall be forwarded to the Executive Desk/ CAO for formal registration. Till now, the application document was given only a temporary registration number.

9.2. Endorsement by Executive Desk

a) Verification of the Recommendation by Technical Desk

The Executive Desk/ CAO shall first check that the verifications made by the technical desk with regard to GLD or proposed roads, building By-Laws and NBC have been duly completed, the building owner & the Designer have provided necessary clarifications or missing documents and the Technical Desk/Section has duly recommended for the endorsement for registration. If anything, missing or overlooked by the Technical Section/Desk is found, clarification is sought from the Desk/section on the same.

b) Forwarding the documents to the Legal Desk

The application document is then forwarded to the Legal Desk/Section to check if there is any complaint filed against the land parcel or whether the land parcel has been frozen against land transaction or building construction.

c) Verification by the Legal Desk against any issues related to the land parcel and building construction

The Legal Desk/Section verifies that there is no pending complaint against the ownership or use of the land parcel and the land parcel has not been frozen against transaction or construction in the municipality record. If any such complaints are found, the application document is kept pending till such matters are resolved as per the legal procedures. Otherwise, the document is forwarded to the Executive Desk/CAO with the note that there are no legal issues related to the application document.

d) Forwarding to the Executive Desk with Recommendation by the Legal Desk

The application document is forwarded to the Executive Desk/ CAO by the Legal Desk/Section when no any pending issues are there with regard to the land parcel.

e) Endorsement for Registration and forwarding the documents to the Registration Desk

Executive Desk/Section shall then endorse the application document for the formal registration and it is then forwarded to the Registration Desk for the registration process.

Section 10. Formal Registration of the Application by the Registration Desk

10.1. Final Checking for Completeness & Endorsement by the Registration Desk and Formal Registration

After receiving the application document with the endorsement from the Executive Desk, the Registration Desk/ Section carries out the final checking with respect to the completeness of the documents and completion of checking from the Technical Desk. Then the application document is formally registered in the municipality. Notice on successful registration is is sent to the Building Owner & the Designer through SMS in the registered mobile number.

10.2. Forwarding the documents to the Ward Desk

The application document is then forwarded to the Ward Desk/ Ward Section for further processing.

Section 11. Forwarding the Documents to the Ward Office by the Ward Desk

11.1. Compilation & Verification of the documents by Ward Desk

The Ward Desk/Section verifies that the application document is complete in all respects. All documents are compiled in to a file and made ready for sending the application document to the ward office.

11.2. Forwarding the documents to the Ward Office by the Ward Desk

The application document compiled in a file shall be sent to the local ward office through the office staff or the Building Owner or the authorized representative of the owner. The Ward Desk/ Section shall keep the record of the person carrying the application document to the ward office to avoid any misplacement of the document.

Section 12. Publication of Notice for Filing Complaint by the Ward Office

12.1. Publication of 15 Days' Notice for Filing Complaint

Within 3 days from the date of receipt of the file containing the application document, the ward office shall send notice to the land/building owners of the land parcels which are abutting to the land parcel of the Building Owner for registering any complaint regarding the construction of the building within 15 days period from the date of publication of the notice. As per the Clause 31(a) of the Local Government Operations Act 2074, such notice shall be affixed at the locations of ward office, buildings of neighbors of the Building Owner and the construction site. The pro-forma for the 15- day notice for filing the complaint is given in appendix-15.

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12.2. Complaint Registration

Within 15 days from the date of publication of the notice by the ward office, the owners of the land parcels abutting to the land parcel of the Building Owner shall file application to the ward office if there are any issues related to the boundary of the property line, side setbacks, land area, position of openings, number of storeys of the proposed buildings, encroachment to the public land or property or any other technical/ practical/ legal issues.

Section 13. Site Verification & Field Investigation by Technician

13.1. General

Within 3 days from the date of expiry of the 15 day-complaint registering period, the CAO shall depute a technician and other municipality staff to investigate on whether it is possible or not to construct the building as per the application document submitted by the Building Owner.

13.2. Site Verification Work

The technician and the municipality staff shall verify that the proposed site plan matches with the actual field conditions at the construction site. For this purpose, dimensions of the land parcels may be measured for the verification of the site plan. Measurements shall be taken to verify that the setback distances on all sides as indicated in the site plan match in the field and that such setback distances fully comply with the building By-Laws. Also, it shall be checked that there is encroachment to the public land & structures. Any probable risk to the existing structures of the neighbors shall also be checked. In case any complaints have been filed by the owners of the land parcels abutting to the land parcel of the Building Owner, then the details of such complaints as per the observed field conditions shall also be substantiated by the site verification team and noted down.

13.3. Field Verification Work

The team consisting of the technician & the municipality staff shall also conduct field verification in presence of the Building Owner, owners of the land parcels abutting to the land parcel of the Building Owner, neighbors and ward representatives. For this purpose, the ward office shall send request letter to the above-mentioned persons to attend the meeting on field investigation at the stipulated date. In the meeting, the team shall brief about the proposed construction and request the attendees to express their views on the same. Any further complaints or suggestions received from the attendees shall be recorded. Finally, a deed of public inquiry on field investigation is prepared by the team with written details on any grievances or agreement on the proposed construction. The deed of public inquiry on field investigation shall have the signature of all attendees along with decisions of the meeting. The sample of request letter to be sent to the neighbors for attending the meeting on the field investigation is given in the appendix-16. Similarly, the sample of minute of

meeting on the field investigation which is called the deed of field investigation is shown in appendix-17.

13.3.1. Submission of the Field Report to the Ward Office

The technician and the staff deputed by the municipality CAO shall submit the field report to the ward office along with the deed of filed investigation and filed photographs with clear recommendation on whether to issue the building permit or not to the Building Owner. As per the clause 32 of Section 7 of the Local government Operations Act 2074, such report has to be submitted within a period of 15 days from the date of deputation for the field investigation. The sample of the field report is given in the appendix-18.

13.3.2. Notification to be provided to the Building owner for any Deviations

The field report shall clearly indicate on any deviations seen in the site plan and other drawings submitted for building permit against the actual conditions in the field observed and noted during the field investigation. Such deviations may be with regard to the ROW of adjoining roads, setback distances to be maintained on four sides, setbacks required for keeping openings in walls, cantilever projections of the buildings, height of the plinth level, height of the building, encroachment to the neighbor's land parcel, safety of the adjoining properties, distance from the banks of rivers, footing projections, special requirement in the protected monument zone, etc. In case any modifications are required to be carried out in the submitted design & drawings due to differing field conditions, the technician shall clearly mention these points in the report.

13.3.3. Forwarding the documents to the Ward Desk by the Ward Office

The Ward Office shall forward the application document together with the deed of field investigation, field investigation report and the complaints received during the 15-day complaint registering period to the Ward Desk/ Section. This may be done through municipality staff, authorized representative or close relatives of the Building Owner. The Ward Office shall keep record on the person taking the documents to the Ward Desk/Section in view of losing or misplacement of the important documents and files.

13.3.4. Forwarding the documents to the Technical Desk by the Ward Desk

The Ward Desk/ Section shall check that the documents received from the Ward Office are complete in all respects and then forward the same to the Technical Desk/Section for further processing.

13.3.5. Complaint Processing

In case any complaints are received against the proposed construction of the building during the 15-day submission period, the local ward office shall submit the same to the Technical Desk/Section through the Ward Desk/Section. The complaints shall first be scrutinized by the Technical Desk/Section. If these complaints are of technical nature and can be solved by

the modifications or alterations of the designs and drawings, the Technical Desk/Section shall instruct the Building Owner to revise the drawings & details accordingly and then resubmit. Such cases may pertain to the following conditions:

- Difference in the dimensions of the land parcel in the field
- ROW of adjoining roads not correct as per the field conditions
- Setback distances as shown in the drawing could not be maintained in the field
- Distance from the river bank shown in the site plan not matching with the field conditions
- Cantilever projection observed to encroach setback areas
- Possibility of compromising safety of the structures in the adjoining land parcels
- Change required in the plinth level of the building
- Change in height required due to light plane requirement because of different ROW of roads adjoining the land parcel
- Mistakes in identification of protected monument zone & sub-zones

To solve the issues mentioned above, corrections in the submitted designs & drawings are required. The Building Owner shall get the drawings corrected through the Designer and the latter shall re-submit the drawings on behalf of the Building Owner. If the corrections have been made as per the suggestions of the Technical Desk/ Section, then the building permit process shall be taken forward.

However, when the complaints are of legal nature, the Technical Desk/Section shall forward the application document together with the field report and complaints to the Legal Desk/Section. Such cases may be related to the following issues:

- Dispute in the ownership of the land parcel
- Dispute in the ownership of the building
- Dispute in the nature of land parcel- whether public land has been encroached
- Existence of public land, irrigation channels, patis, monuments, temples, etc. in the land parcel
- Safety of existing structures during construction by the building owner

For resolving such legal issues, the Legal Desk/ Section shall conduct necessary procedures as per the prevailing laws in which the concerned stakeholders shall be called to attend meetings to discuss the issue and then come to a conclusion after negotiation. Sometimes, it may not be possible to settle the issue through counselling and negotiation from the Legal Desk/ Section and the complainant may like to go to the court for further legal proceedings. Then the application document is kept on-hold till such legal issues are completely resolved. The Building owner shall then be notified accordingly.

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13.3.6. Forwarding the documents to the Revenue Desk by the Technical Desk

When the application document is found to be clear from any complaints and fully complying with the building By-Laws & building code or that the Building Owner has submitted revised designs & drawings as per the suggestion of the Technical desk/Section on the basis of field report, then the application document shall be forwarded to the Revenue Desk/Section by the Technical Desk/ Section for the payment of the applicable building permit fee.

Section 14. Collection of the Building Permit Fee by the Revenue Desk

14.1. General

The design & drawings submitted by the Building Owner will be final after the submission of the field report and further checking by the Technical Desk/Section with the receipt of amended drawings, if required, on the basis of the field report and complaint processing. Then the Technical Desk/Section shall forward the application document to the Revenue Desk/Section for the payment of the building permit fee.

14.2. Assessment of the Building permit Fee by the Revenue Desk

The rate for building permit is generally published in the Financial Act of the municipality. The Revenue Desk/ Section makes assessment of the building permit fee on the basis of type of construction and number of floors and informs the Building Owner about the total fee payable to the municipality. The pro-forma for the calculation of the fee for building permit is shown in the appendix-19.

14.3. Collection of the Building Permit Fee & Issue of Receipt

The Building Owner makes payment of the Building Permit fee to the Revenue Desk/ Section. The latter then issues a receipt of the payment made to the Building Owner. One copy of the payment receipt is attached in the application document.

14.4. Forwarding the documents to the Technical Desk

The application document with the copy of the receipt of the payment of the building permit is then forwarded to the Technical Desk/ Section.

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Section 15. Re-verification of Documents & Recommendation to Issue Temporary Building Permit by the Technical Desk

15.1. Re-verification of the Documents by the Technical Desk

The Technical Desk/ Section shall make final checking of the application document against any omissions or errors against completeness of the documents and compliance of BBL & NBC. If everything is found to be in order, then the Technical Desk/Section shall send the name of the Building owner to the Instructor responsible for taking orientation class on "Building Code & Earthquake Resistant Construction of the Buildings" for the Building Owners.

15.2. Syllabus of the Orientation Class for the Building Owners on Earthquake Resistant Building Construction

The orientation class on the National Building Code & Earthquake Resistant Construction of Building is intended to give an overview of importance of NBC and earthquake resistance construction of buildings to the Building Owners. This will motivate them to adopt the earthquake resistant construction techniques through the help of Designers and the masons. Though Designers carry out the earthquake resistant design during the structural analysis & design of buildings, Building Owners tend to skip the details given in the approved drawing and opt for reducing the size of RC elements and area or number of reinforcement bars thinking that such designs & drawings are not necessary and result in uneconomical construction. Hence such orientation class shall impart them the necessity of compliance of NBC and adoption of earthquake resistant construction.

Following are the recommended course content for the orientation class:

Course Content of the Orientation Class on NBC & Earthquake Resistant Construction of Buildings

S.N.	Topics	Duration
1.	Causes & Effects of Earthquake	30 minutes
2.	Effects of Earthquake on Masonry & RC Buildings	15 minutes
3.	Earthquake Resistant Features in Masonry & RC Buildings	30 minutes
4.	Quality of Construction Materials and Works	30 minutes
5.	Introduction to National Building Code of Nepal	15 minutes
	Total	**2 hours**

15.2.1. Orientation to the Building Owners on Earthquake Resistant Building Construction

The instructor from the municipality shall collect the name list of the Building Owners who need to take the orientation class on NBC & earthquake resistant construction of buildings. The presentation in the class shall be made using PowerPoint presentations and audio-visual clips so that the topics are interesting to the Building Owners. During the training, booklets

and pamphlets on the earthquake resistant construction shall also be distributed to the Building Owners.

15.2.2. Submission of the list of Attendees of the Orientation Class to the Technical Desk

Once the orientation class is over, the instructor shall compile the names of the Building Owner who attended the orientation class and submit to the Technical Desk/ Section. Only the names of the Building Owners who attended the orientation class fully shall be submitted.

Attendance Sheet of the Orientation Class

S.N.	Name of the Building Owner	Date of the Orientation Class	Signature of the Building Owner
1.			
2.			
3.			
4.			

Verified by:

……..

(Signature)

Name of the Instructor: ……

Designation: …….. Date: ……..

15.2.3. Recommendation to issue Temporary Building Permit

Once the Technical Desk/ Section receives the attendance sheet with name list of the Building Owners who attended the orientation class, the Technical Desk/ Section compiles the list of such Building Owners. Then the application files of these Building Owners are forwarded to the Executive Desk/ the Chief Executive Officer with recommendation to issue them the temporary building permit certificates. The sample of the memo on the approval for issuing the temporary building permit is shown in the appendix-20.

15.2.4. Issue of Temporary Building Permit Certificate

The Executive Desk/ Chief Executive Officer shall review the memo submitted by the Technical Desk/ Section against the submitted application document with supporting documents, field investigation report and deed of filed investigation. If everything is found to be in order, then the Executive Desk/ CAO shall issue the temporary building permit in the name of the Building Owner for the construction of building up to the plinth level. The submitted designs & drawings are also approved by the Desk/CAO pursuant to the clauses 32,33, 34 & 35 of the Local Government Operations Act 2074. The sample of the temporary building permit certificate is given in the appendix-21.

Section 16. Supervision of Building Construction Works

16.1. General

When the Building Owner has received the temporary building permit from the municipality, the design phase of the building is completed and now the supervision phase will commence. The Building Owner needs to contact the mason or the contractor and the supervision consultant whose names were submitted earlier at the time of filing application for the building permit. In case the originally submitted masons/contractor and the supervision consultant are not available or the building owner wants to change one or more of them due to some reason, new mason/ contractor and the supervision consultant shall be selected from amongst the list of registered mason/contractor and the supervision consultant available in the municipality website. Immediate notification shall be given to the municipality along with the copies of signed contract agreement with them.

16.2. Summary Supervision Report by the Supervision Consultant

The Supervision Report shall be prepared & signed by the Supervision Consultant and handed over to the Building Owner for the submission to the municipality at the time of interim site inspections. Format of the Supervision Report to be prepared by the Supervision Consultant shall be as given below. The reporting shall be made at the following milestones:

i) Just before the First Interim Site Inspection:

a) For RCC buildings: After the completion of Foundation excavation, soling works, PCC for foundation and rebar cage placing for foundation & columns.

b) For Masonry Buildings: After the completion of Foundation excavation, soling works, PCC for foundation, vertical reinforcement placing, footing construction and wall construction below the plinth level**.**

ii) Just before the Second Interim Site Inspection

- Construction up to the Plinth Level in RCC Buildings & up to the DPC Band in Masonry Buildings before the casting of concrete.

iii) Just before the Third Interim Site Inspection

- Construction up to the First Floor Level before the casting of concrete.

iv) Construction for each floor for multi-story buildings before the casting of concrete.

v) After the Completion of Building Construction Works

16.3. Report for the First Inspection Request:

Components of the report shall be as follows:

a) General information:

- Owner's name

- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of temporary permit of Municipality
a) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
b) Checklist for 1st inspection
c) Photographs: Photographs of up to date completed works (showing Reinforcement of tie beam and column extended)
d) Material information reports:

- Approved Cement brand
- Source name of sand
- Source name of aggregate
- Report of Concrete cube test using approved cement
- Brand of approved reinforcement with Factory batch test report (Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m^2)

16.4. Report for the Second Inspection Request:

Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of 1st inspection approval of Municipality
c) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
d) Checklist for 2st inspection
e) Photographs: Photographs of up to date completed works (showing Reinforcement of each footing and column)
f) Material information reports:

- Report of cube test of Concrete used in footing casting period
- Name of Approved Cement brand, if changed
- Source name of sand, if changed

- Source name of aggregate, if changed
- Brand of approved reinforcement with Factory batch test report (Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m^2), If changed

16.5. Report for the Third Inspection Request:

Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Approval date, Floor/Area of approval
- Construction starting date, Gapping period
- Starting date of supervision consultant's engagement

b) Copy of 1st inspection approval of Municipality
c) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.
d) Checklist for 3rd inspection
e) Photographs: Photographs of up to date completed works (showing Reinforcement of beam, slab and extended columns)
f) Material information reports:

- Report of cube test of Concrete used in tie beam casting period
- Name of Approved Cement brand, if changed
- Source name of sand, if changed
- Source name of aggregate, if changed
- Brand of approved reinforcement with Factory batch test report (Tension, elongation, and bend/re-bend; Reinforcement test report (for buildings of area above 1000 m^2), If changed

16.6. Report for the Building Construction Completion:

The Supervision Consultant shall submit Building Construction completion report that shall be included in application for building completion inspection. Components of the report shall be as follows:

a) General information:

- Owner's name
- Location address
- Plinth area

- Total floor
- Total floor area
- Total floor considered in design
- First approval date, Floor/Area of first approval
- Revised approval date, Floor/Area of revised approval
- Construction starting and completion date, Gapping period
- Starting engagement date of supervision consultant

b) Municipal construction approval drawings, any deviations done during construction period and re-approvals provided by municipality considering the deviations.

c) As built drawings: In general, the Supervision Consultant shall ensure the production and submission of the as-build drawings by the contractor. In absence of provision to prepare 'as build drawing' in contractor's part, the Supervision Consultant must prepare the document. The drawing should cover as-build architectural drawings, reinforcement detailing of major structural components,

d) Photographs: Photographs of municipalities' monitoring stage and completion stage shall include in the report.

e) Structural characteristics of constructed buildings such as design parameters and capacity of building, final structural analysis input file, specification of major construction materials, Geo-technical investigation report, and other miscellaneous information related to services and strength.

- Test Report of the main construction materials (rebar, cement, bricks, sand, aggregates, etc.)
- Test Report of Concrete Quality (cube test reports as per IS 456:2000)
- Photographs showing details and construction progress at each milestone mentioned above.

16.7. Main Items to be checked by the Supervision Consultant

Following are the main items to be checked by the supervision consultant:

Stage 1: Building layout to placing of foundation & column rebars

- Setting out of the building as per the approved design & drawings
- Earthwork excavation works for foundation
- Construction safety provisions
- Quality of construction materials (cement, sand, aggregates, bricks, stone, etc.) & their test reports
- Soling & PCC works
- Rebar details for foundation, footing tie beam, columns

Stage 2: Concreting works below the plinth

- Mix ratio for RCC works
- Formworks for RCC works
- Cube testing to verify the compressive strength of concrete mix
- Curing works for RCC works
- Masonry works in Brick/Stone

Stage 3: Rebar works up to the first-floor level

- Rebar details for columns, beams, slabs & staircases
- Formwork for RCC works
- Cube testing to verify the compressive strength of concrete mix
- Curing works for RCC works
- Construction safety
- Electrical conduits placement for wiring
- Masonry works in Brick/Stone
- Finishing works on walls & floors
- Sanitary & plumbing works
- Door & window works in aluminium/uPVC/Steel/Timber

Stage 4: Rebar works up to other intermediate floor levels

- Rebar details for columns, beams, slabs & staircases
- Formwork for RCC works
- Cube testing to verify the compressive strength of concrete mix
- Curing works for RCC works
- Construction safety
- Electrical conduits placement for wiring
- Masonry works in Brick/Stone
- Finishing works on walls & floors
- Sanitary & plumbing works
- Door & window works in aluminium/uPVC/Steel/Timber

Stage 5: Final completion of the building

- Rebar details for columns, beams, slabs & staircases
- Formwork for RCC works
- Cube testing to verify the compressive strength of concrete mix
- Curing works for RCC works

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- Construction safety
- Electrical conduits placement for wiring
- Masonry works in Brick/Stone
- Finishing works on walls & floors
- Sanitary & plumbing works
- Door & window works in aluminium/uPVC/Steel/Timber

16.8. Contents of the Supervision Report- Photographs, test reports and other details

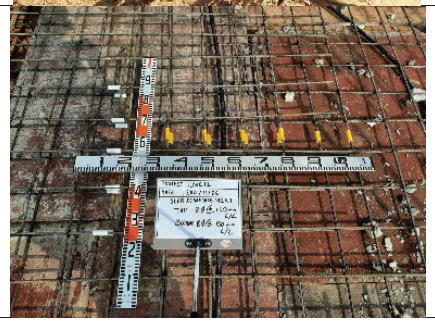
The supervision report submitted by the Supervision Consultant shall include the photographs in the standard format as evidences to the compliance with the approved designs & drawings. Similarly, test reports on the quality of main construction materials such as cement, sand, aggregate, rebars, bricks, etc. and on the compressive strength of concrete using concrete cubes shall also be submitted.

