Report of the Expert Technical Committee on Techno Legal Regime in Disaster Management under GoI-UNDP-DRR Programme

RECOMMENDATION FOR THE AMENDMENT OF KERALA MUNICIPALITY BUILDING RULES, 2013

Submitted To

The Department of Revenue & Disaster Management

Government of Kerala

Through Proper Channel: KSDMA

Submitted By

GoI-UNDP-DRR Programme

2013

Report of the Expert Technical Committee on TLR in Disaster Management formed by the Department of Revenue and Disaster Management, Government of Kerala

1. Background

Based on the lessons learnt from GoI-UNDP Disaster Risk Management Programme implemented in 17 States and UN Tsunami Recovery Support (UNTRS) initiatives implemented in the state of Kerala (2007-09), recommendations of the evaluations conducted, priorities identified in the Eleventh Five Year Plan, provisions of the National Disaster Management Act 2005, Hyogo Framework for Action (HFA) and UNDP's global mandate, a new Disaster Risk Reduction Programme (2010–12) with an outlay of $ 20 million has been formulated by UNDP. DRR programme envisages supporting Central and State Government programmes by providing inputs that would enhance the efficiency and effectiveness of the efforts in Disaster Risk Reduction. This programme, started in January, 2010 in Kerala state, would focus on disaster risk reduction and has essentially two components:

A. Strengthening SDMA and DDMAs to full fill the responsibilities stipulated in the National DM Act (2005) implemented by NDMA with an outlay of 63 crores.

B. Urban risk reduction undertaken by strengthening the Institutional Emergency Response Capacity and community based institutions for DM implemented by Ministry of Home Affairs with an outlay of 37 crores.

One of the key deliverables of Urban Risk Reduction Programme implemented by MHA at central level and The Department of Revenue and Disaster Management in close collaboration with LSGD at the state level is strengthening enforcement of building codes, by-laws and development control regulations focusing on:

- Review/update/amend building by-laws, codes and development of control regulations/land use planning enactments and their applications.
- Establishment of appropriate regulation/legislation and development framework to enforce building by-laws and codes.
- Involvement of public and private construction fraternity.
- Reinforcement of techno-legal regime for earthquake risk mitigation.

Kerala government emphasised the need for a techno-legal regime in the Kerala state Disaster Management Policy.(cl. ***6.6 Techno – Legal Frameworks:*** *The state government will follow national building codes and other codes as laid down by Bureau of Indian Standards. Relevant departments / District Administrations / local authorities shall ensure that existing building bylaws, land use zoning regulations and development control regulations correspond to the requirements for safe construction as laid down by various agencies such as Bureau of Indian Standards (BIS) for seismic zone III.)*

2. Introduction and Formation of Expert Technical Committee

In 2004, Ministry of Home Affairs, GoI had appointed an Expert Committee for formulating amendments in the development control regulations and building by-laws with its secretariat at Building Material Promotion Council (BMTPC) under the chairpersonship of Prof. A.S Arya; National Seismic Advisor to Ministry of Home Affairs. The committee submitted its report to MHA in May 2004 which covered four important aspects as follows:-

1. Amendments in the Town and Country Planning / Urban Development Acts.

2. Land use zoning regulations
3. Development Control Regulations
4. Building Bylaws

The report after getting due consideration and approval from the Ministry of Home Affairs was sent to the Chief Secretaries of all States and UT's to constitute Expert Committees to implement these amendments in their States.

Under GOI – UNDP Urban Risk Reduction Programme, the **Department of Revenue and Disaster Management and The Department of LSGD**, **Kerala State** have constituted a state level **Expert Technical Committee (ETC)** to review the recommendations put forwarded by Prof. Dr. A.S. Arya- National Seismic Advisor to Ministry of Home Affairs towards **amending Building By-Laws for a techno legal regime** for disaster management in the state of Kerala through a G.O (Rt) No. 2204/2011/DMD, dated 08/04/2011, Thiruvananthapuram. The ETC have 15 members under the chairpersonship of Dr. Nivedita P Haran IAS, then Additional Chief Secretary, Revenue and Disaster Management. Members of ECT represent government departments and technical educational institutions. The members of the ECT are,

