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Development and Implementation of National Building Code in Nepal: EXPERIENCES AND CHALLENGES



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- History Of Building Code Development
- Unique Approaches And Contents Of Nepal Building Code
- Code Implementation Experiences: Successes, Silver lining & Challenges
- Challenges Posed By April 2015 M7.8 Gorkha Earthquake
- Why I Am Here? What Requests I Am Making?



BUILDING CODE DEVELOPMENT IN NEPAL

- M6.6 Udaypur Earthquake of 1988 Trigger
 - 721 Death
 - >100,000 buildings damaged / destroyed beyond repair
 - Revived memories of Bihar-Nepal M8.3 Earthquake of 1934
- Government of Nepal, Ministry of Housing and Physical Planning developed with UNDP/UNCHS support
- Prepared in 1992-1994, NZ experiences adopted
- Seismic Hazard Mapping & Risk Assessment done as a part of Building Code Development Project



Understanding The Hazard

Earthquake Sources

Faults

Maximum Magnitude

- 92 Individual Active Faults or Fault Segments
- 3 Fault Systems: MCT, MBT, HFF
- 3 Tectonic Areas: Higher/Tethyan Himalayas, Lesser Himalayas, Indo-Gangetic Plain
- Point and Arial Sources
 - 3 Seismic Areas
 Maximum Magnitude and Depth
 - From North to South
 - Deep, Moderate and Shallow Subduction Zones
 - Within and 150 km Surrounding Nepal
 - Scale of Mapping 1: 500,000 to 1: 50,000





NEPAL NATIONAL BUILDING CODE, 1994



NEPAL NATIONAL BUILDING CODE NBC 105 : 1994



SEISMIC DESIGN OF BUILDINGS IN NEPAL

His Majesty's Government of Nepal Ministry of Physical Planning and Works Department of Urban Development and Building Construction Babar Mahal, Kathmandu, NEPAL



2060

http://www.dudbc.gov.np/building.php



BUILDING & CODE CATEGORIES

LEVEL I	International State of Art	MANDATORY MINIMUM for use of ALTERNATIVE METHODS other than that of LEVEL II. User – International Consultants for large projects
LEVEL II	Professionally Engineered Buildings (17 materials and Process Standards)	Minimum Standards (material and construction process). Covers all Buildings > 3 stories or Plinth Artea > 1000 sq ft. User – Professional designers and Municipal Building Inspectors
LEVEL IIII	Mandatory Rules of Thumb	Pre-engineered design for buildings < 3.5 stories & Plinth Area <1,000 sq. ft. User: Petty contractors, Engineering technicians, Municipal decision makers
LEVEL IV	Guidelines for Remote Rural	Guidelines for Stone/Brick masonry, timber, Bamboo, and other traditional materials. Users: Village Contractor, House-owners, masons



APPROACHES ADOPTED (1)

- Link Code to the hazard : Acceptable level of risk defined more or less
- Cover entire building stock and construction methods used in country
 - All materials
 - All production process (formal, informal, owner-driven)
- Step by step from nothing to something
- Closeness with Indian Building Code recognized, accepted, respected



APPROACHES ADOPTED (2)

- Enforcement through Legislative process
 - making NBC mandatory rather than a good practice alone
 - Enforced legally in all urban and urbanizing settlements (2005)
 - NBC owned by Central government, Implementation responsibility by municipalities
- Building classification : typology, # stories, Plinth Area
 - Rural need guideline
 - Less than three stories, less than 1000 sqft plinth area
 - More than 3 stories, >1,000 sqft plinth area
 - Complex buildings (Palaces, hotels, etc)
 - Modern materials



DIFFICULTIES IN IMPLEMENTATION (1)

- Intent not understood by a majority of engineering graduates and architects
 - Not taught in engineering classes, hence confusion
- Conflict of responsibilities between ministry (authority) and municipalities (responsibility)
- Conflict in concept who is responsible (Professional designers) and who can implement (contractors)?



DIFFICULTIES IN IMPLEMENTATION (2)

- Primary purpose of code is
 - Safety generation or revenue generation?
- Who demands and who supplies?
 - Capacity of demand and supply
- Misunderstanding, confusion, fear
 - Increased costs, additional bureaucratic hurdle
 - Complexity in building permit process & delays
- Instrument of governance



MAIN PROBLEMS

- Lack of adequate demand
 - Low awareness
 - Policy for enforcement
- Low supply capacity in builders, municipalities and ministries
 - Planning bylaw vs Code
 - Institutional mechanism lacking
- Mind-set why go out of comfort zone?