Sample formats of the photographs are shown below:

Each photo shall have following annotations:

- Photo number:
- Title of photo,
- Location of photo as named in approved architectural drawing (X-axis grid name, Y axis grid name, Floor name)
- Date and time of photography
- Photographer:

Description	Sample Photograph
Sample Photo of Rebar check at foundation with following information • Project brief detail with data • Rebar detail at footing	

Sample Photo for Concrete Cube preparation at site with following information: • Project brief detail with data	
Sample Photo for Column rebar check including information: • Project brief detail with data • Longitudinal rebar detail • Stirrups rebar detail	
Sample Photo for Beam and Slab rebar check including information: • Project brief detail with data • Rebar Detail of Slab	

Sample Photo for Beam and Slab rebar check including information: • Project brief detail with data • Rebar detail of Beam **Rebar Detail of Slab**	

16.9. Frequency of Supervision Report Submission

The supervision report shall be submitted at the time of submission of inspection request by the Building owner to the municipality. Besides these, supervision report shall also be submitted after the casting of each floor in a multi-storeyed building.

Section 17. Inspection Works by the Municipality up to the Plinth Level

17.1. General

As per the clauses 11.3, 12.3, 12.4 & 13.2 of BCWP, municipality shall carry out periodic inspection of the building construction works. Generally, four number of inspections are to be made as per the BCWP but interim site inspection can also be made at the time of casting of intermediate floors of a multistoried building.

17.2. Application Filing by the Building Owner for the First Inspection

When the reinforcement works for the foundation, footing tie beams and columns have been erected at the construction site as per the approved designs & drawings for RCC buildings, the Building Owner shall submit the application for the first interim site inspection by the municipality. This shall be done before initiating the casting of concrete for RCC works. In the case of masonry buildings, construction of wall footings, wall layouts, footing tie beams (if any) and the vertical reinforcement shall be complete for making request for the first interim site inspection. This application letter shall include the supervision report prepared by the Supervision Consultant. The Supervision Consultant shall assist the Building Owner for online submission of the application form. The sample application form for the first interim field inspection in shown in the appendix-22. The sample checklist to be submitted by the Supervision Consultant is shown in the appendix.

17.3. Inspection by the Municipality for works below the Plinth level

After receiving the application for the first interim site inspection from the building owner, municipality shall depute a technician for making the first field inspection. The technician shall check the following points and fill the summary in the first inspection checklist.

For RCC Buildings:

- Layout of the building has been done as per the approved drawings
- Positions of columns or walls tally with the approved drawings
- Distance from the boundary and centerline of the roads has been maintained as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings
- There is no danger to the existing structures due to the excavation carried out for the foundation or safety measures have been taken to address this issue
- There is no possibility of damage to the adjoining roads, drains, electric poles, etc. due to the excavation for foundations
- Cages of Reinforcement bars for foundations, footing tie beams and columns have been laid as per the approved designs & drawings
- Lap length of the rebars comply with the detailing rules
- Number of rebars, their dia and spacing of links in the foundation matches with the approved designs & drawings
- Construction site has been properly secured with barricades to restrict the entry of unauthorized persons

For Masonry Buildings:

- Layout of the building has been done as per the approved drawings
- Positions of masonry walls tally with the approved drawings
- Distance from the boundary and centerline of the roads has been maintained as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings
- There is no danger to the existing structures due to the excavation carried out for the foundation or safety measures have been taken to address this issue
- There is no possibility of damage to the adjoining roads, drains, electric poles, etc. due to the excavation for foundations
- Footing steps of masonry walls have been constructed as per the approved drawings
- Vertical reinforcements have been started from the base of the footing and their positions are correct as per the approved drawings.
- Construction site has been properly secured with barricades to restrict the entry of unauthorized persons

17.4. Pro-forma of the Checklist of the First Inspection Report

The sample of the checklist to be filled up by the municipal technician while carrying out the first interim field inspection is shown in appendix-23.

Checklist for Municipal First Interim Site Inspection:

a) For RCC Buildings-

Checklist status	Municipality 1st inspection (Foundation)
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	There is no deviation on layout from approved design.	☐ Yes	☐ No	☐ N/A	
2	The diameter of re-bars, spacing, embedment, and bearing on Foundation according to the approved drawings, and Guidelines.	☐ Yes	☐ No	☐ N/A	
3	Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.	☐ Yes	☐ No	☐ N/A	
4	Excavated area barricaded.	☐ Yes	☐ No	☐ N/A	
5	Isolation of Seepage water due to high water table has been done. Safety against underground utility lines maintained.	☐ Yes	☐ No	☐ N/A	
6	Re-bars are maintained in its position by providing sufficient steel chairs, cover blocks, spacers, supports and binding wire etc. as per specifications and guidelines.	☐ Yes	☐ No	☐ N/A	
7	Anchor development provisions, Length and location of lap splices are as specified in the drawings and specifications and the guideline.	☐ Yes	☐ No	☐ N/A	
8	Legs of stirrups and rings are as per the guideline and drawings.	☐ Yes	☐ No	☐ N/A	
9	Spacing of stirrups and rings in confined zone and other area are as per the drawings and the guideline.	☐ Yes	☐ No	☐ N/A	
10	The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident.	☐ Yes	☐ No	☐ N/A	
11	Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

b) For Masonry Buildings:

Checklist status	Municipality 1st inspection (Foundation)
Date:	
Municipality approval indication No.	
Name of owner:	
Location:	
Supervising Consultant	
Contractor:	

No:	Description	Status			Comments
1	There is no deviation on layout from approved design.	☐ Yes	☐ No	☐ N/A	
2	Wall footings are erected at correct positions as per the approved design	☐ Yes	☐ No	☐ N/A	
3	Footing steps to the wall have been constructed as per the approved design	☐ Yes	☐ No	☐ N/A	
4	Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.	☐ Yes	☐ No	☐ N/A	
5	Excavated area barricaded.	☐ Yes	☐ No	☐ N/A	
6	Isolation of Seepage water due to high water table has been done. Safety against underground utility lines maintained.	☐ Yes	☐ No	☐ N/A	
7	Vertical Reinforcements are maintained in correct position starting from the base of the wall foundation by providing sufficient cover as per specifications and guidelines.	☐ Yes	☐ No	☐ N/A	
8	Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities	☐ Yes	☐ No	☐ N/A	
Supervising Consultant Signature:		Contractor's representative Signature:			

17.5. First Inspection Report by the Technicians & Details to be checked during the First Inspection

The technician deputed from the municipality shall complete the first interim site inspection after noting down the important points mentioned above and filling up the inspection checklist. He/she shall also take photographs of the construction. He/she shall also verify that the supervision report submitted by the supervision consultant are correct and in order. Then he/she shall submit his/her report to the Technical Desk/Section.

17.6. Notifications for the correction of construction works and/or drawings

In case there are deviations in the actual construction in comparison to the approved designs & drawings, the technician shall carefully prepare the notes on the same and include them in the inspection report. After the approval of the inspection report from the Technical Desk/Section, instruction shall be issued to the Building Owner and the Supervision Consultant to make corrections immediately and then re-apply for further inspection. The

sample of the notification for corrections after the first inspection is given in the appendix-37.

17.7. Issue of the First Inspection Certificate by the Municipality

In case the rebar arrangement for RCC building below the plinth level and construction of masonry walls & footings below the plinth level have been found to have been done correctly as per the approved designs & drawings and the layout of the building has been found without any violation of building By-Laws, then the Technical Desk/Section shall issue the First Interim Site Inspection Certificate to the Building Owner along with the instruction to carry out further construction works. The sample of the first interim field inspection certificate is shown in the appendix-24.

17.8. The Second Inspection from the Municipality

After getting the first interim site inspection certificate from the municipality, the Building Owner shall proceed ahead with the concreting works below the plinth level for RCC buildings and with the construction of walls below the DPC band in the case of masonry buildings. Then after laying the rebars for the plinth beam or DPC band, the Building owner shall file an application to the municipality for the second interim site inspection as per the clause 11.3(d).

17.9. Pro-forma for Application from the Building Owner for the Second Inspection

The sample of the application form requesting the municipality to carry out the second interim field inspection is shown in the appendix-25.

17.10. Inspection by the Municipality for works up to the Plinth level

After receiving the application from the Building Owner for the second interim site inspection, Technical Desk/Section shall depute a technician to carry out the field inspection works.

Important points to be checked by the technician at this stage are:

For RCC Buildings:

- Layout of the building has been carried out without any deviation from the foundation level up to the plinth as per the approved drawings
- Positions of columns or walls tally with the approved drawings
- Distance from the boundary and centreline of the roads has been maintained even at this level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the plinth level.
- Masonry works in bricks/ stone for toe walls have been done correctly.

- Backfilling work inside & outside the buildings have been done correctly.
- Reinforcement arrangement for the plinth beams have been correctly laid as per the approved designs & drawings.
- Reinforcement for columns have been correctly laid with provision of lapping of 50% bars at mid height of column in ground floor level.
- Stirrups for plinth beams are of correct diameter, spacing and with 135 degree hooks.
- Formworks for plinth beams are correctly laid in position and level with no leakage of cement slurry.

For Masonry Buildings:

- Layout of the building has been carried out without any deviation from the foundation level up to the plinth as per the approved drawings
- Positions of walls up to the plinth level tally with the approved drawings
- Distance from the boundary and centreline of the roads has been maintained even at this level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the plinth level.
- Masonry works in bricks/ stone for walls have been done correctly.
- Backfilling work inside & outside the buildings have been done correctly.
- Reinforcement arrangements for the DPC band & vertical reinforcement have been correctly laid as per the approved designs & drawings.
- Formworks for DPC bands are correctly laid in position and level with no leakage of cement slurry.

17.11. Second Inspection Report by the Technicians & Details to be checked during the Second Inspection

The technician deputed from the municipality shall visit the construction site & carry out the second interim site inspection after noting down the important points mentioned above and filling up the inspection checklist. He/she shall also take photographs of the construction. He/she shall also verify that the supervision report submitted by the supervision consultant are correct and in order. Then he/she shall submit his/her report to the Technical Desk/Section. The sample checklist to be used for carrying out the second interim field inspection by the municipal technician is shown in the appendix-26.

17.12. Notifications for the correction of construction works and/or drawings

During the second interim site inspection, if the technician observes that there are deviations in the actual construction completed up to the plinth level/ DPC band in comparison to the approved designs & drawings, he/she shall carefully prepare the notes on the same and include them in the inspection report. After the approval of the inspection report from the Technical Desk/Section, instruction shall be issued to the Building Owner and the

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Supervision Consultant to make corrections immediately and then re-apply for further inspection. The sample of the notification for corrections after the first inspection is given in the appendix-38.

17.13. Issue of the Second Inspection Certificate by the Municipality

In case the construction works up to the plinth beam/ DPC band and the rebar arrangement for the plinth beam/ DPC band have been found to have been done correctly as per the approved designs & drawings and the layout of the building has been found without any violation of building By-Laws, then the Technical Desk/Section shall issue the Second Interim Site Inspection Certificate to the Building Owner. The Technical Desk/Section shall also submit recommendation to the Executive Desk/Chief Administrative Officer to grant the Permanent Building Permit to the Building Owner. The sample of the second interim field inspection certificate is shown in the appendix-27. Similarly, the sample of the memo to be submitted by the Technical Desk/Section to the Executive Desk/CAO for issuing the temporary building permit is shown in the appendix-28.

Section 18. Permanent Building Permit

18.1.1. Verification of Inspection Reports & Recommendations

The Chief Administrative Officer shall review the recommendation submitted by the Technical Desk/Section for the issue of the permanent building permit along with the second interim inspection certificate and the supervision report of the building.

18.1.2. Issue of Permanent Building Permit

If it is observed that everything is in order, then the Executive Desk/CAO shall issue the Permanent Building Permit in the name of the Building owner as per the clause 33 of the Local Government Operations Act 2074 (LGOA 2074). Pursuant to the clause 34 of the LGOA 2074, it is also required to approve the designs and drawings too while issuing the building permit.

As per the clause 33 of the LGOA 2074, the CAO shall generally issue the permanent building permit within a period of 7 (seven) days starting from the date of submission of the field investigation report by the technician deputed for carrying out the field investigation. This will be the case when no complaints have been registered by the neighbors or other persons against the construction of the building by the Building Owner. However, when complaints are registered but these are found to be related to issues other than the ownership of the land or the proposed building, then the CAO shall issue the building permit within a period of 30 (thirty) days starting from the date of submission of the field investigation report by the technician. In case the complaints are pertaining to the ownership of the land or the proposed building, the CAO shall issue the directive to file the complaint in the district court within a period of 35 (thirty-five) days. When the complaint is related to only a part of the land parcel and the Building Owner submits amended designs & drawing stating that

the building will be constructed in the undisputed part of the land parcel & the construction in the disputed part shall be carried out as per the court decision, then the CAO shall issue the building permit within a period of 15 days starting from the date of submitting the application by the Building Owner. The sample of the permanent building permit certificate is shown in the appendix-29.

Section 19. Inspection Works by the Municipality for the Superstructure

19.1. General

After receiving the permanent building permit, the building owner shall proceed ahead with the construction of the ground floor level and the reinforcement placement for the construction of the first-floor slab. Before the casting of concrete is carried out, the Building Owner shall submit an application to the municipality for the third interim field inspection.

19.2. Application Filing by the Building Owner for the Third Inspection

The application for the third interim field inspection shall be attached with the supervision report prepared by the supervision consultant of the construction works up to the first-floor level. The sample application form to be submitted by the Building owner requesting for the third interim field inspection by the municipality is shown in the appendix-30.

The Supervision Consultant shall make online submission of the application and the supervision report.

19.3. Inspection by the Municipality for works up to the First Floor Level

Having received the application from the Building Owner for the third interim inspection, the Technical Desk/Section shall depute a technician to inspect the building and submit the report on the same.

19.4. Third Inspection Report by the Technicians & Details to be checked during the Third Inspection

Following are the main points to be checked during the third interim field inspection. Besides, the technician shall also verify the correctness of the supervision report submitted by the Supervision Consultant.

For RCC Buildings:

- Positions of columns or walls tally with the approved drawings
- Distance from the boundary and centreline of the roads has been maintained even at this level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the plinth level.
- Masonry works in bricks/ stone for ground floor walls have been done correctly.

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- Reinforcement for columns have been correctly placed tallying with the number & diameter of rebars as indicated in the approved designs & drawings with provision of lapping of 50% bars at mid height of column at the second-floor level.
- Reinforcement arrangement for the floor beams have been correctly done with respect to the number, diameter and positions (top & bottom layers) at supports and at mid-span as per the approved designs & drawings.
- Links in the columns & stirrups in the floor beams are of correct diameter & spacing and are with 135 degree hooks following the ductile detailing provisions as indicated in the approved drawings.
- Formworks for the floor beams and slabs are correctly laid in position and level with no possibility of leakage of cement slurry.
- Vertical posts and bracings of the formwork are correctly erected without possibility of lateral movement.
- Conduits for electrical wirings have been correctly laid in positions as per the approved drawings.
- Cantilever projections of slabs at the first-floor levels are as per the approved drawings and do not overhang in the setback areas,

For Masonry Buildings:

- Positions of walls up to the ground floor level tally with the approved drawings
- Distance from the boundary and centreline of the roads has been maintained even at this level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the plinth level.
- Masonry works in bricks/ stone for walls have been done correctly.
- Reinforcement arrangements for the horizontal roof band & vertical reinforcement have been correctly laid as per the approved designs & drawings.
- Formworks for the first-floor slab are correctly laid in position and level with no leakage of cement slurry.
- Vertical posts and bracings of the formwork are correctly erected without possibility of lateral movement.
- Conduits for electrical wirings have been correctly laid in positions as per the approved drawings.
- Cantilever projections of slabs at the first-floor levels are as per the approved drawings and do not overhang in the setback areas.

The sample checklist to be used by the technician while carrying out the third interim field inspection is given in the appendix-31.

19.5. Notifications for the correction of construction works and/or drawings

While carrying out the third interim site inspection, if the technician observes that there are deviations in the actual construction completed up to the first-floor level in comparison to the approved designs & drawings, he/she shall carefully prepare the notes on the same and include them in the inspection report. After the approval of the inspection report from the Technical Desk/Section, instruction shall be issued to the Building Owner and the Supervision Consultant to make corrections immediately and then re-apply for further inspection. The sample of the notification for corrections after the first inspection is given in the appendix-39.

19.6. Issue of the Third Inspection Certificate by the Municipality

If the technician finds that the construction work up to the first floor level have been carried out as per the approved designs & drawings and tallys with the supervision report submitted by the Supervision Consultant, then he/she shall submit his/her inspection report along with the recommendation to permit further construction of the building as per the approved designs & drawings. The sample of the third interim site inspection certificate is shown in the appendix-32.

19.7. Interim Site Inspections from the Municipality

a) Inspection by the Municipality for works at intermediate levels

Construction of multistoried buildings shall be carried out by the Building Owner beyond the first-floor level as per the approved designs & drawings after getting the third interim inspection certificate. As per the provision under the clause 39 of the LGOA 2074, municipality may depute technician to inspect the building at any intermediate stage to verify that the construction is being undertaken in full compliance with the building By-Laws and National Building Code.

b) Notifications for the correction of construction works and/or drawings

During the inspection of construction works at intermediate floors by the municipality, if it is found that the construction is being done deviating from the approved designs & drawings, the technician shall submit inspection report along with his/her recommendation to the CAO within 15 days from the date of deputation. The CAO shall submit the report to the Mayor for taking necessary actions. If the construction is found to have been carried out deviating from the approved designs & drawings, the Mayor can impose a fine up to of NRs 2 lakhs and order for the whole or part of the building. Having obtained the instruction from the municipality to demolish a part or whole of unauthorized construction, the Building owner shall immediately carry out its implementation.

Section 20. Building Construction Completion Certificates

20.1. General

The Building Owner shall complete the construction of works of the building as per the approved designs & drawings once the third interim field inspection certificate has been received. The construction shall be complete in all respects up to the highest level of floor. Then the Building Owner shall file an application in the municipality requesting for the final inspection. The sample of the application form requesting the municipality for the final field inspection is shown in the appendix-33.

20.2. Inspection by the Municipality for the Completion of Construction Works

After receiving the request for the final field inspection from the Building Owner, the Technical Desk/ Section of the municipality shall depute a technician to carry out the final field inspection and submit a report on the same. At the time of final field inspection, the technician shall also verify that the Building Owner has constructed the septic tank & the soak pit if there is no sanitary sewer in the vicinity to which house connection can be made. In such case, the completion certificate shall not be issued if the septic tank & the soak pit has not been constructed by the Building Owner. Following are the main points to be checked at the time of final field inspection:

For RCC Buildings:

- Positions of all columns or walls tally with the approved drawings
- Distance from the boundary and centerline of the roads has been maintained up to the roof level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the roof level.
- Masonry works in bricks/ stone for all walls up to the roof level have been done correctly.
- Cantilever projections of slabs at all floor levels are as per the approved drawings and do not overhang in the setback areas.
- Construction of floors have been completed as per the approved designs & drawings.
- The total constructed floor area does not exceed the approved total floor area issued at the time of permanent building permit.
- The total building height above the ground level does not exceed the approved total height of the building.
- The number of basement floors does not exceed the approved number of basement floor construction.
- There is no any unauthorized construction in the land parcel of the Building Owner.
- Maintenance of public infrastructure such as roads, drains, water supply line, etc , if affected during construction, has been completed.

- The building has been painted at least one coat on inside and outside surfaces.

For Masonry Buildings:

- Positions of walls up to the roof level tally with the approved drawings
- Distance from the boundary and centerline of the roads has been maintained up to the roof level as per the approved drawings
- Setback distances on all four sides have been kept as per the approved drawings from the foundation to the roof level.
- Masonry works in bricks/ stone for all walls have been done correctly.
- Cantilever projections of slabs at all floor levels are as per the approved drawings and do not overhang in the setback areas.
- The total constructed floor area does not exceed the approved total floor area issued at the time of permanent building permit.
- The total building height above the ground level does not exceed the approved total height of the building.
- The number of basement floors does not exceed the approved number of basement floor construction.
- There is no any unauthorized construction in the land parcel of the Building Owner.
- Maintenance of public infrastructure such as roads, drains, water supply line, etc., if affected during construction, has been completed.
- The building has been painted at least one coat on inside and outside surfaces.