1. Shri R.K. Singh, Secretary LSGD
2. Smt. Latha C.A, Honorary Secretary, KSDMA
3. Mr. K. Sundaran, Chief Engineer (Design & Admin), PWD
4. Shri Eapen Varghese- CTP, LSGD
5. Dr. K.G. Thara, Head & Faculty, DMC, ILDM
6. Smt. T.M. Sudha- STP, LSGD
7. Smt. Ann Jacob- STP, LSGD
8. Dr. S. Sheela- HoD, Dept of Civil Engineering, College of Engineering Thiruvananthapuram
9. Dr. E.V. Nampoothri, Principal, Baselios Mathews II College of Engineering, Sasthamcotta, Kollam.
10. Prof. Dr.Balan, Geotechnical Engineering, College of Engineering Thiruvananthapuram
11. Prof. Dr. Ruby Abraham, Structural Engineering, College of Engineering Thiruvananthapuram
12. Shri John Mathai, Scientist, CESS, Thiruvananthapuram
13. Dr. S. Chandrakaran, HoD, Department. of Civil Engineering, NIT Calicut
14. Dr.Yacub Mohan George, Prof. Department of Civil Engineering, Jai Bharath College of Management & Engineering Technology, Ernakulam
15. Mr. Rahul Leslie, Assistant Director, Buildings Design, DRIQ, O/o the Chief Engineer (Design & Admin), PWD

Secretary KSDMA was the convener and Chief Town Planner (CTP) LSGD was the Team Coordinator under the chairpersonship of Additional Chief Secretary, Revenue and Disaster Management, GoK. Shri. Eapen Varghese, CTP, LSGD also acted as team leader for the Town Planning sub-group, Dr. Yacub Mohan George was the team leader for the Structural Safety sub-

group and Dr. Balan was the Team leader for Geo technical safety sub-group. Members of the three sub-committees namely; Town Planning; Structural and Geo technical are mentioned in the table below:

Sl. No.	Name of sub-committee	Name of committee head and members
1.	Town Planning	1. Shri. Eapen Varghese (Team Leader) 2. Smt. T.M. Sudha (Member) 3. Smt. Ann Jacob (Member)
2.	Structural Safety	1. Dr. Yacub Mohan George (Team Leader) 2. Mr. K. Sundaran (Member) 3. Dr. S. Sheela (Member) 4. Prof. Dr. Ruby Abraham (Member) 5. Dr. E.V. Nampoothri (Member) 6. Mr. Rahul Leslie (Member)
3.	Geo technical	1. Dr. Balan (Team Leader) 2. Dr. K.G. Thara (Member) 3. Dr. S. Chandrakaran (Member) 4. Shri. John Mathai (Member)

The entire coordination and liaisoning work of Techno Legal Regime in Disaster Management was done by Shri. Ramesh Krishnan, Programme Co-ordinator of GoI-UNDP-Urban Risk Reduction Programme, Government of Kerala.

3. Overall Aim of the ETC

The overall aim of the ETC / Study by ETC is disaster risk reduction and mitigation in the state of Kerala through enactment and effective enforcement of an appropriate techno-legal regime.

4. Objectives of the ETC / study by ETC

4.1 Review the recommendations of Professor A. S. Arya, National Seismic Advisor; Ministry of Home Affairs, GoI and submit expert opinion on adopting Prof. A. S. Arya's recommendations in Kerala Building Rules.

4.2 Propose amendments in Kerala Municipal Building Rules for strengthening Techno - Legal Regime in the State for disaster management.

5. Scope of the study

5.1 Review and redefine the terminology used by Prof. A.S. Arya and the classifications of buildings based on state specific state of affairs.

5.2 Study the existing safety provisions including accessibility, road alignment, parking facilities, right of way etc., of high rise / lifeline buildings / special buildings and other occupancy type buildings provided in existing Building Rules and its enforcement and compliance and submit recommendations to be incorporated in Building Rules for strengthening the safety provisions and ensuring its compliance taking into consideration the vulnerability of the State to various natural and human-induced disasters.

5.3 Explore the existing hazard Zonations (developed by CESS, BMPTC etc) and based on the same, appraise the general content and zoning practices of the Master Plans prepared by

Town Planning Department and suggest modifications on zonation and recommend zoning regulations to be fit in to Master plans. Suggest norms for restricting development activities in areas vulnerable to natural disasters.

5.4 Suggest stipulations for safe guarding drainage lines in Master Plans in order to reduce flood risk, analysing the drainage of cities (available in GIS platform).

5.5 Study the existing norms for undertaking soil investigation and provisions in Prof. A. S. Arya's proposal on soil investigation and submit recommendations to be incorporated in Building Rules.