MAIN PROBLEMS

- Code not explained to the people, so low/no demand
 - Source of conflict between politician and people
- Engineers consider it a technical issue of design and not a safety issue for people
- Building Code (BC) not taught in Engineering classes as of TODAY!
- BCI yet not into professional discourse
 - Peer review, professional liability, third-party monitoring



CHALLENGES

- Roles of Academia, developers / implementers, designers, governments Define!
- Enhance Municipal Institutional Capacity
- Improve Municipal process and structure
 - Building code stipulations into the Building Permit Process
 - Planning Bylaws (norms, FAR, Height, Ground coverage etc) and code requirements
- Consider Local specificity
 - Historical monuments of Kathmandu Valley
 - Need for Risk Sensitivity Land use planning
 - Microzonation, etc



SILVER LINING ..SUCCESS CASES

- Small town of (Eq. affected) Dharan started serious and successful implementation early on in mid-1990s
- Transparency and education paid!
- Myths and realities compared! Learning process assisted by NSET through continued collaboration
- A process for implementation developed and learned in about a decade



SILVER LINING - EFFORTS BY MINISTRY OF LOCAL DEVELOPMENT

- Need & potential recognized, strategic interventions identified and enacted
- Municipal performance monitoring Building code enforcement as one of the minimum criteria of success MCPM
- Building Code promoted as a cross-cutting issue in municipal governance
- Budget allocated, reform process enacted
- Positive environment after recent earthquake



Situation after the Gorkha Earthquake

- Earthquake triggered controversies
 - Blame game
- Need for Code Revision re-surfaced with confusion
 - Is it a technical issues or a social issue?
- Need for standards for repair/retrofitting
- Apparent rush vs learning / evaluation of potential outcome & impact



Need for Code Revision

- The Building Code in 1994 had a focus was on low-rise buildings only
- Now, high rise buildings coming up; existing code provisions problems, especially on:
 - Load combinations
 - Seismic load distribution
 - No cut off after minimum acceleration in the response spectra



Need for Nepal NBC Revision

- Consider a 300-yr return period vs a 500 return period
 - Consider proliferation of concrete buildings now
 - Increased average economic life of buildings
- Revisit the current stipulations: much higher demand to unreinforced masonry buildings, and very low demand to reinforced concrete buildings
- Incorporate geotechnical foundation design requirements including specially for high-rise buildings
- The pre-engineered approach for Mandatory Rules of Thumb (MRT) should be revised compatible to the present-day understanding, and
- Incorporate global learning on materials, technology etc. in the past two decades



Rational Approaches for Code Revision

- Update understanding on Seismic Hazard and Risks
 - Understand the (strange) behavior of the earthquake
 - Update seismic hazard mapping and risk assessment
- Conduct detailed Seismic Microzonation of larger urban areas
 - Develop Risk sensitive Land use Planning
 - Develop commensurate requirements for geotechnical site investigation
 - Learn from Global knowledge and practice on dealing with issues of seismic hazard, geo-technics, structures, environmental etc.
- Consider economic implication
 - Revisit acceptable level of risk or
 - Consider the political / economic implications

NSET

Implementation Vs. Revision

- Only Implementation enhances safety!
- Revision is easy, Implementation is the main challenge!
- Good efficient implementation of current form of code, even without revision, can enhance safety significantly
 - From current baseline to 80%+ for many buildings excluding high rises.
 - The envisaged revision of the code is to enhance safety from 80% to 90-95%.

 FOCUS ON IMPLEMENTATION STRATEGY IMPROEMENT



I AM HERE TO LEARN HOW TO LEARN & ASSIST (1)

- April 2015 (M7.8) Gorkha Earthquake affected
 - 800,000 buildings to G4 and G5
 - Many more damaged G1 to G3
- NSET is advising Nepal Government on reconstruction
 - Opportunity / Responsibility to learn from Global experience

 Opportunity to IMPLMENT Building Code to ONE MILLION Buildings in 5 Years!



I AM HERE TO LEARN HOW TO LEARN & ASSIST (2)

- NSET facilitating national partnership
 - Central Government & municipalities; Academia, private sector consultants, research institutions
 - Significant USAID/OFDA supported Agreements
- Want to develop and strengthen
 Partnership with ICC, USGS, US Academia, Nepalese diaspora, others
- Want to establish ICC Nepal Chapter?

Thank You!