The checklist to be used by the technician while carrying out the final inspection is shown in the appendix-34.

20.3. Notifications for the correction of construction works and/or drawings

In case the building construction work has been found to have been conducted not as per the building permit issued and also not in consonance with the building By-Laws, then the Builder Owner shall be instructed to demolish the unauthorized portions. In case the building construction work is found to have been done not exactly as per the approved drawings with minor modifications in the internal arrangements only but complies with the approved drawings in general, then the Building owner shall be instructed to submit an amended drawing for approval and then the completion certificate shall be issued.

20.4. Building Construction Completion Certificate

a) Recommendation for the Issue of Building Construction Completion Certificate

After receiving the final field inspection report from the technician, the Technical Desk/ Section shall review that the report is complete in all respects and shows that the construction work has been completed as per the approved designs & drawings. Then the Technical Desk/ Section shall forward a memo to the Executive Desk/ CAO for the approval for issuing the

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completion certificate to the Building Owner. The sample of the memo is given in the appendix-35.

b) Issue of Building Construction Completion Certificate

Having received the recommendation from the Technical Desk/ Section for the issue of the building construction completion certificate, the Executive Desk/ CAO shall review the memo and the supporting documents. If everything is found to be in order, then the Executive Desk/ CAO shall issue the building construction completion certificate in the name of the Building Owner. The sample of the building construction completion certificate is shown in the appendix-36.

Section 21. Miscellaneous

21.1. Partial Completion Certificate

a) General:

In case the Building Owner wants to use the building before the construction of building is fully completed as per the approved design & drawings and wants to get the partial completion certificate, then the Building owner shall apply for Building Construction Partial Completion Certificate. This may be done when the Building owner does not want to construct the upper storeys of the building or when the Building Owner wants to withheld the the construction of upper storeys for some time due to some unfavorable conditions.

b) Requirement for getting Building Construction Partial Completion Certificate:

For getting the building construction partial completion certificate, the construction work shall be completed up to stage so that the building becomes habitable and at least one coat of finishing has been applied on the inside & outside surfaces of the building. The Building owner shall also complete the construction of septic tank & soak pit if there is no city sewer line connection available in the vicinity. Similarly, maintenance of public infrastructure such as roads, drains, water supply line, etc., if affected during construction, shall have been completed.

c) Application for the Inspection for Building Construction Partial Completion:

Before getting the partial completion certificate, the building owner shall apply for the inspection for the partial completion as per the format given in the appendix-41. In the e-BPS system, the Supervision Consultant shall upload the application for the inspection in the online system.

d) Municipality Inspection for the Partial Completion:

After receiving the application for the inspection for partial completion, the Technical Desk/ Section shall depute a technician for carrying put the field inspection. The technician shall then make a field visit to the construction site and verify that the

construction has been completed up to the storey for which the building owner has mentioned in the application form for the inspection for the partial completion.

Following are the main points to be checked at the time of field inspection for the issue of partial completion certificate:

For RCC Buildings:

- Positions of all columns or walls tally with the approved drawings.
- Distance from the boundary and centerline of the roads has been maintained as per the approved drawings up to the storey for which the partial completion certificate is requested.
- Setback distances on all four sides have been kept as per the approved drawings from the foundation up to the storey for which the partial completion certificate is requested.
- Masonry works in bricks/ stone for all walls up to the storey for which the partial completion certificate is requested have been done correctly.
- Cantilever projections of slabs at all floor levels are as per the approved drawings and do not overhang in the setback areas.
- Construction of floors have been completed as per the approved designs & drawings up to the storey for which the partial completion certificate is requested.
- The total constructed floor area does not exceed the approved total floor area issued at the time of permanent building permit.
- The total building height above the ground level, up to the storey for which partial completion is requested, does not exceed the approved height of the building up to the storey.
- The number of basement floors does not exceed the approved number of basement floor construction.
- There is no any unauthorized construction in the land parcel of the Building Owner.
- Maintenance of public infrastructure such as roads, drains, water supply line, etc., if affected during construction, has been completed.
- The building has been painted at least one coat on inside and outside surfaces.

For Masonry Buildings:

- Positions of walls tally with the approved drawings up to the storey for which the partial completion certificate is requested.
- Distance from the boundary and centerline of the roads has been maintained as per the approved drawings up to the storey for which the partial completion certificate is requested.
- Setback distances on all four sides have been kept as per the approved drawings from the foundation up to the storey for which the partial completion certificate is requested.
- Masonry works in bricks/ stone for all walls have been done correctly.

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- Cantilever projections of slabs at all floor levels are as per the approved drawings and do not overhang in the setback areas.
- The total constructed floor area does not exceed the approved total floor area issued at the time of permanent building permit.
- The total building height above the ground level does not exceed the approved total height of the building up to the storey for which the partial completion certificate is requested.
- The number of basement floors does not exceed the approved number of basement floor construction.
- There is no any unauthorized construction in the land parcel of the Building Owner.
- Maintenance of public infrastructure such as roads, drains, water supply line, etc , if affected during construction, has been completed.
- The building has been painted at least one coat on inside and outside surfaces.

The checklist to be used by the technician while carrying out the final inspection during the check for the partial completion is shown in the appendix-42.

a) Notifications for the correction of construction works and/or drawings

At the time of inspection for the issue of building construction partial completion certificate, if the building construction work up to the level for which the Building Owner has requested for the partial completion certificate, has been found to have been conducted not as per the building permit issued and also not in consonance with the building By-Laws, then the Builder Owner shall be instructed to demolish the unauthorized portions. In case the building construction work is found to have been done not exactly as per the approved drawings with minor modifications in the internal arrangements only but complies with the approved drawings in general, then the Building owner shall be instructed to submit an amended drawing for approval and then the partial completion certificate shall be issued.

b) Recommendation for the Issue of Building Construction Completion Certificate

After receiving the field inspection report from the technician, the Technical Desk/ Section shall review that the report is complete in all respects and shows that the construction work has been completed as per the approved designs & drawings up to the level for which the Building Owner has requested for partial completion certificate. Then the Technical Desk/ Section shall forward a memo to the Executive Desk/ CAO for the approval for issuing the partial completion certificate to the Building Owner. The sample of the memo is given in the appendix-43.

c) Issue of Building Construction Partial Completion Certificate

Having received the recommendation from the Technical Desk/ Section for the issue of the building construction partial completion certificate, the Executive Desk/ CAO shall review the memo and the supporting documents. If everything is found to be in order, then the Executive Desk/ CAO shall issue the building construction partial completion certificate in

the name of the Building Owner. The sample of the building construction partial completion certificate is shown in the appendix-44.

21.2. Recommendation to the Utility Agencies

a) General:

Building Owners are required to get either the Building Construction Partial Completion Certificate or the Building Construction Completion Certificate before they can file application for getting recommendation from the municipality for providing connections from utility agencies such as water supply authority, Nepal Electricity Authority. Similarly, the recommendation for selling of properties like land and building and for keeping these properties on mortgage in a bank or a financial institution shall also be provided only if the Building Owner has received full or partial completion certificate of building construction.

b) Recommendation Letter to the Utility Agencies

The format of the recommendation letter provided by the municipality for recommendation to the utility agencies is shown in Appendix-45.

21.2.1. Extension of the Time Period of Building Construction Completion Period

a) General:

The time period within which the Building Owner shall complete the construction of the building is two years or as per the submitted work plan (in case of large or complex building) from the date of issue of permanent building permit from the municipality.

b) Request for the Extension of the Time Period:

In case the Building Owner could not complete the construction of building within a period of two years or within the period shown by the approved work plan from the date of issue of permanent building permit and needs additional period, he/she shall apply for the extension of the construction period by another two years or as per revised work plan but such an application shall be submitted to the municipality before the expiry of the original construction period pursuant to the Clause 38 of the Local Government Operations Act 2074. The sample form of the application for the time extension is given in the appendix-46.

c) Approval for the Extension of the Time Period for the Completion of Building

The application letter from the Building owner is reviewed by the Technical Desk/Section and if it is found in order, the Technical Desk/Section shall forward the application with its recommendation to the Executive Desk/Section. The Executive Desk/Section shall

also review the application and the recommendation and then approve the request for the extension of the time period for the completion of the building by another two years or as per the submitted revised work schedule. The format of the letter notifying the Building Owner about the extension of the time is given in the appendix-47.

d) Additional Fee for the Time Extension:

Pursuant to the Clause 38 sub-clause 3 of the Local Government Operations Act 2074, the Building owners need to pay an additional fee equivalent to the 5 (five) percent of the originally paid building permit fee for getting the time extension.

e) Expiry of the Building Permit

In case the Building Owner fails to get the building construction completed as per the approved designs & drawings within the originally stipulated period of two years and also fails to register for the time extension, then the building permit issued to the Building Owner shall no longer be valid. Similarly, if the Building Owner fails to get the building completed even after the extended time period in case the time extension was awarded after filing the application for the same, then again, the building permit issued to him/her shall no longer be valid. In both the cases, the Building owner shall be required to apply for fresh building permit fulfilling all the requirements as stipulated in this working procedure for a new building permit.

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APPENDICES

LIST OF APPENDICES

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Appendix-1: Application for Registration as a Designer in the Municipality

To.

…….. Municipality

Office of the Municipal Executive

District: ……..

Province: …….

Photograph of the Applicant

Re: <u>Application for enlisting as a Registered Designer in the Municipality</u>

Dear Sir/ Madam,

I/We have been involved in planning, designing & construction of buildings in Nepal and now wish to provide similar services in the sector of **<u>planning & design of buildings</u>** to the interested building owners in the municipality. Pursuant to the Clause 20 of the Building Construction Working Procedure, I/we hereby request for enlisting me/us as the registered designer in the municipality with the following details & supporting documents.

1. Personal Details:

a) In English:

Forename: Middle Name: Surname:

b) In Nepali:

……
……

c) Gender: ☐ Male ☐ Female ☐ Others
d) Date of Birth (in BS): ……/……/…… day/month/year
e) Place of Birth:……Municipality/VDC ……..District ……Province
f) Citizenship: ☐ Nepali ☐ Others (specify):
g) Date of Issue of Citizenship (in BS): ……/……/…… day/month/year
h) Place of issue of Citizenship:
i) Current Address:

……Municipality/VDC …….. District ……Province

j) Permanent Address:

……Municipality/VDC ……. District ……Province

k) Contact number: mobile no. …… Landline no……

l) PAN number: ……..

m) Firm Registration no. (only for consulting firms): ……..

n) Firm Registration Date (only for consulting firms): ……/……/…… day/month/year

2. Academic Qualifications:

Academic Level	Subject (Civil/Arch./Mech./ Elec./etc)	Institution	Country	Completion Year
SLC				
Certificate/Diploma Level				
Bachelor				
Masters				
PhD				

3. Nepal Engineering Council Registration:

NEC Registration No.: ……..

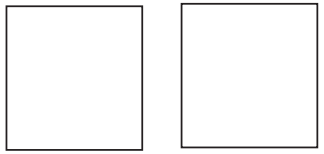
NEC Registration Year: …….. BS

4. Attached Documents:
   a) Copy of Citizenship Certificate- 1 (one) copy
   b) Copy of Nepal Engineering Council Registration Certificate- 1 (one) copy
   c) Copy of Bachelors' Degree Certificate- 1 (one) copy
   d) Copy of PAN Registration- 1 (one) copy
   e) Passport size Photographs (3 copies)
   f) Sample Signature- 1 (one) copy
   g) Copy of Firm Registration Certificate (only for consulting firms)- 1 (one) copy
   h) Copy of VAT Registration Certificate (only for consulting firms) – 1 (one) copy
   i) Copy of Business Registration Certificate (only for consulting firms) - 1
5. Declaration for Authenticity and non-blacklisting

I hereby declare that the above- mentioned details and documents are true and authentic and fully understand that in case of any discrepancy, I will be held fully liable as per the prevailing laws of the country. I further declare that I have not been blacklisted by the municipality in connection with my service as a designer.

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Left Right



……

(Signature of the Applicant)

Name: ……..

Date: ……

Thumb Prints of the Applicant

Appendix-2: Application for the Registration of Masons (Nepali version)

दर्तावाला निर्माणकर्मीमा सूचीकृत हुन आवेदन

श्री ..... नगरपालिका

..... काठमाण्डौं ।

विषय : दर्तावाला निर्माणकर्मीमा सूचीकृत हुन पाऊँ भन्ने बारे ।

म विगत ..... वर्षदेखि भवन निर्माण क्षेत्रमा निर्माणकर्मीको रुपमा कार्यरत रहेको र त्यस नगरपालिका क्षेत्रमा भवन निर्माण गर्न इच्छुक घरधनीहरुलाई दर्तावाला निर्माणकर्मीमा सूचीकृत भई निर्माणकर्मीको सेवा प्रदान गर्न तत्पर रहेको जानकारी गराउँदछु । त्यस नगरपालिकाको भवन निर्माण कार्यविधि, २०७८ को दफा २० बमोजिम तपसीलमा उल्लेखित विवरणहरु पुष्ट्याई गर्ने कागजातहरु संलग्न गरी नगरपालिकामा दर्तावाला निर्माणकर्मीहरुको रुपमा सूचीकृत हुन पाऊँ भनी यो निवेदन पेश गरेको छु ।

तपसील

दर्तावाला निर्माणकर्मीमा सूचीकृत भई निर्माणकर्मीको सेवा प्रदान गर्न इच्छुक व्यक्तिको विवरण	
नाम, थर :	**हालको ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
पत्राचार गर्ने ठेगाना : .....न.पा., ...वडा नं. ..... जिल्ला	**स्थायी ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
मोबाइल नं. :	**टेलिफोन नं. :**
नागरिकता नं. :	**नागरिकता जारी भएको मिति :** ..... साल .....महिना.....गते
नागरिकता जारी गर्ने कार्यालय :	**जन्म मिति :** .....साल .....महिना.....गते
लिङ्ग : ☐ पुरुष ☐ महिला ☐ अन्य	
शैक्षिक योग्यता : ☐ सामान्य साक्षर ☐ प्राथमिक विद्यालय तह ☐ माध्यमिक विद्यालय तह ☐ १०+२ वा सो भन्दा माथि	
निर्माणकार्यको अनुभव : .....वर्ष	**भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको मिति :**
निर्माणमा विज्ञता : ☐ डकर्मी ☐ सिकर्मी ☐ नकर्मी अन्य :	
संलग्न कागजातहरु :	
१. नेपाली नागरिकताको प्रमाणपत्रको प्रतिलिपि २. शैक्षिक योग्यताको प्रमाणपत्रको प्रतिलिपि ३. भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको प्रमाणपत्रको प्रतिलिपि ४. पासपोर्ट साइजको फोटो २ (दुई) प्रति	
माथि लेखिएको व्यहोरा ठिक साँचो हो, फरक परेमा म आफै जवाफदेही हुनेछु र अन्यथा भएमा कानून अनुसारको सजाय भोग्न तयार छु ।	
निवेदन दिएको मिति : .....साल .....महिना.....गते	**निवेदकको नाम, थर :** ..... हस्ताक्षर :

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निवेदकको औंठा छाप दायाँ बायाँ	**निवेदकको तस्वीर**

Appendix-3 Application for the Registration of Contractors (Nepali version)

दर्तावाला निर्माण व्यवसायीमा सूचीकृत हुन आवेदन

श्री ..... नगरपालिका

..... जिल्ला,

.....प्रदेश ।

विषय : दर्तावाला निर्माण व्यवसायीमा सूचीकृत हुन पाऊँ भन्ने बारे ।

म/हामी विगत ..... वर्षदेखि भवन निर्माण क्षेत्रमा निर्माणकर्मीको रुपमा कार्यरत रहेको र त्यस नगरपालिका क्षेत्रमा भवन निर्माण गर्न इच्छुक घरधनीहरुलाई दर्तावाला निर्माण व्यवसायीमा सूचीकृत भई निर्माण व्यवसायीको सेवा प्रदान गर्न तत्पर रहेको जानकारी गराउँदछु/छौं । त्यस नगरपालिकाको भवन निर्माण कार्यविधि, २०७८ को दफा ४.३ बमोजिम तपसीलमा उल्लेखित विवरणहरु पुष्ट्याई गर्ने कागजातहरु संलग्न गरी नगरपालिकामा दर्तावाला निर्माण व्यवसायीको रुपमा सूचीकृत हुन पाऊँ भनी यो निवेदन पेश गरेको छु/छौं ।

तपसील

दर्तावाला निर्माण व्यवसायीमा सूचीकृत भई सेवा प्रदान गर्न इच्छुक व्यक्ति/ फर्मको प्रमुखको विवरण	
नाम, थर :	**हालको ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
पत्राचार गर्ने ठेगाना : .....न.पा., ...वडा नं. ..... जिल्ला	**स्थायी ठेगाना :** .....न.पा., ...वडा नं. ..... जिल्ला
मोबाइल नं. :	**टेलिफोन नं. :**
नागरिकता नं. :	**नागरिकता जारी भएको मिति :** ..... साल .....महिना.....गते
नागरिकता जारी गर्ने कार्यालय :	**जन्म मिति :** .....साल .....महिना.....गते
लिङ्ग : ☐ पुरुष ☐ महिला ☐ अन्य	
शैक्षिक योग्यता : ☐ सामान्य साक्षर ☐ प्राथमिक विद्यालय तह ☐ माध्यमिक विद्यालय तह ☐ १०+२ वा सो भन्दा माथि	
निर्माणकार्यको अनुभव : .....वर्ष	**भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको मिति :** .....साल .....महिना.....गते
निर्माण व्यवसायी व्यक्ति भएको हकमा	
निर्माणमा विज्ञता (व्यक्तिको हकमा): ☐ डकर्मी ☐ सिकर्मी ☐ नकर्मी अन्य :	**भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको मिति :**
निर्माण व्यवसायी फर्मको रुपमा भएको हकमा :	
फर्मको नाम : फर्मको कम्पनी दर्ता भएको मिति : ..... साल .....महिना .....गत फर्मको मूल्य अभिवृद्धि कर (VAT) दर्ता भएको मिति : ..... साल .....महिना .....गत नगरपालिकामा व्यवसाय दर्ता भएको मिति :..... साल .....महिना .....गत निर्माण व्यवसाय ऐन अनुसार इजाजत प्राप्त श्रेणी : ☐ क ☐ ख ☐ ग ☐ घ निर्माण व्यवसाय ऐन अनुसार इजाजत प्राप्त मिति :..... साल .....महिना .....गते	
निर्माण व्यवसायी व्यक्ति वा फर्मसंग भएको भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएका निर्माणकर्मीहरुको विवरण :	
१. तालिम प्राप्त निर्माणकर्मीको नाम, थर (१) :.....	

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निजले तालिम सम्पन्न गरेको मिति :..... साल .....महिना .....गते २. तालिम प्राप्त निर्माणकर्मीको नाम (२) :..... निजले तालिम सम्पन्न गरेको मिति :..... साल .....महिना .....गते
संलग्न कागजातहरु :
१. नेपाली नागरिकताको प्रमाणपत्रको प्रतिलिपि २. शैक्षिक योग्यताको प्रमाणपत्रको प्रतिलिपि ३. भूकम्प प्रतिरोधी भवन निर्माण सम्बन्धी तालिम लिएको प्रमाणपत्रको प्रतिलिपि ४. पासपोर्ट साइजको फोटो २ (दुई) प्रति ५. फर्मको हकमा कम्पनी दर्ता प्रमाणपत्रको प्रतिलिपि ६. फर्मको हकमा मूल्य अभिवृद्धि कर (VAT) दर्ता प्रमाणपत्रको प्रतिलिपि ७. फर्मको हकमा निर्माण व्यवसाय ऐन अनुसार इजाजत प्राप्त प्रमाणपत्रको प्रतिलिपि ८. फर्मको हकमा नगरपालिकामा व्यवसाय दर्ता प्रमाणपत्रको प्रतिलिपि
माथि लेखिएको व्यहोरा ठिक साँचो हो, फरक परेमा म आफै जवाफदेही हुनेछु र अन्यथा भएमा कानून अनुसारको सजाय भोग्न तयार छु ।

निवेदन दिएको मिति : .....साल .....महिना.....गते	**निवेदकको नाम, थर :** ..... हस्ताक्षर :
निवेदकको औठा छाप बायाँ दायाँ	**निवेदकको तस्वीर**

Appendix-4: Application Form for the Registration of Supervision Consultants

To.

…….. Municipality/ Rural Municipality

District: ……..

Province: …….

Photograph of the Applicant

Re: Application for enlisting as a Registered Supervision Consultant in the Municipality

Dear Sir/ Madam,

I/We have been involved in planning, designing & construction of buildings in Nepal and now wish to provide similar services in the sector of **Construction Supervision of Buildings** to the interested building owners in the municipality. Pursuant to the Clause 20 of the Building Construction Working Procedure, I/we hereby request for enlisting me/us as the registered designer in the municipality with the following details & supporting documents.

1. Personal Details:

a) In English:

Forename: Middle Name: Surname:

b) In Nepali:

……

c) Gender: ☐ Male ☐ Female ☐ Others

d) Date of Birth (in BS): ……/……/…… day/month/year

e) Place of Birth:……Municipality/VDC ……District ……Province

f) Citizenship: ☐ Nepali ☐ Others (specify):

g) Date of Issue of Citizenship (in BS): ……/……/…… day/month/year

h) Place of issue of Citizenship:

i) Current Address:

……Municipality/VDC …….. District ……Province

j) Permanent Address:

……Municipality/VDC …….. District ……Province

k) Contact number: mobile no. …… Landline no……

l) PAN number: ……..

m) Firm Registration no. (only for consulting firms): ……..

n) Firm Registration Date (only for consulting firms): ……/……/…… day/month/year

2. Academic Qualifications:

Academic Level	Subject (Civil/Arch./Mech./ Elec./etc)	Institution	Country	Completion Year
SLC				
Certificate/Diploma Level				
Bachelor				
Masters				
PhD				

3. Nepal Engineering Council Registration (mandatory for engineers/ architects):

NEC Registration No.: ……

NEC Registration Year: …….. BS

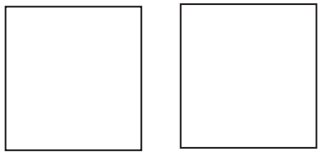
4. Attached Documents:
   a) Copy of Citizenship Certificate- 1 (one) copy
   b) Copy of Nepal Engineering Council Registration Certificate- 1 (one) copy
   c) Copy of Bachelors' Degree Certificate- 1 (one) copy
   d) Copy of PAN Registration- 1 (one) copy
   e) Passport size Photographs (3 copies)
   f) Sample Signature- 1 (one) copy
   g) Copy of Firm Registration Certificate (only for consulting firms)- 1 (one) copy
   h) Copy of VAT Registration Certificate (only for consulting firms) – 1 (one) copy
   i) Copy of Business Registration Certificate (only for consulting firms) – 1

5. Declaration for Authenticity and non-blacklisting

I hereby declare that the above- mentioned details and documents are true and authentic and fully understand that in case of any discrepancy, I will be held fully liable as per the prevailing laws of the country. I further declare that I have not been blacklisted by the municipality in connection with my service as a designer.

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Left Right



Thumb Prints of the Applicant

……

(Signature of the Applicant)

Name: ……..

Date: ……

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Appendix-5: Documents Required for application submission

a) For New Construction

List of the documents to be submitted for getting permit for new construction

S.N.	Descriptions of the documents required	No. of copies	Remarks
1.	Drawings showing elevations, sections, plans, details and site plans of the building in the prescribed format with the signature of the Designer & the Building Owner	3 copies	Details are given in section 13 above.
2.	Structural design report (for Class A & Class B Buildings only)	1 copy	Details are given in section 14 above.
3.	Electrical drawings and details (for Class A & Class B Buildings only)	3 copies	Details are given in section 18 above.
4.	Sanitary drawings and details (for Class A & Class B Buildings only)	3 copies	Details are given in section 17 above.
5.	Bar bending schedule of reinforcement (for Class A & Class B Buildings only)	2 copies	
6.	Attested copies of the land ownership certificate	1 copy	Copies of land ownership certificate of all land plots in which the building construction is proposed.
7.	Copy of the receipt showing payment of land tax in case there is no any building in the land parcel and copy of the receipt of the payment of integrated property tax in case there is already other building in the land parcel or new storey is to be added to the existing building of the current fiscal year	1 copy	
8.	Attested copy of the citizenship certificate of the building owner	1 copy	
9.	Copy of the cadastral map showing the land plot number	1 copy	
10.	Copy of the municipality registration certificate of the designer	1 copy	
11.	Passport size photo of the applicant	1 copy	
12.	Copy of the land registration form and land transfer paper	1 copy	
13.	Copy of the certificate of the registered masons or contractor along with willingness paper	1 copy	
14.	Copies of the certificates of registered electricians & plumbers	1 copy each	
15.	If the applicant is an authorized person but not the applicant, copy of the authorization letter from the builder owner to the authorized person, Such authorization must have been signed by the ward chairperson or three gentlemen/ladies as witnesses. Copies of citizenship certificates of the building owner and the authorized person shall also be submitted.	1 copy each	
16.	If a representative has been assigned by the building owner for processing the building permit, a copy of the citizenship certificate of the representative shall also be submitted.	1 copy	
17.	If the access road to the building site has not been shown in the cadastral map, recommendation letter from the Ward Office verifying the existence of the access road in the field. If the land parcel is a Guthi land, recommendation letter from Guthi Sansthan verifying the existence of the access road.		

18.	If the land parcel is a Guthi land, permission letter from the Guthi Sansthan for the construction of the building. Also, if the land owner of such land parcel wants to construct the building, permission letter from the Mohi. If the Mohi wants to construct the building, permission letter from the land owner is required.		
19.	If the land parcel is in mortgage in some financial institution, authorization letter from the institution for the construction of the building.		
20.	For the construction of institutional/ commercial building, following additional documents are required to be submitted: a) Copy of the Company Registration Certificate b) Copy of the VAT/PAN Registration Certificate c) Copy of the Memorandum of Association & Articles of Association of the Company d) Copy of the Business Registration Certificate in the Municipality e) Copy of the Minute of Meeting for the Construction of the Building		

b) For the Addition of Storeys to the Existing Building

List of the documents to be submitted for getting permit for the addition of new storeys or new blocks

S.N.	Descriptions of the documents required	No. of copies
1.	All documents required for getting building permit for new construction	3 copies
2.	Copies of the approved drawings and details of old building obtained after getting the building permit. Such drawings shall include all floor plans, all elevations, sectional elevations, site plans and structural detailed drawings.	1 copy
3.	Building construction completion certificate/ partial completion certificate	1 copy
4.	Receipt or voucher showing payment of the building & land tax to the municipality till this fiscal year	1 copy
5.	Photographs showing existing condition of the old building	1 copy

c) For Reconstruction after Demolition of Existing Building

- Documents required are the same as the ones required for new construction

d) For Repair/ Maintenance of Existing Building

List of the Documents to be submitted for getting permit for the Repair/ Maintenance of the Existing Building

S.N.	Descriptions of the documents required	No. of copies

1.	Copy of the Land Ownership Certificate	1 copy
2.	Receipt or voucher showing payment of the building & land tax to the municipality till this fiscal year	1 copy
3.	Copy of the Citizenship Certificate of the Building Owner	1 copy
4.	Printed copy of the Cadastral Map	1 copy
5.	Photograph showing the Building to be repaired	1 copy
6.	Recommendation letter from the Ward Office for carrying out the Repair	1 copy
7.	Recommendation letter from the Department of Archaeology in case the building is located in heritage zone or sub-zone.	1 copy

e) Alteration of Façade or Changing of Roof

List of the documents to be submitted for getting permit for the alteration of the façade of the existing building or for changing the roof

S.N.	Descriptions of the documents required	No. of copies
1.	Plans & elevations of the existing façade or roof along with the plans & elevations of the proposed façade or roof.	2 copies

f) Transfer of Building Permit in the Name of New Owner

List of the documents to be submitted for the transfer of the building permit in the name of new building owner

S.N.	Descriptions of the documents required	No. of copies
1.	Application letter requesting transfer of the building permit in the name of the new owner	1 copy
2.	Copy of the land ownership certificate	1 copy
3.	Copy of the certificate issued by the land revenue office showing transfer of the ownership of the property	1 copy
4.	Original copies of the building permit, designs and drawings issued by the municipality in the name of the original owner	3 copies
5.	Copy of the receipt showing payment of the land tax & property tax up to the current fiscal year.	1 copy
6.	Photograph of the building already constructed.	1 copy
5.	Any other supporting documents requested by the municipality	1 copy

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Appendix-6 Application Form for Building Permit

6(a) Details to be Filled-in by the Building Owner

The Building Owner has to fill-in the following details and then put the signature in the main application form:

S.N.	Title of the Detail	Description of the Details
1.	Details of Land Owner	• Name • Address • Citizenship no.
2.	Details of the Building Owner	• Name • Address • Citizenship no. • Name of Father/ Husband/ Wife
3.	Details of the Site	• Ward no., • Locality • previous ward no. • name of the access road • name of nearest main road • surface type of the access road
4.	Cadastral Information of the land Plot	• Sheet no. of cadastral map • parcel no. • ownership type • plot area as per land ownership certificate • names of the owners & parcel numbers of land abutting to the land of the building owner
5.	Details of Proposed Construction	• Occupancy type-residential, commercial, others • Proposed construction- new construction, façade change, addition of storeys, boundary wall, roof change, addition of building blocks, new construction after demolition of old building • Date of issue of Building Permit received earlier
6.	Details of Sewerage System	• Septic Tank • Soak Pit • city sewer line
7.	Details of Solid Waste Disposal	• Municipality container • own land • others
8.	Details of Water Suply System	• City water supply line • Tube well • Dug well • others
9.	Details of Electricity Supply	• Distance from the nearest electricity line, • whether HT line is going over the land plot

10.	Applicant's Signature, Contact Address, Phone	• Signature • Name • Age • Address • phone no.
11.	Signature of the Person who brought the application for registration	• Signature • Name • Age • Address • phone no.

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6(b) Details to be Filled-in by the Designer

S.N.	Title of the Detail	Description of the Details
1.	Details of Land Owner	• Name • Address • Citizenship no.
2.	Details of the Building Owner	• Name • Address • Citizenship no. • Name of Father/ Husband/ Wife
3.	Land Use Zone	
4.	Type of Construction	
5.	Plot no. of the Land Parcel in which the construction is proposed	
6.	Area of the land parcel as per the land ownership certificate (in sq. ft.)	
7.	Actual area of the land parcel as per the field measurement (in sq. ft.)	
8.	Plinth area of the proposed building (in sq. ft.)	
9.	Ground coverage of the proposed building (in percentage)	

10.	Details of floor areas of the new construction and existing building			
	Storey	Area of the proposed building (sq. ft./ sq. m)	Area of the existing building (sq. ft/ sq. m)	Total floor area (in sq. ft/ sq. m)
i)	Basement			
ii)	Ground Floor			
iii)	First Floor			
iv)	Second Floor			
v)	Third Floor			
vi)	Fourth Floor			
vii)	Fifth Floor			
viii)	Sixth Floor			
	Total			

11.	Area covered by other constructions like compound wall, shade, etc	Compound wall: Shade:
12.	Ground coverage after the new construction including existing buildings and other new construction	In sq. ft.: In percentage:
13.	Permissible Ground Coverage	In sq. ft.: In percentage:
14.	Number of storeys in the proposed building	☐ basement ☐ ground floor ☐ first floor ☐ second floor ☐ third floor ☐ fourth floor ☐ fifth floor ☐ sixth floor ☐……..

15.	Ceiling height of each storey in the proposed building	Storey	Height	Unit in m/ ft
		Basement		
		Ground		
		First		
		Second		
		Third		
		Fourth		
		Fifth		
		Sixth		

16.	Total height of the building (in m/ ft):	
17.	Type of Structure	☐ Temporary ☐ Permanent ☐ Reinforced Concrete Framed ☐ Load Bearing (brick masonry) ☐ Load Bearing (stone masonry) ☐ Steel Framed ☐ Timber Framed ☐ others : ……
18.	Type of Mortar used in masonry wall	☐ cement sand mortar ☐ mud mortar ☐ lime surkhi mortar ☐ other: ……..
19.	Type of Roofing Material	☐ RCC ☐ RBC ☐ Tile ☐ CGI Sheet ☐ Thatched Roof ☐ Others: …….
20.	Right-of-way (ROW) of the roads abutting to the land parcel in metre/ feet	Frontside: Backside: Left side Right side:

21.	Setback distance from the road to the proposed building (in m/ feet)						
	Side	distance from the centre line of the road		distance from the edge of the existing road		Distance from the edge of the ROW	
		actual	minimum as per By-Laws	actual	minimum as per By-Laws	actual	minimum as per By-Laws
	Front						
	Back						
	Left						
	Right						

22.	Distance between outer face/wall and boundary of the plot				
	Facade of the building	Road existing or not	Door/window opening existing or not	Minimum required distance between the outer face of the building and plot boundary	Existing distance between the outer face of the building and plot boundary
	North				
	South				
	East				
	West				

23.	Distance from the bank of the river/ canal/ public land to the face of the building (if applicable)	
	Permissible distance from the bank of the river/stream/canal/public land to the face of the building (in metre/feet)	
	Actual distance from the bank of the river/stream/canal/public land to the face of the building (in metre/feet)	

24.	Length of cantilever projection or chhajja beyond the face of the building (in m/ feet)				
		Front side	Back side	Left side	Right side
	Proposed				
	Permissible				

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25.	Distance between the edge of the high tension line and the building (if applicable)	
	Permissible distance (in m or feet)	
	Proposed distance (in m or feet)	
26.	Declaration from the designer: I have prepared the designs and drawings after studying the applicable building By-Laws, building code & other prevailing laws. I shall be fully liable if the designs & drawings are found to be not compliant as per specified By-Laws, building codes & prevailing laws. Signature: Name: Designation: Educational qualification: Name of the consulting firm (if applicable): Designer registration no: Stamp of the firm: Date:	Declaration from the building owner: I/we fully agree to undertake construction of the building as per the approved designs & drawings in full compliance to the technical details described above, building By-Laws of the municipality and building code. I shall be fully liable as per the prevailing laws in case the construction is found to be done in violation of the By-Laws, building code and encroaching public land. Signature: Name: Address: Date:

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Appendix-7: Affidavit Form to be filled-in by the Building Owner

…….. Municipality

……

Re: Submission of drawing / design as per building By-Laws and building code

I / we have submitted this building permit application along with the design & drawings, technical check list and other necessary documents for the proposed construction of a building in ……..Municipality, located at ..... ward no…… plot no. ……having area ……..

I/we are responsible for all the risks posed by the lack in technical design, seismic design or construction safety. I /we will get design by the registered designer, building constructed by the registered contractor and construction supervision done from the registered supervision consultant whose names are attached herewith in the application. I will abide by the instructions issued by the municipality from time to time and will be present in the municipality office whenever necessary.

House Owner's Name: ……

Address: ……..

Phone No: ……..

Signature: ……

Date:

Right Left

Appendix-8: Affidavit Form to be filled-in by the Structural Designer

…….. Municipality

……

Re: Declaration on the preparation of structural designs & drawings as per the Nepal National Building Code.

I /We hereby certify that the structural design and the preparation of structural drawings & details of the building proposed to be constructed by Mr/Mrs/Ms …….. located in …….. Municipality, Ward no. ……, plot no. …… with the plot area of ……has been done by me/ us. I /we have prepared the designs & drawings in strict compliance to the professional practice & Nepal National Building Code (NNBC) and also following earthquake resistant building design principles . The technical details on the structural designs described in the application form are as per the designs & drawings prepared by me/us. I/we shall be held fully liable in case the structural designs & the related drawings are found to be not in compliance with the National Building Code of Nepal.

Designer's Name/company name ……

Designation: ……

Educational Qualification: ……

Designer Registration no in the municipality: ……

Contact no: ……

Nepal Engineering Council Registration no.: ……

Address: ……

Signature: ……

Date: ……..

Name of the Building Owner:

Address:

Contact no.:

Signature:

Date:

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Appendix-9: Affidavit Form to be filled-in by the Designer (Architectural Part)

…….. Municipality

……

Re: Declaration on the preparation of architectural designs & drawings as per the building By-Laws of the municipality.

I /We hereby certify that the planning & architectural design of the building proposed to be constructed by Mr/Mrs/Ms …….. located in …….. Municipality, Ward no. ……, plot no. …… with the plot area of ……has been done by me/ us. I /we have prepared the designs & drawings in strict compliance to the professional practice & buildings By-Laws of the municipality. The technical details described in the application form are as per the designs & drawings prepared by me/us. I/we shall be held fully liable in case the designs & drawings are found to be not in compliance with the building By-Laws.

Designer's Name/company name ……

Designation: ……

Educational Qualification: ……

Designer Registration no in the municipality: ……

Contact no: ……

Nepal Engineering Council Registration no.: ……

Address: ……

Signature: ……

Date: ……..

Name of the Building Owner:

Address:

Contact no.:

Signature:

Appendix-10: Affidavit Form to be filled-in by the Supervision Consultant

…….. Municipality

……

Re: Declaration on carrying out the Construction Supervision Works of the Building as per the Approved Designs & Drawings from the municipality.

I /We hereby certify that the construction supervision works of the building proposed to be constructed by Mr/Mrs/Ms …….. located in …….. Municipality, Ward no. ……, plot no. …… with the plot area of ……shall be done by me/ us as per the agreement signed with the Building Owner by me/us. I /we hereby pledge that the construction supervision works shall be carried out in strict adherence to the professional practice conforming to the Building Code & buildings By-Laws as per the approved designs & drawings from the municipality. I/we shall submit the Supervision Report at the frequency mentioned in the Building Construction Working Procedure (BCWP). I/we shall be held fully liable in case any instructions are issued from my/our side to the Building Owner and the Contractor which are found to be not in compliance with the building By-Laws & the Building Code. I/we fully understand that the municipality may take actions against me/us as per the BCWP and other prevailing laws in the event of unprofessional & unethical activity from my/our side.

Supervision Consultant's Name/company name

……

Designation: ……

Educational Qualification: ……

Supervision Consultant Registration no in the municipality: ……

Contact no: ……

Nepal Engineering Council Registration no.: ……

Address: ……

Signature: ……

Date: ……..

Name of the Building Owner:

Address:

Contact no.:

Signature:

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Appendix-11: Authorization Letter

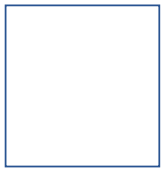
Date: ……

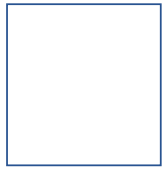
(Appointment of Authorized Representative)

I/we residing in …….. district …….. Metropolitan/ sub-metropolitan city/ municipality/ rural municipality, ward no. …… state that I/ we need to submit the application document for the construction of a building in the land parcel with parcel no. ……., with area of the plot …….. located at previous ward no. ……., present ward no. ……., …….. Metropolitan/ sub-metropolitan city/ municipality/ rural municipality and further state that I/we are unable to be physically present for the submission of the application document as well as to be present in other matters pertaining to the building permit process. I/ we declare that I/we have therefore given full authorization to Mr./Mrs/Ms. ……., age …….. years, who resides in …… metropolitan city/ municipality/ rural municipality, ward no. …… as our legal representative for the submission of the application document for getting the building permit from the municipality. The authorized person shall respond on our behalf to any queries or complaints pertaining to the building permit process. I/we shall accept the court decision in case any complaint is filed against the building construction and shall bear the punishment or pay any penalty as decided by the court. I /we shall also make payment against any fine, deposit, court fee, etc as per the court order. In case such payments are not made on our behalf, I/we fully agree that this authorization letter is cancelled and building permit process is carried on as per the prevailing laws. This authorization letter has been issued by I/ we in full agreement to Mr./Mrs./Ms. …… in presences of witnesses whose signature is affixed below in …… metropolitan city/ municipality/ rural municipality.

…….. Year ……..Month …….. Day

Signature: ……





Right Left

Witnesses:

1) Mr./Mrs/Ms. …… Signature: ……

2) Mr./Mrs/Ms. …… Signature: ……
3) Mr./Mrs/Ms. …… Signature: ……

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Appendix-12: Agreement Letter from the other Land Owner for Building Construction

Letter of Agreement issued by the Owner of the Land Parcel

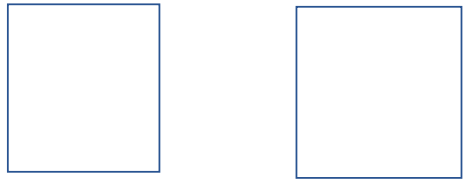
for the Construction of Building

(to be issued when the Building Owner is not the owner of the Land Parcel in which the building construction is proposed by the Building Owner and for which building permit is being sought by the Building Owner from the municipality)

Having received a request for issuing an agreement letter from Mr./Mrs./ Ms. …….. of age …….. years, who resides in …….. municipality, ward no. ……, …….. locality and who wishes to file an application to the municipality for getting building permit for the construction of building/ shade/ walls/ road in a land parcel with land parcel no. ……., cadastral sheet no. …… registered in my/our name and which is located at ……. District, ……. Municipality/ rural municipality, previous ward no. ……, current ward no. ……, I/we of age …… years residing in …….. district, …… municipality, previous ward no. ……., current ward no. ……., agree to issue this agreement letter in his/her name. I/we authorize him/her for the construction of building/shade/walls/road in my land parcel. I will not raise any objection in this regard stating that he/she is not authorized for such construction. I/we hereby grant permission to him/ her with my full knowledge and faith stating that in case any objection is raised from my/our side, the objection shall be nullified on the basis of this agreement paper.

Dated …… Year …….. month …… day .

Signature by the authorizing person:



Right Left

Witnesses:

1. Mr./ Mrs./ Ms. ……., signature: ……..

2. Mr./ Mrs./ Ms. ……., signature: ……..
3. Mr./ Mrs./ Ms. ……., signature: ……..

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Appendix-13: Provisions of EPR 2077 on BES/IEE/EIA

Sector: Housing, Building, Settlement Development & Urban Development

Category	Annex-1	Annex-2	Annex-3
	Concise Environmental Study	Initial Environmental Examination	Environmental Impact Assessment
1	Construction of Buildings of height from 20 to 30 metres	Construction of Buildings of height from 30 to 45 metres	Construction of Buildings having height more 45 metres
2	Construction of Buildings of Residential, Commercial or Residential+Commercial Mixed Use Building with built-up area or floor area equal to 3000 to 5000 sq.m.	Construction of Buildings of Residential, Commercial or Residential+Commercial Mixed Use Building with built-up area or floor area equal to 5000 to 10000 sq.m.	Construction of Buildings of Residential, Commercial or Residential+Commercial Mixed Use Building with built-up area or floor area more than 10000 sq.m.
3	Construction of Cinema Hall, Theatre, Public Building, Stadium, Concert Hall or Sports Complex in which 500 to 1000 people enter or leave at once.	Construction of Cinema Hall, Theatre, Public Building, Stadium, Concert Hall or Sports Complex in which 1000 to 2000 people enter or leave at once.	Construction of Cinema Hall, Theatre, Public Building, Stadium, Concert Hall or Sports Complex in which more than 2000 people enter or leave at once.
4	Land Development Project having area 5 to 10 hectares.	Land Development Project having area 10 to 100 hectares.	Land Development Project having area more than 100 hectares.
5	Hard Surface Pavement construction of area from 1 to 5 hectares for Dry Port, Bus Park, Parking Lot, etc.	Hard Surface Pavement construction of more than 5 hectares in area for Dry Port, Bus Park, Parking Lot, etc.	
6	Construction & Operation of Buildings in which 5000 to 10000 litres of water is daily withdrawn from underground sources is consumed.	Construction & Operation of Buildings in which 10000 to 20000 litres of water is daily withdrawn from underground sources is consumed.	Construction & Operation of Buildings in which more than 20000 litres of water is daily withdrawn from underground sources is consumed.
7		Settlement Development in 1 to 5 hectares of land.	Settlement Development in more than 5 hectares of land.
8		Site Development Works with excavation and earth filling of volume more than 20000 cu. m.	
9			Urbanization as per prevailing laws on land use.

Appendix-14: Checklist for Completeness of Required Documents at the Registration Desk

a) New Building Construction

S.N.	Descriptions of the documents required	No. of copies	Submitted	
			Yes	No
A.	**Legal Documents to be submitted by the Building Owner**			.
1.	Attested copies of the land ownership certificate	1 copy		
2.	Copy of the receipt showing payment of land tax in case there is no any building in the land parcel and copy of the receipt of the payment of integrated property tax in case there is already other building in the land parcel or new storey is to be added to the existing building of the current fiscal year	1 copy		
3.	Attested copy of the citizenship certificate of the building owner	1 copy		
4.	Copy of the cadastral map showing the land plot number	1 copy		
5.	Passport size photo of the applicant	1 copy		
6.	Copy of the land registration form and land transfer paper	1 copy		
7.	Copy of the Contract Paper between the Building Owner & the Registered Designer	1 copy		
8.	Copy of the Contract Paper between the Building Owner & the Registered Masons/ Contractor	1 copy		
9.	Copy of the Contract Paper between the Building Owner & the Registered Supervision Consultant	1 copy		
10.	Copy of the certificate of the trained masons available with the Contractor along with willingness paper	1 copy		
11.	If the applicant is an authorized person but not the applicant, copy of the authorization letter from the builder owner to the authorized person, such authorization must have been signed by the ward chairperson or three gentlemen/ladies as witnesses. Copies of citizenship certificates of the building owner and the authorized person shall also be submitted.	1 copy each		
12.	If a representative has been assigned by the building owner for processing the building permit, a copy of the citizenship certificate of the representative shall also be submitted.	1 copy		
13.	If the access road to the building site has not been shown in the cadastral map, recommendation letter from the Ward Office verifying the existence of the access road in the field. If the land parcel is a Guthi land, recommendation letter from Guthi Sansthan verifying the existence of the access road.	1 copy		
14.	If the land parcel is a Guthi land, permission letter from the Guthi Sansthan for the construction of the building. Also, if the land owner of such land parcel wants to construct the building, permission letter from the Mohi. If the Mohi wants to construct the building, permission letter from the land owner is required.	1 copy		
15.	If the land parcel is in mortgage in some financial institution, authorization letter from the institution for the construction of the building.	1 copy		

16.	For the construction of institutional/ commercial building, following additional documents are required to be submitted: a) Copy of the Company Registration Certificate b) Copy of the VAT/PAN Registration Certificate c) Copy of the Memorandum of Association & Articles of Association of the Company d) Copy of the Business Registration Certificate in the Municipality e) Copy of the Minute of Meeting for the Construction of the Building	1 copy each		
B.	**Legal Documents to be submitted by the Designer**			
1.	Copy of the municipality registration certificate of the Designer	1 copy		
2.	Copy of the municipality registration certificate of the Masons/ Contractor	1 copy		
3.	Copy of the municipality registration certificate of the Supervision Consultant	1 copy		
C.	**Technical Documents to be submitted by the Designer**			
1.	Architectural Drawings showing elevations, sections, plans, details and site plans of the building in the prescribed format with the signature of the Designer & the Building Owner	3 copies		
2.	Structural drawings (for Class A & Class B Buildings only) with the signature of the Designer & the Building Owner	3 copies		
3.	Electrical drawings and details (for Class A & Class B Buildings only) with the signature of the Designer & the Building Owner	3 copies		
4.	Sanitary drawings and details (for Class A & Class B Buildings only) with the signature of the Designer & the Building Owner	3 copies		
5.	Bar bending schedule of reinforcement (for Class A & Class B Buildings only) with the signature of the Designer & the Building Owner	2 copies		
6.	Structural Design Report (for Class A & Class B Buildings only)	1 copy		
7.	Soft Copy of Structural Analysis File (for Class A & Class B Buildings only)	1 copy		
8.	Geo-technical Investigation Report (for important buildings and buildings with more than 17 m in height or more than 5 storeys for Class A & Class B Buildings only)	1 copy		
D.	**Forms to be Filled-in by the Building Owner**			
1.	Application Form for Building Permit	1 copy		
E.	**Forms to be Filled-in by the Designers**			
1.	Detail Form on Building By-Laws & other Details	1 copy		
2.	Affidavit Form by the Architect for Compliance of Building By-Laws	1 copy		
3.	Affidavit Form by the Structural Engineer for Compliance of National Building Code	1 copy		
4.	Affidavit Form by the Sanitary Engineer for Compliance of National Building Code	1 copy		

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5.	Affidavit Form by the Electrical Engineer for Compliance of National Building Code	1 copy		

b) For the Addition of Storeys to the Existing Building

Checklist for the Completeness of the documents to be submitted for getting permit for the addition of new storeys or new blocks

S.N.	Descriptions of the documents required	No. of copies	submitted	
			Yes	No
1.	All documents required for getting building permit for new construction	3 copies		
2.	Copies of the approved drawings and details of old building obtained after getting the building permit. Such drawings shall include all floor plans, all elevations, sectional elevations, site plans and structural detailed drawings.	1 copy		
3.	Building construction completion certificate/ partial completion certificate	1 copy		
4.	Receipt or voucher showing payment of the building & land tax to the municipality till this fiscal year	1 copy		
5.	Photographs showing existing condition of the old building	1 copy		

c) For Reconstruction after Demolition of Existing Building

- Documents required are the same as the ones required for new construction

d) For Repair/ Maintenance of Existing Building

List of the Documents to be submitted for getting permit for the Repair/ Maintenance of the Existing Building

S.N.	Descriptions of the documents required	No. of copies	submitted	
			Yes	No
1.	Copy of the Land Ownership Certificate	1 copy		
2.	Receipt or voucher showing payment of the building & land tax to the municipality till this fiscal year	1 copy		
3.	Copy of the Citizenship Certificate of the Building Owner	1 copy		
4.	Printed copy of the Cadastral Map	1 copy		
5.	Photograph showing the Building to be repaired	1 copy		
6.	Recommendation letter from the Ward Office for carrying out the Repair	1 copy		

7.	Recommendation letter from the Department of Archaeology in case the building is located in heritage zone or sub-zone.	1 copy		

e) Alteration of the façade of the existing building or for changing the roof

List of the documents to be submitted for getting permit for the alteration of the façade of the existing building or for changing the roof

S.N.	Descriptions of the documents required	No. of copies	submitted	
			Yes	No
1.	Plans & elevations of the existing façade or roof along with the plans & elevations of the proposed façade or roof.	3 copies		

f) Transfer of Building Permit in the Name of New Owner

List of the documents to be submitted for the transfer of the building permit in the name of new building owner

S.N.	Descriptions of the documents required	No. of copies	Submitted	
			Yes	No
1.	Application letter requesting transfer of the building permit in the name of the new owner	1 copy		
2.	Copy of the land ownership certificate	1 copy		
3.	Copy of the certificate issued by the land revenue office showing transfer of the ownership of the property	1 copy		
4.	Original copies of the building permit, designs and drawings issued by the municipality in the name of the original owner	3 copies		
5.	Copy of the receipt showing payment of the land tax & property tax up to the current fiscal year.	1 copy		
6.	Photograph of the building already constructed.	1 copy		
5.	Any other supporting documents requested by the municipality	1 copy		

g)

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Appendix-15: Pro-forma of 15 Days' Notice for filing Complaint

…….. **Municipality**

Office of the Municipal Executive

……..

…….. **No. Ward Office**

Notice issued by Ward no. … Office for Registering Complaint

within 15 Days against Building Construction

Having received the application for the construction of ……. By Mr./Mrs./Ms. …… residing in …….. district, …… municipality, ward no. ……, in the land parcel with parcel no. ….., cadastral sheet no. ……, land parcel area …… sq. m. located in …….. municipality, ward no. ……., this notice has been published for the notification of the neighbors and the land owners of land parcels abutting to the land of the applicant pursuant to the Clause 31 (A) of the Local Government Operations Act 2074.

It is notified that you are required to register a complaint with supporting documents to verify your complaints within a period of 15 days from the date of publication of this notice in the municipality in case the proposed construction will harm your property or public lands because of the building permit to be issued on the basis of the application received from the applicant for getting building permit together with supporting documents and field measurements. It is further notified that no action will be taken by the municipality in case the complaint is registered after the expiry of the stipulated period.

Description of the Boundaries on 4 sides of the Land Parcel in which building construction is proposed:

Direction	Distance from the boundary of the land parcel to the building face	Owner of the land parcel abutting to the land parcel of the building owner		Remarks
		Land Parcel no.	Name of the owner of the land parcel	
North				
South				
East				
West				

Name of the proposed construction:

Length:

Breadth:

Height:

Number of storeys:

It is requested to notify the ward office if there are any remarks or grievances.

The Building Owner is requested to contact the municipality on the 16th day from the date of publication of the notice. If the Building Owner carries out construction before the issue of the building permit, municipality shall take actions against the Building Owner as per the prevailing laws.

……..

(Secretary)

Ward Office

Ward no. ……

cc:

1. Ward no. ……, Ward Committee Office
2. Applicant Mr./Mrs/Ms. ……

Address:

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Appendix-16: Request Letter to Attend the Meeting on Field Investigation

…….. Municipality

Office of the Municipal Executive

……..

…….. No. Ward Office

Registration No. ……

Received letter no. ……

Date:……/ ……./ …….

Re: **Request for Attending the Meeting on Field Investigation**

Mr./Mrs./Ms. ……

…….

……..

Dear Sir/ Madam,

Having received the application from Mr./Mrs./Ms. ……, ……. residing in ward no. ……., ……. municipality for granting building permit for the construction of new building in the land parcel with land parcel no. …… owned by Mr./Mrs./Ms.……, …….located in ward no. ……, the ward office is going to conduct a meeting on field investigation on the same. You are therefore requested to attend the meeting scheduled at ……. AM/PM on BS 2078/…./…… .

……..

(Secretary)

Ward Office

Ward no. ……

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Appendix-17: Deed of Public Inquiry for the Approval of Building Permit

…….. **Municipality**

Deed of Public Inquiry for the Approval of Building Permit

(For official use only)

We below-mentioned neighbors of Mr./ Mrs./ Ms. ……..of ward no. …….whose land parcel located at ……municipality, ward no ……..plot no. …… of area …….. and applied for approval of building construction and published notice on filed investigation conducted by the ward chairman or his representative to get no objection within a period of 15 days from the date of publication of notice. This document is to certify that there is no comments and problems for construction from the land owners of the of the land parcels abutting to the land parcel of the applicant including the signatures of the presentee and submit to ward no …….. office and if any details are found to be false, we are ready to bear as per the prevailing laws.

Details

East Side:-

West Side:-

North Side:-

South Side:-

Witness

1.

2.

In presence of

Member of Kathmandu Metropolitan…….
Signature……..

From Ward office

Name of authorized
sender:……Signature……
……

20…..year……month……..date.

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Appendix-18: Technical Report after the Field Investigation

Regarding Building Permit as per the Schedule 7, Section 31, 32 of the Local Government Operations Act, 2074

(for Official Use Only)

To.

The Chief Administrative Officer

……..Municipality

Re: Submission of Technical Report after Field Investigation

As per the application for granting building permit from the Building Owner Mr./Ms./Mrs. ……from ward no……., tole …….at plot no…… with area ……. , field investigation has been done and report is submitted as follows:

1. Zone (location of proposed building) …… Subzone……..

2. Regarding road

a) If clearance for the ROW is need to maintained as mention in By-Laws:
   i. width of road…….., direction……,
   ii. distance required to maintained from the centerline of the road ……
   iii. actual distance maintained from central line ……
b) Whether there is proposed road in the vicinity or not:
   i. Width of the proposed road, if any, …… direction……..
   ii. Distance required to be maintained from the central line of the proposed road ……,
   iii. Actual distance maintained from the central line of the proposed road ……,
   iv. Distance maintained OK or not ok as per By-Laws……
c) width of the existing road……..and direction……..
   i. Distance required to maintained from centerline……
   ii. If the road is a track road, whether less or more than 50 m in length…….
   iii. Whether it is a dead end road or not……
   iv. Set Back:-Distance require to be maintained…… actual distance maintained

v. OK or not OK …….

d) If there are row housing on the left and right hand sides of proposed building, number of buildings ……..

3. Details on electric transmission/distribution line in the vicinity, if any:

i. Voltage of the line: ……Volt
ii. Distance required to be maintained from the line and the building……
iii. Actual distance maintained from the line and the building……
iv. OK or not OK …….

4. Public properties adjoining to the land parcel (river, public land, drainage, pati, pauwa, temple), if any:
……
…….

5. Rivers (Bagmati, Bisnumati, Dobhikhola, Manohora, etc) adjoining to the land parcel, if any:
……..

i. distance from the river bank to be maintained…….m
ii. distance from the river bank actually maintained…….m
iii. distance maintained OK or not ……..

6. Whether there is any building or temporary structure in the proposed site or not:……

Whether such buildings or structures have been constructed as per the approved drawing or not…….

7. House no. of the nearest building as per the location plan: ……..

8. Any tree plantation done in the land parcel or not: ……

9. Land parcel ownership: Guthi or self? .....

10. Does the land parcel lies under protected monument zone or archeological zone?
.....

11. Whether any complaint received from the owners of the land parcel abutting to the land parcel of the Building Owner? .....

12. Whether the shape and dimension of the land parcel are the same in the cadastral map and in the field? .....

13. Is the actual land area in the field more or less than the landowner certificate?
.....

14. It is recommended / not recommended to issue the building permit as per the details described above.

15. If there are more details to be provided, use next page.

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Report prepared by……

Name:……

Designation…….

Date……

Note:

a. All details mentioned above are mandatorily to filled- up.
b. If there are any mistakes in above-mentioned details, the technician who prepared this report will be held responsible.

Appendix-19: Pro-forma for Building Permit Fee Calculation

……..Municipality

Office of the Municipal Executive

……

Payment of the Building Permit Fee

(For official use only)

Name of the Building Owner: ……

Construction Type: ☐ New Construction ☐ Addition of Storeys ☐ Repair & Maintenance ☐ Demolition of Old Building & New Construction ☐ Others: ……..

Occupancy Type as per Building By-Laws: ……

Category of Building: ☐ Category A ☐ Category B ☐ Category C ☐ Category D

Details of Calculation of Building Permit Fee:

Storey	Area of proposed construction (in sq.ft. or sq.m.)	Building Permit Fee		Remarks
		Rate	Amount	
Ground				
First				
Second				
Third				
Fourth				
Fifth				
Sixth				
Seventh				
Eighth				
Ninth				
Tenth				
Basement				
Semi-basement				
		Total		
Application Form Fee				To be submitted to the Revenue Section
Application Registration Fee				
Others				

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Grand Total				

Amount in Words: ……..

Signature:……

Name of the Section In charge: ……

Designation: ……

Date: …….. **Receipt No.:** ……. **payment received by:** …….

For the use of Revenue Section:

Received NRs …… against the building permit fee from the applicant.

Date: …….. **Receipt No.:** ……. **payment received by:** …….

Appendix-20: Memo for the Issue of Temporary Building Permit:

…… Municipality

Office of the Municipal Executive

Technical Desk/Section

…….

To.

The Chief Administrative Officer

……. Municipality

…….

Re: Issue of Temporary Building Permit for the Construction of Building up to the Plinth Level

Mr./Mrs./Ms. …….. residing in ward no. …….., …… Tol, …… municipality has submitted application with design, drawings and supporting documents for getting building permit for the construction of building in the land parcel with parcel no. ……., having area ……. sq.m., located at ……. Tol, ward no. ……., …… municipality pursuant to Clause 27, 28, 29 & 30 of the Local Government Operations Act 2074. Having received no complaint after the publication of the 15-day notice for registering any complaint against the construction of the building by the applicant as per the clause 31 of the same act; having received the notification that no harm or damage is caused by the construction of the building; having received the recommendation from the field technician for the approval of the designs & drawings and for issuing the building permit through the field investigation report along with the deed of field investigation report dated ……., I hereby submit this memo for the issue of the temporary building permit for the construction of building up to the plinth level to Mr./ Mrs./ Ms. ……. with my recommendation for the same pursuant to the clauses 32, 33, 34 & 35 of the Local Government Operations Act 2074.

……..

(Signature)

Name: ……..

Designation: Section Chief

Date: ……

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Appendix-21: Temporary Building Permit Certificate

……..**Municipality**

Office of the Municipal Executive

……

Temporary Building Permit Certificate

Date: ……

Re: Certificate on Temporary Building Permit for the Construction up to the Plinth Level

Mr./Mrs./Ms. ……

ward no. ……., ……

……Municipality

Having received your application for the construction of building in …… municipality, previous ward no. ….., current ward no. ……, in the land parcel no. ……..,cadastral sheet no. ……., with land parcel area …… sq.m. (……..Ropani …… Anna…… Paisa ……Dam), and having completed the process as per the Local Government Operations Act 2047, the submitted designs & drawings have been approved through the decision of this municipality dated …….. and this certificate is provided to you for the construction of the building up to the plinth level with the clause that the construction shall be done as per the approved drawings in consonance with the building By-Laws & National Building Code of Nepal.

After the completion of the construction up to plinth level with septic tank and soak pit, application shall be submitted for getting permanent building permit for carrying out construction above the plinth level.

1. Area occupied by proposed building……

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Total area……..

2. Area occupied by existing building ……

   Total area……..

3. Ground coverage percentage……%
4. Floor Area ratio……..
5. No. of proposed building storeys …… total length……., width……., Height……..
6. Distance to be maintained from the edge of ROW: ……
7. Distance to be maintained from the center of ROW: ……
8. Type of proposed building: ……..
9. Proposed structure type of building……..
10. Others: ……..

…….. …… ……

Prepared by Checked by Approved by

Appendix-22: Application Form for the First Interim Site Inspection by the Municipality

Date: ……..

The Chief Administrative Officer

…… Municipality

Office of the Municipal Executive

……

Re: Request for the First Interim Site Inspection by the Municipality

Dear Sir/ Madam,

I/we would like to inform you that I/we have commenced the building construction works as per the approved designs & drawings after receiving the temporary building permit on …… from the municipality. After completing the earthwork excavation in foundation, soling and PCC works, I/we have finished the work on fabrication and erection of reinforcement cages for the foundation, footing tie beams and columns and now, we are ready for commencing the concreting works for the foundation & columns. I/we therefore request for the first interim site inspection by the municipality and issuance of the first interim inspection certificate to me/us. The Supervision Report prepared by the Supervision Consultant is also attached with this application.

……

(signature)

Name of the Applicant:

Address:

Date:

Attachment: Supervision Report dated …….. submitted by the Supervision Consultant

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Appendix-23: First Interim Site Inspection Checklist

Inspection Checklist for the First Interim Site Inspection

Ver. 2022/04/26
Date: (20…../…../…..

Submitted to: ..... Municipality

Building Owner:					Building permit date:(20…../…../…..)		
Building permit no:					Contact no.		
Designer Consultant:					Contact no.		
Location:		City		Ward		Town	
Supervision Consultant's name:		Registered No.			Contact no.	9841696502	
Address		City		Ward		Town	

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Inspection method *1 A/B/C	Inspection Validation Result P:Pass/F:Fail	Inspection Validation by Municipality P:Pass/F:Fail
I.	Bye-laws information							
1	…… Zone …… subzone					A B C		
2	FAR (m)					A B C		
3	Road width (m)					A B C		
4	Right of way (m)					A B C		
5	Set back (m)					A B C		
6	Site area (m^2)					A B C		
7	Plinth area (m^2)					A B C		
8	Ground coverage %					A B C		
9	Plinth height (m)					A B C		
10	Other		-	-		A B C		
II.	Construction safety information							
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				A B C		
		Piles higher than one meter is stepped properly.				A B C		
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				A B C		
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				A B C		
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				A B C		
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.), the operator/driver shall ensure the safety of persons and properties.				A B C		
16	Passageway (including stair gangways)	Over one meter wide.				A B C		
		Not be obstructed.				A B C		
17	Near a public place	Fence and suitable warning signs are provided.				A B C		
18	Fire Fighting	Adequate fire Fighting equipment is provided.				A B C		
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				A B C		

		An adequate number and type of fire extinguishers are placed.				A B C			
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				A B C			
		Vertical safety nets are installed. 8m high buildings				A B C			
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				A B C			
		Adequate barriers and physical guards are provided around excavations.				A B C			
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				A B C			
		Protection of neighboring properties are provided.				A B C			
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				A B C			
22	Construction of Roofs	A walking platform is provided over reinforcements.				A B C			
III.	**Building information**								
23	Building category (A,B,C or D)					A B C			
24	Building purpose (Residential, commercial,					A B C			
25	Number of story					A B C			
26	Total height of building (m)					A B C			
27	Concrete Mix Used for building					A B C			
28	Reinforcement grade					A B C			
29	Structural system of proposed building					A B C			
30	Other								
IV.	**1st interim site inspection items**								
31	Layout details								
		There is no deviation on layout from approved design.				A B C			
		Number of columns				A B C			
32	Foundation details								
	Type of foundation								
	A. Isolated foundation								
	F1	Size of Foundation (LxB) (m)				A B C			
		Depth of Foundation (D) (m)				A B C			
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C			
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C			
		Distance between top & bottom reinforcement if applicable (m)				A B C			
		Hook length (m)				A B C			
		Concrete cover (mm)				A B C			
	B. Combined foundation								
	a. Combined slab foundation								
	F1	Size of Foundation (LxB) (m)				A B C			

		Depth of Foundation (D) (m)				A B C		
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Distance between top & bottom reinforcement (m) if applicable (m)				A B C		
		Concrete cover (mm)				A B C		
	b. Combined slab and beam foundation							
	F1	Size of Foundation (LxB) (m)				A B C		
		Depth of Foundation (D) (m)				A B C		
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Distance between top & bottom reinforcement if applicable (m)				A B C		
		Concrete cover (mm)				A B C		
		For beam						
		Size of Beam (B x D) (m)				A B C		
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
	c. Combined with strap beam							
	Grid (1-A) or Foundation type which ever is applicable	Size of Foundation (LxB) (m)				A B C		
		Depth of Foundation (D)				A B C		
		Reinforcement in Foundation mm @ c/c (eg. 12mm @ 150c/c)				A B C		
		Concrete cover (mm)				A B C		
		For beam						
		Size of strap beam (B x D) (m)				A B C		
		Reinforcement in strap beam N-Dia (in mm)(T) + N-Dia (in mm)(B) eg. (3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Hook length (m)				A B C		
		Hook angle (degree)				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Distance between reinforcement of each bars in x direction (m)				A B C		
		Concrete cover (mm)				A B C		

	F2	Size of Foundation (LxB) (m)				A B C		
		Depth of Foundation (D)				A B C		
		Reinforcement in Foundation mm @ c/c (eg. 12mm @ 150c/c)				A B C		
		Concrete cover (mm)				A B C		
		For beam						
		Size of strap beam (B x D) (m)				A B C		
		Reinforcement in strap beam N-Dia (in mm)(T) + N-Dia (in mm)(B) eg. (3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Hook length (m)				A B C		
		Hook angle (degree)				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Distance between reinforcement of each bars in x direction (m)				A B C		
		Concrete cover (mm)				A B C		
		B. MAT/RAFT Foundation						
	F1	Size of Foundation (LxB)				A B C		
		Depth of Foundation (D)				A B C		
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				A B C		
		Distance between top & bottom reinforcement if applicable (m)				A B C		
		Concrete cover (mm)				A B C		
		3. Pile Foundation						
		For piles						
	P1	Diameter of piles (d)				A B C		
		Depth of piles (D)				A B C		
		Main reinforcements N-dia. in mm eg. 8-12mm				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		
33		Column details						
	Grid A-1	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing to GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Development length from top of the footing (in mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		

	A-2	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing to GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Development length from top of the footing (in mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		
	A-3	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing to GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Development length from top of the footing (in mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		
34		Before concreting						
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				A B C		
		Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities				A B C		

Note, *1; A:Visual Inspection, B:Measurement Inspection, C:Inspection by Documents such as the Supervision

All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Supervision Consultant	**Checked By**	**Approved By**
.....	.....	.....
Supervising Engineer	**Engineer**	**Section Chief**
On behalf of the owner	**Municipality**	**Municipality**

Appendix-24: First Interim Site Inspection Certificate

……..Municipality

Office of the Municipal Executive

……

Date: ……

First Interim Site Inspection Certificate

Regarding the application Mr./Mrs./Ms. …… has submitted for the first interim site inspection of construction works on date ……. for the building constructed at previous ward no. ……., current ward no. ……., in land parcel no. ……. with area ……. sq. m in ……. municipality along with the Supervision Report, first interim site inspection has been carried out by this municipality for checking the correctness of the construction works excluding concreting works as per the approved designs & drawings below the plinth level and verified to be in order. So, this certificate along with notice to proceed ahead with concreting works for the foundations and column casting up to the plinth level for RCC buildings and to proceed ahead with the construction of masonry walls above the foundation level for masonry building has been issued.

……..	……	…….
Prepared by	Checked by	Approved by

A3-6-74

Appendix-25: Application Form for the Second Interim Site Inspection by the Municipality

Date: ……..

The Chief Administrative Officer

…… Municipality

Office of the Municipal Executive

……

Re: <u>Request for the Second Interim Site Inspection by the Municipality</u>

Dear Sir/ Madam,

I/we would like to inform you that I/we have completed the building construction works up to the plinth/ DPC level as per the approved designs & drawings after receiving the first interim site inspection certificate on …… from the municipality. I/we now have finished the reinforcement works for the plinth beam/ DPC band and are ready for commencing the concreting works. I/we therefore request for the second interim site inspection by the municipality and issuance of the second interim inspection certificate to me/us. The Supervision Report on the construction works up to the plinth beam/DPC band prepared by the Supervision Consultant is also attached with this application.

……

(signature)

Name of the Applicant:

Address:

Date:

Attachment: Supervision Report dated …….. submitted by the Supervision Consultant

Appendix-26: Second Interim Site Inspection Checklist

Inspection Checklist for the Second Interim Site Inspection

Ver. 2022/04/26

Submitted to: ..... Municipality

Date: (20.../..../....)

Building Owner:					Building permit date:		
Building permit no:					Contact no.		
Designer Consultant:					Contact no.		
Location:		City		Ward		Town	

Supervision Consultant's name:		Registered No.			Contact no.		
Address		City		Ward		Town	

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Inspection method *1 A/B/C	Inspection Validation Result P:Pass/F:Fail	Inspection Validation by Municipality P:Pass/F:Fail
I.	Bye-laws information							
1	..... Zone ..... subzone					A B C		
2	FAR (m)					A B C		
3	Road width (m)					A B C		
4	Right of way (m)					A B C		
5	Set back (m)					A B C		
6	Site area (m^2)					A B C		
7	Plinth area (m^2)					A B C		
8	Ground coverage %					A B C		
9	Plinth height (m)					A B C		
10	Other		-	-		A B C		
II.	Construction safety information							
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				A B C		
		Piles higher than one meter is stepped properly.				A B C		
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				A B C		
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				A B C		
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				A B C		
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.), the operator/driver shall ensure the safety of persons and properties.				A B C		
16	Passageway (including stair gangways)	Over one meter wide.				A B C		
		Not be obstructed.				A B C		
17	Near a public place	Fence and suitable warning signs are provided.				A B C		
18	Fire Fighting	Adequate fire Fighting equipment is provided.				A B C		
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				A B C		
		An adequate number and type of fire extinguishers are placed.				A B C		
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				A B C		
		Vertical safety nets are installed. 8m high buildings				A B C		
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				A B C		
		Adequate barriers and physical guards are provided around excavations.				A B C		
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				A B C		
		Protection of neighboring properties are provided.				A B C		
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				A B C		
22	Construction of Roofs	A walking platform is provided over reinforcements.				A B C		
III.	Building information							
23	Building category (A,B,C or D)					A B C		
24	Building purpose (Residential, commercial,					A B C		
25	Number of story					A B C		
26	Total height of building (m)					A B C		
27	Concrete Mix Used for building					A B C		
28	Reinforcement grade					A B C		
29	Structural system of proposed building					A B C		
30	Other							
IV.	2nd interim site inspection items							
31	Concrete mix used for							
		Foundation (Cement:Sand:Aggregates)				A B C		
		Beams (Strap/tie)				A B C		
		Columns				A B C		
		Plinth Beams				A B C		
32	Concrete test report for							
		Foundation/Columns/Strap beam (MPa)				A B C		
33	Layout details							
		There is no deviation on layout from approved design (Plinth beam projection)				A B C		
34	Lower tie beam (if applicable)							
	Grid A-1	Size of tie beam (D x B in m) (eg. 0.35 x 0.35)				A B C		
		Height from GL (m)				A B C		

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		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (m)				A B C		
35		**Plinth beam**						
	Grid A-1	Size of tie beam (D x B in m) (eg. 0.35 x 0.35)				A B C		
		Height from GL to plinth lvl (m)				A B C		
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
36		**Toe wall details**						
		Thickness of wall (m)				A B C		
		Height upto G.L. plinth beam				A B C		
		Masonry type (Stone/brick)				A B C		
		Mortar Ratio				A B C		
		Below plinth Brickwork done in plumb, true line and level, proper interlocked and vertical joints broken						
		The brickwork is constantly kept moist on all faces for a minimum period of seven (7) days.						
37		**Backfilling soil works**						
		Backfill for foundations, walls and other structures is carried out from the approved source of soil/materials.				A B C		
		The backfilling is done in the layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/ mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.				A B C		
38		**Before concreting**						
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				A B C		
		Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities				A B C		

Note, *1; A:Visual Inspection, B:Measurement Inspection, C:Inspection by Documents such as the Supervision

A3-6-76

All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Supervision Consultant	Checked By	Approved By
.....	.....	.....
Supervising Engineer On behalf of the owner	Engineer Municipality	Section Chief Municipality

Appendix-27: Second Interim Site Inspection Certificate

……..Municipality

Office of the Municipal Executive

……

Date: ……

Second Interim Site Inspection Certificate

In reference to the application which Mr./Mrs./Ms. …… has submitted for the second interim site inspection of construction works on date ……. for the building constructed at previous ward no. ……., current ward no. ……., in land parcel no. ……. with area ……. sq. m in …… municipality along with the Supervision Report, second interim site inspection has been carried out by this municipality for checking the correctness of the construction works up to the plinth/DPC level excluding concreting works of plinth beam/DPC band as per the approved designs & drawings and has verified them to be in order. So, this certificate along with notice to proceed ahead with concreting works for the plinth beam/ DPC band has been issued.

……..	……	…….
Prepared by	Checked by	Approved by

A3-6-77

Appendix-28: Memo for the Issue of Permanent Building Permit

…… **Municipality**

Office of the Municipal Executive

Technical Desk/Section

…….

To.

The Chief Administrative Officer

……. Municipality

…….

Re: Issue of Permanent Building Permit for the Construction of Superstructure

Mr./Mrs./Ms. …….. residing in ward no. ……., …… Tol, …… municipality has submitted application with design, drawings and supporting documents for getting building permit for the construction of building in the land parcel with parcel no. ……., having area ……. sq.m., located at ……. Tol, ward no. ……., …… municipality pursuant to Clause 27, 28, 29 & 30 of the Local Government Operations Act 2074. He/she was issued the temporary building permit for the construction of building up to the plinth level through the decision of the municipality dated …… The second interim field investigation report dated …… has shown that the construction up to the plinth level has been carried out as per the approved designs & drawings in consonance with the building By-Laws & National Building Code. I hereby submit this memo for the issue of the permanent building permit for the construction of superstructure of the building to Mr./ Mrs./ Ms. ……. with my recommendation for the same pursuant to the clauses 32, 33 & 34 of the Local Government Operations Act 2074.

……..

(Signature)

Name: ……..

Designation: Section Chief

Date: ……

Appendix-29: Permanent Building Permit Certificate

…….. **Municipality**

Office of the Municipal Executive

……

Permanent Building Permit Certificate

Date: ……

Re: Certificate on Permanent Building Permit for the Construction of Superstructure

Mr./Mrs./Ms. ……

ward no. ……., ……

……Municipality

Having received your application dated ……..for the second interim site inspection & construction of superstructure of the building in …… municipality, previous ward no. ….., current ward no. ……, in the land parcel no. ……..,cadastral sheet no. ……., with land parcel area …… sq.m. (……..Ropani …… Anna…… Paisa ……Dam), and having completed the process as per the Local Government Operations Act 2047, this certificate is provided to you for the construction of the superstructure of the building with the details indicated below under the condition that the construction shall be done as per the approved designs & drawings in consonance with the building By-Laws & National Building Code of Nepal. You are requested to get the Building Construction Completion Certificate after the completion of the construction work as per the approved designs & drawings.

Description of the Approved Construction

1. Type of construction:

2. Dimensions of the proposed building:

   Length: …….. Breadth: …… Total height: ……

3. No. of storeys: ……..
4. Intended use of the building:
5. Type of structure:
6. Approved floor areas for the construction of the building:

S.N.	Floor Level	Approved Floor Area (in sq. ft.)
1.	Semi-basement	
2.	Basement	
3.	Ground	
4.	First	
5.	Second	
6.	Third	
7.	Fourth	
8.	Fifth	
9.	Sixth	
	Total Floor Area	

7. Others:

…….. …… ……

Prepared by Checked by Approved by

I understand and fully accept that the municipality may take actions against me/us as per the prevailing laws if the building construction is carried out not complying with the approved designs & drawings or against the conditions mentioned above.

……

(signature)

Building Owner or his/her authorized representative

****

A3-6-78

Renewal of Permanent Building Permit

S.N.	Date of Renewal	Date of Expiry	Recommended by	Approved by

Transfer of Permanent Building Permit Authorization

S.N.	Name & Address of the Person transferring the building permit authorization	Name & Address of the Person receiving the building permit authorization	Recommended by	Approved by

A3-6-79

Appendix-30: Application Form for the Third Interim Site Inspection by the Municipality

Date: ……..

The Chief Administrative Officer

…… Municipality

Office of the Municipal Executive

……

Re: <u>Request for the Third Interim Site Inspection by the Municipality</u>

Dear Sir/ Madam,

I/we would like to inform you that I/we have completed the building construction works up to the first-floor level excluding the casting of concrete but including the reinforcement placement for the first-floor slab as per the approved designs & drawings after receiving the permanent building permit certificate on …… from the municipality. I/we am/are now ready for commencing the concreting works of the first-floor slab. I/we therefore request for the third interim site inspection by the municipality and issuance of the third interim inspection certificate to me/us. The Supervision Report on the construction works up to the first-floor level excluding the concreting of slab prepared by the Supervision Consultant is also attached with this application.

……

(signature)

Name of the Applicant:

Address:

Date:

Attachment: Supervision Report dated …….. submitted by the Supervision Consultant

Appendix-31: Third Interim Site Inspection Checklist

Inspection Checklist for the Third Interim Site Inspection

Ver. 2022/04/26

Submitted to: ..... Municipality **Date: (20...../...../.....)**

Building Owner:				**Building permit date:**		
Building permit no:				**Contact no.**		
Designer Consultant:				**Contact no.**		
Location:		**City**	**Ward**		**Town**	

Supervisor consultant name		**Registered No.**		**Contact no.**		
Address		**City**	**Ward**		**Town**	

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Inspection method *1 A/B/C	Inspection Validation Result P:Pass/F:Fail	Inspection Validation by Municipality P:Pass/F:Fail
I.	**Bye-laws information**							
1	..... Zone ..... subzone					A B C		
2	FAR (m)					A B C		
3	Road width (m)					A B C		
4	Right of way (m)					A B C		
5	Set back (m)					A B C		
6	Site area (m^2)					A B C		
7	Plinth area (m^2)					A B C		
8	Ground coverage %					A B C		
9	Plinth height (m)					A B C		
10	Other					A B C		
II.	**Construction safety information**							
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				A B C		
		Piles higher than one meter is stepped properly.				A B C		
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				A B C		
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				A B C		
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				A B C		
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.),the operator/driver shall ensure the safety of persons and properties.				A B C		
16	Passageway (including stair gangways)	Over one meter wide.				A B C		
		Not be obstructed.				A B C		
17	Near a public place	Fence and suitable warning signs are provided.				A B C		
18	Fire Fighting	Adequate fire Fighting equipment is provided.				A B C		
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				A B C		
		An adequate number and type of fire extinguishers are placed.				A B C		

19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				A B C		
		Vertical safety nets are installed. 8m high buildings				A B C		
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				A B C		
		Adequate barriers and physical guards are provided around excavations.				A B C		
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				A B C		
		Protection of neighboring properties are provided.				A B C		
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				A B C		
22	Construction of Roofs	A walking platform is provided over reinforcements.				A B C		
III.	**Building information**							
23	Building category (A,B,C or D)					A B C		
24	Building purpose (Residential, commercial, institution,					A B C		
25	Number of story					A B C		
26	Total height of building (m)					A B C		
27	Concrete Mix Used for building					A B C		
28	Reinforcement grade					A B C		
29	Structural system of proposed building					A B C		
30	Other							
IV.	**3rd interim site inspection items**							
31	Concrete mix used for							
		Plinth Beams				A B C		
		Columns				A B C		
32	Concrete test report for							
		Columns/Beams at 2nd interim inspection stages				A B C		
33	**Layout details**							
		There is no deviation on layout from approved design (Beam and slab projections)				A B C		
34	**Column details**							
	Grid A-1	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing and GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		

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		Concrete cover (mm)				A B C		
	A-2	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing and GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		
	A-3	Size of columns (m) eg. 0.35m x 0.35m				A B C		
		Height from base of the footing and GL (m)				A B C		
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				A B C		
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				A B C		
		Distance between opposite mainbars c/c (m)				A B C		
		Concrete cover (mm)				A B C		
35		**Staircase details**						
	Grid C-3	Width of staircase flight (W in m) (eg. 0.4 x 0.25)				A B C		
		Staircase incline slab depth (mm)				A B C		
		Tread (mm)				A B C		
		Riser (mm)				A B C		
		Total number of riser				A B C		
		Reinforcement in staircase (in mm) @ spacing in mm c/c (eg. 12mm @150mm c/c Both ways				A B C		
		Nosing bar				A B C		
	Landing beam of stairs	Size of landing beam (D x B in m) (eg. 0.35 x 0.25)				A B C		
		Reinforcement in landing beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @ 150mm c/c)				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
		Lapping length (eg. 960mm for 16mm dia)				A B C		
		Development length of staircase (mm)				A B C		
36		**Beam details**						
	Grid A-1	Size of plinth beam (D x B in m) (eg. 0.4 x 0.25)				A B C		
		Height from Plinth beam (m)				A B C		
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		

		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
		Lapping length (eg. 960mm for 16mm dia)				A B C		
		Development length (mm)				A B C		
	A-2	Size of plinth beam (D x B in m) (eg. 0.4 x 0.25)				A B C		
		Height from Plinth beam (m)				A B C		
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				A B C		
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
		Lapping length (eg. 960mm for 16mm dia)				A B C		
		Development length (mm)				A B C		
		Floor slab						
37	S1	Thickness of slab (mm)				A B C		
		Reinforcement in slab Dia (in mm) @ spacing in mm c/c eg (8mm @150mm c/c bothways)				A B C		
		Position of top reinforcement				A B C		
		Distance between top & bottom reinforcement (m)				A B C		
		Concrete cover (mm)				A B C		
38		**Before concreting**						
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				A B C		
		Formwork has sufficient structural integrity and compliance to the formwork drawing. Line and level have been checked.				A B C		
		Formworks including post, bracing and shores are sufficient and well-fixed to resist concrete poring and compaction activities and leakage possibilities				A B C		
		Service conducts (electric and sanitary) are properly provided to ensure strength of structure members				A B C		

All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Supervision Consultant **Checked By** **Approved By**

Appendix-32: Third Interim Site Inspection Certificate

……..Municipality

Office of the Municipal Executive

……

Date: ……

Third Interim Site Inspection Certificate

In reference to the application which Mr./Mrs./Ms. …… has submitted for the third interim site inspection of construction works on date ……. for the building constructed at previous ward no. ……., current ward no. …….., in land parcel no. ……. with area ……. sq. m in …… municipality along with the Supervision Report, the third interim site inspection has been carried out by this municipality for checking the correctness of the construction works up to the first-floor level excluding concreting works of slab as per the approved designs & drawings and has verified them to be in order. So, this certificate along with notice to proceed ahead with further construction works as per the approved designs & drawings has been issued.

……..	……	…….
Prepared by	Checked by	Approved by

Appendix-33: Pro-forma for Application from the Building Owner for the Final Inspection

Date: ……

The Chief Administration Officer

…… Municipality

Office of the Municipal Executive

…….

Re: **Request for the Final Field Inspection & Issue of Completion Certificate**

Dear Sir/ Madam,

I/we would like to inform you that as per the permanent building permit issued by the municipality dated …….. for the construction of superstructure and the third interim field inspection certificate dated …….. at ward no. ……., land parcel no. ……. with area …….sq. m at …… municipality, we have completed the construction of the building. The supervision report prepared by the Supervision Consultant is also attached here with. So, we kindly request you to arrange for the final field inspection of the constructed building and issue the building construction completion certificate to me/us.

…….

(signature)

Name of the Applicant:

Address:

A3-6-82

Appendix-34: Pro-forma of the Final Inspection Report

Inspection Checklist for the Final Site Inspection

Ver. 2022/04/26

Submitted to: ..... Municipality Date: (20.../...../.....)

Building Owner:				**Building permit date:**		
Building permit no:				**Contact no.**		
Designer Consultant:				**Contact no.**		
Location:		**City**	**Ward**		**Town**	

Supervisor consultant name		**Registered No.**			**Contact no.**		
Address		**City**		**Ward**		**Town**	

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Inspection method *1 A/B/C	Inspection Validation Result P:Pass/F:Fail	Inspection Validation by Municipality P:Pass/F:Fail
I.	**Bye-laws information**							
1	..... Zone ..... subzone					A B C		
2	FAR (m)					A B C		
3	Road width (m)					A B C		
4	Right of way (m)					A B C		
5	Set back (m)					A B C		
6	Site area (m^2)					A B C		
7	Plinth area (m^2)					A B C		
8	Ground coverage %					A B C		
9	Plinth height (m)					A B C		
10	Other					A B C		
II.	**Construction safety information**							
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				A B C		
		Piles higher than one meter is stepped properly.				A B C		
12	flammable liquids like petrol, thinners, etc.	Stored in conformity with the relevant regulations.				A B C		
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				A B C		
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				A B C		
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.),the operator/driver shall ensure the safety of persons and properties.				A B C		
16	Passageway (including stair	Over one meter wide.				A B C		
		Not be obstructed.				A B C		
17	Near a public place	Fence and suitable warning signs are provided.				A B C		
18	Fire Fighting	Adequate fire Fighting equipment is provided.				A B C		
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				A B C		
		An adequate number and type of fire extinguishers are placed.				A B C		
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				A B C		

		Vertical safety nets are installed. 8m high buildings				A B C		
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				A B C		
		Adequate barriers and physical guards are provided around excavations.				A B C		
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				A B C		
		Protection of neighboring properties are provided.				A B C		
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				A B C		
22	Construction of Roofs	A walking platform is provided over reinforcements.				A B C		
III.	**Building information**							
23	Building category (A,B,C or D)					A B C		
24	Building purpose (Residential, commercial, institution,					A B C		
25	Number of story					A B C		
26	Total height of building (m)					A B C		
27	Concrete Grade Used for					A B C		
28	Reinforcement grade					A B C		
29	Structural system of proposed building					A B C		
30	Other					A B C		
I.	**Final site inspection**							
31	Building details							
		As built construction does not deviate from approved design.				A B C		
		Complies code and by-laws requirements.				A B C		
		The structure is free from undue cracks, settlements, leakage, damping etc.				A B C		
		All hinges, Tower bolts, handles are as per specification. Shutters are properly fixed in frames.				A B C		
32	Sanitary							
		Sanitary lines checked in designed pressure and found OK. No leakage or damping observed in structure.				A B C		
		Sanitary fixtures functioning satisfactorily.				A B C		
		Installation of septic tanks						
33	Electrical							
		All electric power points are checked for full capacity functioning and short circuit.				A B C		
		Earthing function tested OK.				A B C		
34	Clearance of site and surroundings							
		Maintenance of public infrastructure like road, drains, water supply line, etc if affected by building construction works has been completed				A B C		

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All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Supervision Consultant	Checked By	Approved By
.....	.....	.....
Supervising Engineer On behalf of the owner	Engineer Municipality	Section Chief Municipality

A3-6-84

Appendix-35: Memo for the Issue of Building Construction Completion Certificate:

…… **Municipality**

Office of the Municipal Executive

Technical Desk/Section

…….

To.

The Chief Administrative Officer

……. Municipality

…….

Re: Issue of Building Construction Completion Certificate

Mr./Mrs./Ms. …….. residing in ward no. ……., …… Tol, …… municipality has submitted application along with the supervision report for getting building construction completion certificate for the building in the land parcel with parcel no. ……., having area ……. sq.m., located at ……. Tol, ward no. ……., …… municipality. He/she was issued the permanent building permit for the construction of superstructure through the decision of the municipality dated …… and the third interim field inspection certificate dated …….. . The final field inspection report dated …… has shown that the construction up to the roof level has been carried out as per the approved designs & drawings in consonance with the building By-Laws & the National Building Code. I hereby submit this memo for the issue of the building construction completion certificate of the building to Mr./ Mrs./ Ms. ……. with my recommendation for the same pursuant to the clause 5.3 of the Basic Construction Standards on Settlement Development, Urban Planning & Building Construction 2072.

……..

(Signature)

Name: ……..

Designation: Section Chief

Date: ……

Appendix-36: Pro-forma of the Building Construction Completion Certificate

…….. **Municipality**

Office of the Municipal Executive

……..

Date: ……

Building Construction Completion Certificate

This is to certify that Mr./Ms./Mrs. …… has completed the construction of building as per the details given below after receiving the permanent building permit dated …… from the municipality.

1. Details of the Land Owner & the Building Owners

Name of the Land Owner:
Name of the Building Owner:

2. Details of the Land Parcel:

Land Parcel no. ……..
Cadastral Sheet no. ……..
Area of the Land Parcel: ……

3. Address of the location of the Building:

Previous ward no. …….. Current ward no.: ……
Tole/ location name: …….
Name of the Street: ……

4. Building Details:
   a) Structural type of the building : ☐ RCC ☐ Brick masonry in CSM ☐ Stone Masonry in CSM ☐ Steel Farmed ☐ Timber framed

      ☐ Others: ……

   b) Category of Building : ☐ Category A ☐ Category B ☐ Category C ☐ Category D
   c) No. of storeys ……
   d) Plinth area of building (sq. ft)……..
   e) Total floor area of building (sq.ft)……..
   f) Permanent Building Permit Certificate no: …… Date:……..
   g) Purpose/Use of the Building……

5. Construction Data

S.N.	Floor Level	Actual area of floor
1.	Semi Basement	
2.	Basement	
3.	Ground Floor	
4.	First Floor	
5.	Second Floor	
6.	Third Floor	
7.	Fourth Floor	
8.	Fifth Floor	
9.	Sixth Floor	
	Total Floor Area	

6. Total height of the building above GL (Feet/Meter) :……
7. Actual FAR: ……
8. Actual Ground Coverage Ratio: ……..
9. ROW of the adjoining road: ……
10. Actual setback distance from the edge of the adjoining road: ……..
11. Height of building plinth above the nearest road level: ……
12. Distance maintained from the centre line of the road adjoining with the land parcel to the building line: ……
13. Distance maintained from the nearest HV electrical transmission/ distribution line, if applicable: ……
14. Distance maintained from the nearest bank of the river, if applicable: ……
15. Sewage Treatment through: ☐ Septic tank & soak pit ☐ city sewer line
16. Other Details

……	……	……	……
Inspected by	Checked by	Submitted by	Approved by

A3-6-85

Appendix-37: Instruction for Correction Works after the First Interim Site Inspection

……..Municipality

Office of the Municipal Executive

……

Date: ……

Instruction for Correction Works

after the First Interim Site Inspection

To.

Mr./Mrs./ Ms. ……

……

……

Dear Sir /Madam,

This is with reference to the first interim site inspection dated ……. undertaken by the municipality in your/your representative's presence as per the application dated …….. submitted by you for the building constructed at previous ward no. ……., current ward no. ……., in land parcel no. ……. with area ……. sq. m in ……. municipality along with the Supervision Report. During the inspection, non-conformances in the construction work as per the approved designs & drawings have been noticed as per the list attached with this letter. You are hereby requested to immediately stop further construction work and carry out the corrections to bring the construction work in compliance with the approved designs & drawings. After the completion of the correction works, you are required to resubmit the application letter along with supervision report of the correction works for getting the first interim inspection certificate from the municipality. It is notified that the municipality may take actions against you as per the prevailing laws in the event that you fail to carry out the correction works and do further works and the building permit issued to you may be cancelled by the municipality.

…….. …… ……

Prepared by Checked by Approved by

A3-6-86

Detailed Instruction Sheet for Correction Works

after the First Interim Site Inspection

Instruction Sheet for the Corrections of Construction Works based on the 1st Interim Site Inspection

Ver. 2022/04/26

Issued by: Mahalaxmi Municipality Date: (2022/…../…..)

Issued to:

Building Owner					Building permit date:		
Building permit no					Contact no.		
Designer Consultant					Contact no.		
Location		City		Ward		Town	

Supervision consultant's name		Registered No.			Contact no.		
Address		City		Ward		Town	

S.N.	Description		According to the Approval Drawing	According to Actual Construction in site		Remarks
I.	Non-conformance relating to the Bye-laws Requirements					
1	..... Zone ..... subzone					
2	FAR (m)					
3	Road width (m)					
4	Right of way (m)					
5	Set back (m)					
6	Site area (m^2)					
7	Plinth area (m^2)					
8	Ground coverage %					
9	Plinth height (m)					
10	Other					
II.	Non-Conformance relating to the Construction Safety Requirements					
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				
		Piles higher than one meter is stepped properly.				
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.), the operator/driver shall ensure the safety of persons and properties.				
16	Passageway (including stair gangways)	Over one meter wide.				
		Not be obstructed.				
17	Near a public place	Fence and suitable warning signs are provided.				
18	Fire Fighting	Adequate fire Fighting equipment is provided.				
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				

		An adequate number and type of fire extinguishers are placed.				
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				
		Vertical safety nets are installed. 8m high buildings				
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				
		Adequate barriers and physical guards are provided around excavations.				
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjaoent structures, buildings, roadways, sidewalks, walls, etc.				
		Protection of neighboring properties are provided.				
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distanoe of 1.2 m past each end of the extent of the construction.		Not used in site yet as it is just in foundation stage		
22	Construction of Roofs	A walking platform is provided over reinforcements.		Not provided		
III.	Non-conformance relating to the Building information Requirement					
23	Building category (A,B,C or D)					
24	Building purpose (Residential, commercial,					
25	Number of story					
26	Total height of building (m)					
27	Concrete Mix Used for building					
28	Reinforcement grade					
29	Structural system of proposed building					
30	Other					
IV.	Non-conformance relating to the 1st Interim Site Inspection Items					
31	Layout details					
		Deviation on layout from approved design.				
		Number of columns				
32	Foundation details					
	Type of foundation					
	A. Isolated foundation					
	F1	Size of Foundation (LxB) (m)				
		Depth of Foundation (D) (m)				
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Distance between top & bottom reinforcement if applicable (m)				
		Hook length (m)				
		Concrete cover (mm)				
	B. Combined foundation					
	a. Combined slab foundation					
	F1	Size of Foundation (LxB) (m)				
		Depth of Foundation (D) (m)				
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Distance between top & bottom reinforcement if applicable (m)				
		Concrete cover (mm)				
		For beam				
		Size of Beam (B x D) (m)				
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
	c. Combined with strap beam					
	Grid (1-A) or Foundation type which ever is applicable	Size of Foundation (LxB) (m)				
		Depth of Foundation (D)				
		Reinforcement in Foundation mm @ c/c (eg. 12mm @ 150c/c)				
		Concrete cover (mm)				
		For beam				
		Size of strap beam (B x D) (m)				
		Reinforcement in strap beam N-Dia (in mm)(T) + N-Dia (in mm)(B) eg. (3-12mm (T) + 3-12mm (B))				
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Hook length (m)				
		Hook angle (degree)				
		Distance between top & bottom reinforcement (m)				
		Distance between reinforcement of each bars in x direction (m)				
		Concrete cover (mm)				
	F2	Size of Foundation (LxB) (m)				

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		Depth of Foundation (D)				
		Reinforcement in Foundation mm @ c/c (eg. 12mm @ 150c/c)				
		Concrete cover (mm)				
		For beam				
		Size of strap beam (B x D) (m)				
		Reinforcement in strap beam N-Dia (in mm)(T) + N-Dia (in mm)(B) eg. (3-12mm (T) + 3-12mm (B))				
		Stirrups dia. & spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Hook length (m)				
		Hook angle (degree)				
		Distance between top & bottom reinforcement (m)				
		Distance between reinforcement of each bars in x direction (m)				
		Concrete cover (mm)				
		B. MAT/RAFT Foundation				
	F1	Size of Foundation (LxB)				
		Depth of Foundation (D)				
		Top Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Bottom Reinforcement in Foundation (eg. 12mm @ 150c/c)				
		Distance between top & bottom reinforcement if applicable (m)				
		Concrete cover (mm)				
		3. Pile Foundation				
		For piles				
	P1	Diameter of piles (d)				
		Depth of piles (D)				
		Main reinforcements N-dia. in mm eg. 8-12mm				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
33		**Column details**				
	Grid A-1	Size of columns (m) eg. 0.35m x 0.35m				
		Height from base of the footing to GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				
		Development length from top of the footing (in mm)				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
	A-2	Size of columns (m) eg. 0.35m x 0.35m				

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		Height from base of the footing to GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				
		Development length from top of the footing (in mm)				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
	A-3	Size of columns (m) eg. 0.35m x 0.35m				
		Height from base of the footing to GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				
		Development length from top of the footing (in mm)				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
34		**Before concreting**				
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				
		Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities				

All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Prepared by:	Checked By	Approved By
.....	.....	.....
Sub-engineer Municipality	Engineer Municipality	Section Chief Municipality

Appendix-38: Instruction for Correction Works after the Second Interim Site Inspection

……..Municipality

Office of the Municipal Executive

……

Date: ……

Instruction for Correction Works

after the Second Interim Site Inspection

To.

Mr./Mrs./ Ms. ……

……

……

Dear Sir /Madam,

This is with reference to the second interim site inspection dated ……. undertaken by the municipality in your/your representative's presence as per the application dated …….. submitted by you for the building constructed at previous ward no. ……., current ward no. …….., in land parcel no. ……. with area ……. sq. m in ……. municipality along with the Supervision Report. During the inspection, non-conformances in the construction work as per the approved designs & drawings have been noticed as per the list attached with this letter. You are hereby requested to immediately stop further construction work and carry out the corrections to bring the construction work in compliance with the approved designs & drawings. After the completion of the correction works, you are required to resubmit the application letter along with supervision report of the correction works for getting the second interim inspection certificate from the municipality. It is notified that the municipality may take actions against you as per the prevailing laws in the event that you fail to carry out the correction works and do further works and the building permit issued to you may be cancelled by the municipality.

…….. …… …….

Prepared by Checked by Approved by

A3-6-89

Detailed Instruction Sheet for Correction Works

after the Second Interim Site Inspection

Instruction Sheet for the Corrections of Construction Works based on the Second Interim Site Inspection

Ver. 2022/04/26

Issued by: ..... Municipality Date: (2022/..../....)

Building Owner		Building permit date:			
Building permit no		Contact no.			
Designer Consultant		Contact no.			
Location		City	Ward		Town

Supervisor consultant name		Registered No.		Contact no.	
Address		City	Ward		Town

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Remarks
I.	Non-conformance relating to Bye-laws					
1	..... Zone ..... subzone					
2	FAR (m)					
3	Road width (m)					
4	Right of way (m)					
5	Set back (m)					
6	Site area (m^2)					
7	Plinth area (m^2)					
8	Ground coverage %					
9	Plinth height (m)					
10	Other		-	-		
II.	Non-conformance relating to Construction					
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				
		Piles higher than one meter is stepped properly.				
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.), the operator/driver shall ensure the safety of persons and properties.				
16	Passageway (including stair gangways)	Over one meter wide.				
		Not be obstructed.				
17	Near a public place	Fence and suitable warning signs are provided.				

18	Fire Fighting	Adequate fire Fighting equipment is provided.					
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.					
		An adequate number and type of fire extinguishers are placed.					
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.					
		Vertical safety nets are installed. 8m high buildings					
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.					
		Adequate barriers and physical guards are provided around excavations.					
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.					
		Protection of neighboring properties are provided.					
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.					
22	Construction of Roofs	A walking platform is provided over reinforcements.					
III.	**Non-conformance relating to Building**						
23	Building category (A,B,C or D)						
24	Building purpose (Residential, commercial,						
25	Number of story						
26	Total height of building (m)						
27	Concrete Mix Used for building						
28	Reinforcement grade						
29	Structural system of proposed building						
30	Other						
IV.	**2nd interim site inspection items**						
31	Concrete mix used for						
		Foundation (Cement:Sand:Aggregates)					
		Beams (Strap/tie)					
		Columns					

		Plinth Beams				
32	Concrete test report for					
		Foundation/Columns/Strap beam (MPa)				
33	**Layout details**					
		There is no deviation on layout from approved design (Plinth beam projection)				
34	**Lower tie beam (if applicable)**					
	Grid A-1	Size of tie beam (D x B in m) (eg. 0.35 x 0.35)				
		Height from GL (m)				
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (m)				
35	**Plinth beam**					
	Grid A-1	Size of tie beam (D x B in m) (eg. 0.35 x 0.35)				
		Height from GL to plinth lvl (m)				
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
36	**Toe wall details**					
		Thickness of wall (m)				
		Height upto G.L. plinth beam				
		Masonry type (Stone/brick)				
		Mortar Ratio				
		Below plinth Brickwork done in plumb, true line and level, proper interlocked and vertical joints broken				
		The brickwork is constantly kept moist on all faces for a minimum period of seven (7) days.				
37	**Backfilling soil works**					
		Backfill for foundations, walls and other structures is carried out from the approved source of soil/materials.				

		The backfilling is done in the layers of thickness not exceeding 15 cm with watering, rolling and ramming by manual methods/ mechanical compactors to grade and level as shown on drawings to obtain 90% laboratory maximum dry density.				
38	Before concreting					
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				
		Formworks are well fixed to resist concrete poring and compaction activities and leakage possibilities				

Prepared by:

.....
Sub-engineer
Municipality

Checked By

.....
Engineer
Municipality

Approved By

.....
Section Chief
Municipality

A3-6-91

Appendix-39: Instruction for Correction Works after the Third Interim Site Inspection

……..Municipality

Office of the Municipal Executive

……

Date: ……

Instruction for Correction Works after the Third Interim Site Inspection

To.

Mr./Mrs./ Ms. ……

……

……

Dear Sir /Madam,

This is with reference to the third interim site inspection dated ……. undertaken by the municipality in your/your representative's presence as per the application dated …….. submitted by you for the building constructed at previous ward no. ……., current ward no. ……., in land parcel no. ……. with area ……. sq. m in …… municipality along with the Supervision Report. During the inspection, non-conformances in the construction work as per the approved designs & drawings have been noticed as per the list attached with this letter. You are hereby requested to immediately stop further construction work and carry out the corrections to bring the construction work in compliance with the approved designs & drawings. After the completion of the correction works, you are required to resubmit the application letter along with supervision report of the correction works for getting the third interim inspection certificate from the municipality. It is notified that the municipality may take actions against you as per the prevailing laws in the event that you fail to carry out the correction works and do further works and the building permit issued to you may be cancelled by the municipality.

……..	……	…….
Prepared by	Checked by	Approved by

Detailed Instruction Sheet for Correction Works

after the Third Interim Site Inspection

Instruction Sheet for the Corrections of Construction Works based on the Third Interim Site Inspection

Ver. 2022/04/26

Issued by: ..... Municipality Date: (2021/.../...)

Issued to:

Building Owner			**Building permit date:(2021/11/01)**			
Building permit no			**Contact no.**		**City**	
Designer Consultant			**Contact no.**		**Town**	
Location					**Ward**	

Supervisor consultant name		Registered No.		Contact no.	
Address		City		Ward	Town:

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Remarks
I.	**Non-conformance relating to Bye-laws Requirements**					
1	..... Zone ..... subzone					
2	FAR (m)					
3	Road width (m)					
4	Right of way (m)					
5	Set back (m)					
6	Site area (m^2)					
7	Plinth area (m^2)					
8	Ground coverage %					
9	Plinth height (m)					
10	Other					
II.	**Non-conformance as per Construction Safety Requirements**					
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				
		Piles higher than one meter is stepped properly.				
12	Flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.),the operator/driver shall ensure the safety of persons and properties.				
16	Passageway (including stair gangways)	Over one meter wide.				
		Not be obstructed.				
17	Near a public place	Fence and suitable warning signs are provided.				
18	Fire Fighting	Adequate fire Fighting equipment is provided.				
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				
		An adequate number and type of fire extinguishers are placed.				

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19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				
		Vertical safety nets are installed. 8m high buildings				
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				
		Adequate barriers and physical guards are provided around excavations.				
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				
		Protection of neighboring properties are provided.				
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				
22	Construction of Roofs	A walking platform is provided over reinforcements.				
III.	**Non-conformance relating to Building information Requirements**					
23	Building category (A,B,C or D)					
24	Building purpose (Residential, commercial, institution, hospital etc)					
25	Number of story					
26	Total height of building (m)					
27	Concrete Mix Used for building					
28	Reinforcement grade					
29	Structural system of proposed building					
30	Other					
IV.	**Non-conformance relating to the 3rd Interim Site Inspection Requirements**					
31	Concrete mix used for					
		Plinth Beams				
		Columns				
32	Concrete test report for					
		Columns/Beams at 2nd interim inspection stages				
33	Layout details					
		There is no deviation on layout from approved design (Beam and slab projections)				
34	Column details					
	Grid A-1	Size of columns (m) eg. 0.35m x 0.35m				
		Height from base of the footing and GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				

		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
	A-2	Size of columns (m) eg. 0.35m x 0.35m				
		Height from base of the footing and GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
	A-3	Size of columns (m) eg. 0.35m x 0.35m				
		Height from base of the footing and GL (m)				
		No. and size of reinforcements N-Dia (in mm) + N-Dia (in mm) (eg. 4-20mm + 4-16mm)				
		Stirrups dia and spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c)				
		Distance between opposite mainbars c/c (m)				
		Concrete cover (mm)				
35		Staircase details				
	Grid C-3	Width of staircase flight (W in m) (eg. 0.4 x 0.25)				
		Staircase incline slab depth (mm)				
		Tread (mm)				
		Riser (mm)				
		Total number of riser				
		Reinforcement in staircase (in mm) @ spacing in mm c/c (eg. 12mm @150mm c/c Both ways				
		Nosing bar				
	Landing beam of stairs	Size of landing beam (D x B in m) (eg. 0.35 x 0.25)				
		Reinforcement in landing beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @ 150mm c/c)				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
		Lapping length (eg. 960mm for 16mm dia)				

		Development length of staircase (mm)				
36		Beam details				
	Grid A-1	Size of plinth beam (D x B in m) (eg. 0.4 x 0.25)				
		Height from Plinth beam (m)				
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
		Lapping length (eg. 960mm for 16mm dia)				
		Development length (mm)				
	A-2	Size of plinth beam (D x B in m) (eg. 0.4 x 0.25)				
		Height from Plinth beam (m)				
		Reinforcement in beam N-Dia (in mm)(T) + N-Dia (in mm)(B) (eg. 3-12mm (T) + 3-12mm (B))				
		Stirrups dia. And spacing Dia (in mm) @ spacing in mm c/c (eg. 8mm @100mm c/c (end) and 8mm @ 150mm c/c (center))				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
		Lapping length (eg. 960mm for 16mm dia)				
		Development length (mm)				
		Floor slab				
37	S1	Thickness of slab (mm)				
		Reinforcement in slab Dia (in mm) @ spacing in mm c/c eg (8mm @150mm c/c bothways)				
		Position of top reinforcement				
		Distance between top & bottom reinforcement (m)				
		Concrete cover (mm)				
38		Before concreting				
		The dirt, grease or other deleterious adhesions are removed from the reinforcement before concrete placement. Reinforcement is not corroded to the point that pitting of the bars is evident				

		Formwork has sufficient structural integrity and compliance to the formwork drawing. Line and level have been checked.				
		Formworks including post, bracing and shores are sufficient and well-fixed to resist concrete poring and compaction activities and leakage possibilities				
		Service conducts (electric and sanitary) are properly provided to ensure strength of structure members				

Prepared by:

.....
Sub- Engineer
Municipality

Checked By

.....
Engineer
Municipality

Approved By

.....
Section Chief
Municipality

A3-6-94

Appendix-40: Instruction for Correction Works after the Final Inspection

……..Municipality

Office of the Municipal Executive

……

Date: ……

Instruction for Correction Works after the Final Inspection

To.

Mr./Mrs./ Ms. ……

……

Dear Sir /Madam,

This is with reference to the final inspection dated ……. undertaken by the municipality in your/your representative's presence as per the application dated …….. submitted by you for the building constructed at previous ward no. ……., current ward no. ……., in land parcel no. …… with area ……. sq. m in …… municipality along with the Supervision Report. During the inspection, non-conformances in the construction work as per the approved designs & drawings have been noticed as per the list attached with this letter. You are hereby requested to immediately stop further construction work and carry out the corrections to bring the construction work in compliance with the approved designs & drawings. After the completion of the correction works, you are required to resubmit the application letter along with supervision report of the correction works for getting the final inspection certificate from the municipality. It is notified that the municipality may take actions against you as per the prevailing laws in the event that you fail to carry out the correction works and do further works and the building permit issued to you may be cancelled by the municipality.

……..	……	…….
Prepared by	Checked by	Approved by

Detailed Instruction Sheet for Correction Works after the Final Site Inspection

Instruction Sheet for the Corrections of Construction Works based on the Final Site Inspection

Ver. 2022/04/26

Submitted by: ..... Municipality **Date: (2021/..../....)**

Issued to:

Building Owner:		**Location:**		**Building permit date:**	
Building permit no:		**City:**	**Ward:**	**Town:**	**Contact no.**
Designer Consultant:				**Contact no.**	

Supervisor consultant name		Registered No.		Contact no.	
Address		City		Ward	Town

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Remarks
I.	**Non-conformance relating to Bye-laws Requirements**					
1	..... Zone ..... subzone					
2	FAR (m)					
3	Road width (m)					
4	Right of way (m)					
5	Set back (m)					
6	Site area (m^2)					
7	Plinth area (m^2)					
8	Ground coverage %					
9	Plinth height (m)					
10	Other					
II.	**Non-conformance as per Construction Safety Requirements**					
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				
		Piles higher than one meter is stepped properly.				
12	flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.),the operator/driver shall ensure the safety of persons and properties.				
16	Passageway (including stair	Over one meter wide.				
		Not be obstructed.				
17	Near a public place	Fence and suitable warning signs are provided.				
		Adequate fire Fighting equipment is provided.				

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18	Fire Fighting	The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				
		An adequate number and type of fire extinguishers are placed.				
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				
		Vertical safety nets are installed. 8m high buildings				
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				
		Adequate barriers and physical guards are provided around excavations.				
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				
		Protection of neighboring properties are provided.				
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				
22	Construction of Roofs	A walking platform is provided over reinforcements.				
III.	**Non-conformance relating to Building information Requirements**					
23	Building category (A,B,C or D)					
24	Building purpose (Residential, commercial, institution,					
25	Number of story					
26	Total height of building (m)					
27	Concrete Grade Used for					
28	Reinforcement grade					
29	Structural system of proposed building					
30	Other					
I.	**Non-conformance relating to Final site Inspection Requirements**					
31	**Building details**					
		As built construction does not deviate from approved design.				
		Complies code and by-laws requirements.				
		The structure is free from undue cracks, settlements, leakage, damping etc.				

		All hinges, Tower bolts, handles are as per specification. Shutters are properly fixed in frames.				
32			Sanitary			
		Sanitary lines checked in designed pressure and found OK. No leakage or damping observed in structure.				
		Sanitary fixtures functioning satisfactorily.				
		Installation of septic tanks				
33			Electrical			
		All electric power points are checked for full capacity functioning and short circuit.				
		Earthing function tested OK.				
34			Clearance of site and surroundings			
		Maintenance of public infrastructure like road, drains, water supply line, etc if affected by building construction works has been completed				

Prepared by:

.....
Sub-engineer
Municipality

Checked By

.....
Engineer
Municipality

A3-6-96

Appendix-41: Pro-forma for Application from the Building Owner for the Final Inspection for getting the Partial Completion Certificate

Date: ……

The Chief Administration Officer

…… Municipality

Office of the Municipal Executive

……

Re: **Request for the Final Field Inspection & Issue of Partial Completion Certificate**

Dear Sir/ Madam,

I/we would like to inform you that as per the permanent building permit issued by the municipality dated …….. for the construction of superstructure and the third interim field inspection certificate dated …….. at ward no. …….., land parcel no. …… with area ……sq. m at …… municipality, we have completed the partial completion of the construction of the building. I/we would also like to notify you that due to my/our unavoidable circumstances, I/we want to stop further construction work of the building at this stage till further notice from my/our side and bring the building to its use. The supervision report prepared by the Supervision Consultant is also attached herewith. So, we kindly request you to arrange for the final field inspection of the constructed building and issue the building construction partial completion certificate to me/us.

…….
(signature)

Name of the Applicant:

Address:

Appendix-42: Site Inspection Checklist for the Partial Completion Certificate

Inspection Checklist for the Final Site Inspection for the Partial Completion

Ver: 2022/04/26

Submitted to: ..... **Municipality** Date: (20.../...../.....)

Building Owner:				**Building permit date:**		
Building permit no:				**Contact no.**		
Designer Consultant:				**Contact no.**		
Location:		**City**	**Ward**		**Town**	

Supervisor consultant name		**Registered No.**		**Contact no.**		
Address		**City**	**Ward**		**Town**	

S.N.	Description		According to Approval Drawing	According to Actual Construction in site	Photo No.	Inspection method *1 A/B/C	Inspection Validation Result P:Pass/F:Fail	Inspection Validation by Municipality P:Pass/F:Fail
I.	**Bye-laws information**							
1	..... Zone ..... subzone					A B C		
2	FAR (m)					A B C		
3	Road width (m)					A B C		
4	Right of way (m)					A B C		
5	Set back (m)					A B C		
6	Site area (m^2)					A B C		
7	Plinth area (m^2)					A B C		
8	Ground coverage %					A B C		
9	Plinth height (m)					A B C		
10	Other					A B C		
II.	**Construction safety information**							
11	Materials store	They are segregated as to kind, size, and length such that they are safe against falling.				A B C		
		Piles higher than one meter is stepped properly.				A B C		
12	flammable liquids like petrol, thinners, etc,	Stored in conformity with the relevant regulations.				A B C		
13	Explosives such as detonators, gun powder, gelatins, etc.,	Stored in conformity with current regulations for the storage and handling of explosives.				A B C		
14	All glass	Sored, cut to size and made ready in a separate, dry and covered yard. The floor of the glass store shall be covered with gunny bags to prevent workers slipping on a smooth floor.				A B C		
15	Dumping the materials	Before it from mechanical equipment (eg, vehicle, crane etc.),the operator/driver shall ensure the safety of persons and properties.				A B C		
16	Passageway (including stair	Over one meter wide.				A B C		
		Not be obstructed.				A B C		
17	Near a public place	Fence and suitable warning signs are provided.				A B C		
18	Fire Fighting	Adequate fire Fighting equipment is provided.				A B C		
		The enough number of fire escapes is provided. -Minimum of one fire escape. -Over four storeys building has two fire escapes. -An additional fire escape per 500 square meters of plinth area.				A B C		
		An adequate number and type of fire extinguishers are placed.				A B C		
19	Safety	Safety helmets(hard hats), goggles, mask, gloves, safety boots, safety belts, ropes and oxygen masks are provided, as needed.				A B C		
		Vertical safety nets are installed. 8m high buildings				A B C		
20	Earthworks in Excavation and Foundation	One meter deep excavation trench. -An escape route is provided at every 20 m of trench. -appropriate precautions are taken against collapse of the walls of the trench.				A B C		
		Adequate barriers and physical guards are provided around excavations.				A B C		
		Support systems such as sheet piling, shoring and strutting etc. are provided to protect excavated slopes, ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.				A B C		
		Protection of neighboring properties are provided.				A B C		
21	Construction of walls	A canvas-covered guard is provided along the thoroughfare for the extent of the wall and for a further distance of 1.2 m past each end of the extent of the construction.				A B C		
22	Construction of Roofs	A walking platform is provided over reinforcements.				A B C		
III.	**Building information**							
23	Building category (A,B,C or D)					A B C		
24	Building purpose (Residential, commercial, institution,					A B C		
25	Number of story					A B C		
26	Total height of building (m)					A B C		
27	Concrete Grade Used for					A B C		
28	Reinforcement grade					A B C		
29	Structural system of proposed building					A B C		
30	Other					A B C		
I.	**Final site inspection**							
31	Building details							
		As built construction does not deviate from approved design.				A B C		
		Complies code and by-laws requirements.				A B C		
		The structure is free from undue cracks, settlements, leakage, damping etc.				A B C		
		All hinges, Tower bolts, handles are as per specification. Shutters are properly fixed in frames.				A B C		
32	Sanitary							
		Sanitary lines checked in designed pressure and found OK. No leakage or damping observed in structure.				A B C		
		Sanitary fixtures functioning satisfactorily.				A B C		
		Installation of septic tanks						
33	Electrical							
		All electric power points are checked for full capacity functioning and short circuit.				A B C		
		Earthing function tested OK.				A B C		
34	Clearance of site and surroundings							
		Maintenance of public infrastructure like road, drains, water supply line, etc if affected by building construction works has been completed				A B C		

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All the above information is correct to my knowledge and if any misinformation is found then I am ready to face the consequences as directed by the municipal's law

Supervision Consultant	Checked By	Approved By
.....	.....	.....
Supervising Engineer On behalf of the owner	Engineer Municipality	Section Chief Municipality

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Appendix-43: Memo for the Issue of the Partial Completion Certificate

…… **Municipality**

Office of the Municipal Executive

Technical Desk/Section

…….

To.

The Chief Administrative Officer

……. Municipality

…….

Re: Issue of Building Construction Partial Completion Certificate

Mr./Mrs./Ms. …….. residing in ward no. …….., …… Tol, …… municipality has submitted application along with the supervision report for getting the **building construction partial completion certificate** for the building in the land parcel with parcel no. ……., having area ……. sq.m., located at ……. Tol, ward no. ……., …… municipality. He/she was issued the permanent building permit for the construction of superstructure through the decision of the municipality dated …… and the third interim field inspection certificate dated …….. . The final field inspection report dated …… has shown that the construction up to the …….. level has been carried out as per the approved designs & drawings in consonance with the building By-Laws & the National Building Code. I hereby submit this memo for the issue of the building construction partial completion certificate of the building to Mr./ Mrs./ Ms. ……. with my recommendation for the same pursuant to the clause 13.3 of the Basic Construction Standards on Settlement Development, Urban Planning & Building Construction 2072.

……..

(Signature)

Name: ……..

Designation: Section Chief

Date: ……

Appendix-44: Sample of the Building Construction

44.1Partial Completion Certificate

…….. **Municipality**

Office of the Municipal Executive

……..

Date: ……

Building Construction Partial Completion Certificate

This is to certify that Mr./Ms./Mrs. …… has partially completed the construction of building as per the details given below after receiving the permanent building permit dated …… from the municipality.

1. Details of the Land Owner & the Building Owners

Name of the Land Owner:
Name of the Building Owner:

2. Details of the Land Parcel:

Land Parcel no. ……..
Cadastral Sheet no. …….
Area of the Land Parcel: ……

3. Address of the location of the Building:

Previous ward no. …….. Current ward no.: ……
Tole/ location name: …….
Name of the Street: ……

4. Building Details:

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h) Structural type of the building: ☐ RCC ☐ Brick masonry in CSM ☐ Stone Masonry in CSM ☐ Steel Farmed ☐ Timber framed

☐ Others: ……

i) Category of Building: ☐ Category A ☐ Category B ☐ Category C ☐ Category D

j) No. of storeys ……
k) Plinth area of building (sq. ft)……..
l) Total floor area of building (sq.ft)……..
m) Permanent Building Permit Certificate no: …… Date:……..
n) Purpose/Use of the Building……

5. Construction Data

S.N.	Floor Level	Actual area of floor
1.	Semi Basement	
2.	Basement	
3.	Ground Floor	
4.	First Floor	
5.	Second Floor	
6.	Third Floor	
7.	Fourth Floor	
8.	Fifth Floor	
9.	Sixth Floor	
	Total Floor Area	

6. Total height of the building above GL (Feet/Meter):……
7. Actual FAR: ……
8. Actual Ground Coverage Ratio: ……..
9. ROW of the adjoining road: ……
10. Actual setback distance from the edge of the adjoining road: ……..
11. Height of building plinth above the nearest road level: ……
12. Distance maintained from the centre line of the road adjoining with the land parcel to the building line: ……
13. Distance maintained from the nearest HV electrical transmission/ distribution line, if applicable: ……
14. Distance maintained from the nearest bank of the river, if applicable: ……
15. Sewage Treatment through: ☐ Septic tank & soak pit ☐ city sewerline
16. Other Details

……	……	……	……
Inspected by	Checked by	Submitted by	Approved by

Appendix-45: Sample Letter to be issued to the Utility Agencies

…….. **Municipality**

Office of the Municipal Executive

……..

Date: ……

TO WHOM IT MAY CONCERN

This is to certify that Mr./Mrs./Ms. …….. residing in ward no. ……., …… Tol, …… municipality has been issued the building construction completion certificate for the building in the land parcel with parcel no. ……., having area …….. sq.m., located at ……. Tol, previous ward no. ……., current ward no. …….. in …… municipality constructed as per the building permit no. …….. dated ……. issued by this municipality. Therefore, we hereby recommend for the issue of utility connections (water supply/ sewerage line/ storm water drain/ electricity connections/ landline telephone/ deep tubewell boring, etc.) to the Building Owner for the afore-mentioned building from your institution as per the prevailing laws and regulations.

……..

(Signature)

Name: ……..

Designation: Chief Administrative Officer

Date: ……

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Appendix-46: Sample of the Request Letter to the Municipality for the Extending the Time of Building Permit for the Construction of Building

Date: ……

The Chief Administration Officer

…… Municipality

Office of the Municipal Executive

……..

Re: **Request for the Extension of Time of Original Building Permit for the Construction Completion of the Building**

Dear Sir/ Madam,

I/we would like to inform you that I/we was/were issued the permanent building permit from the municipality dated …….. for the construction of the building at previous ward no. ……., current ward no. …… in the land parcel no. ……. with area …….sq. m at …… municipality. Due to some unavoidable circumstances, I/we have been unable to complete the construction of the building within the allocated time of two years from the date of issue of the building permit. I /we have completed the construction works up to the foundation/plinth/ ……..… Floor level only. So, I/we kindly request you for extending the time of original building permit by another 2 (two) years and issue me/us the building permit time extension certificate. Copy of the voucher/receipt of the payment of the fee for the time extension is attached with this application.

……

(signature)

Name of the Applicant:

Address:

Appendix-47: Notification Letter on the Extension of Time of Building Permit for the Construction of Building

……..Municipality

Office of the Municipal Executive

……

Date: ……

Notification on the Extension of Time of Building Permit for the Construction of Building

To.

Mr./Mrs./ Ms. ……

……

……

Dear Sir /Madam,

This is with reference to your application dated ……. filed by you/your representative for the construction of building at previous ward no. ……., current ward no. ……., in land parcel no. …… with area ……. sq. m in ……. municipality along with the copy of the original building permit no. ……..…….. dated …… . After the field verification work and necessary checking carried out by the Technical section of the municipality, you are notified that the municipality has made a decision, pursuant to the Clause 38 sub-clause 3 of the Local Government Operations Act 2074, to extend the time of the original building permit issued to you for the afore-mentioned construction by another 2 (two) years starting from the date of the registration of your application. You are hereby requested to take all measures to complete the construction of the building within the now extended building permit date.

……..

(Signature)

Name: ……..

Designation: Chief Administrative Officer

Date: ……

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