5.6 Study the impact of construction activities in wetland/paddy land and suggest norms for regulations in the context of Kerala conservation of Wetland and Paddy land Act.

5.7 Review and modify the forms suggested by BMPTC/ Prof. A.S. Arya stipulated for application for sanctions related to construction activities.

5.8 Review the experience and qualification of professionals to evaluate the safety of structures (structural engineer, construction engineer, geotechnical engineer, safety engineers etc) recommended by Prof. A.S. Arya and suggest modifications considering the special situation in Kerala.

5.9 Suggest norms and specifications for ensuring quality control in construction and its assessment in construction activities/sites.

5.10 Review existing rules for renovation particularly of lifeline buildings and look for incorporating retrofitting aspects and suggest modification in this regard.

5.11 Suggest capacity building training (technical) programmes for officials and construction fraternity for enforcement and adherence to safe construction practices.

6. Key deliverables / expected outputs

6.1 Proposed amendments and recommendations for amendments submitted to the Government for amending Kerala Municipal Building Rules to incorporate provisions addressing safety from disasters in construction and measures for effective enforcement of such provisions, based on recommendations of Prof. A.S. Arya.

6.2 Recommendations submitted to Government on zoning regulations in City Master Plans based on hazard Zonations to ensure development control regulations in areas vulnerable to disasters.

6.3 Suggestions for simplifying various forms for certifications, suggestions regarding the technical competency of professionals supervising construction activities and issuing certifications, and suggestions on capacity building of various stakeholders on safer construction practices and enforcement submitted to Government.

6.4 Guidelines for ensuring quality control in construction activities prepared and submitted to Government to be incorporated in Building Rules.

6.5 Guidelines for retrofitting of old lifeline buildings is prepared and submitted to Government to be incorporated in Building Rules.

7. Methodology of the study

The methodology to be adopted in the study is defined in the following two ways;

7.1 Desk review of the recommendations of Expert Committee under chairpersonship of Prof. A.S. Arya and National Building Code 2005 for formulating amendments in building Rules and development control regulations.

7.2 Desk review of Kerala Municipal/ Panchayat Building Rules from a disaster risk reduction point of view and evaluate the same based on the recommendations of Prof. A.S. Arya.

7.3 Pilot Studies to collect first-hand information through field investigation, wherever/ if necessary

8. Sub Committees

To effectively carry out the proposed study and to submit the recommendations to the government in time, the ETC will divide in to three sub-committees as given below. The responsibilities of each sub-committee are narrated below.

1. **Structural Safety Committee:** Evaluate the issues related to structural safety; suggest modifications to the existing practices if any needed; review various forms used for submitting applications for constructions; recommend the qualifications/experience/competency or role of structural design engineer/agency; Formation of structural design review panel for proof checking of the application to be submitted along with the application for building permit; recommend norms for maintenance and retrofitting of lifeline/special buildings etc.
2. **Geotechnical Committee:** Prepare the format for soil investigation report; recommend norms for taking in to consideration drainage channels in master plans; recommend zoning regulations based on hazard zonation and earthquake/flood potential etc.
3. **Town Planning Committee:** Town planning related issues; modification of building rules and development of control regulations based on safety concerns etc.

All the three sub-committees have met several times and prepared separate reports. These reports were discussed in common forum and the reports were consolidated and reviewed. The final report (DRAFT) is submitted here with for further necessary action.

As per the National Building Code 2005 and Model building code of NDMA, the building construction is to be regulated by a **Techno Legal Regime**. The Owner / builder should enter in to an agreement with Professionals like - 1) Architect or Engineer-on-record (who plans the building), 2) Structural Engineer-on-record and 3) Construction -engineer -on-record to ensure that the buildings are constructed as per IS codes & NBC 2005.

Construction safety is given importance in the National building code. Construction engineer-on-record is responsible for the safety during construction. Form work & scaffolding design is to be done before the work starts, especially if the height is more than 10 m. *(If the form work was designed & checked properly, the accident that occurred in the Arroor Church could have been avoided and 2 lives could have been saved).*

Life line buildings& high priority buildings - Hospitals and assembly halls (auditorium, schools, collages, Malls) are to be designed and constructed in such a way that they can be occupied even after earthquake. Stringent design codes are to be followed. **Structural audit** of existing hospitals are to be done periodically and **seismic retrofitting** is to be done, if required.

As per the National Disaster Management Guideline, for the **Management of Earthquakes**, (Ch. 4 & 5) Structural safety audit of life line structures is to be done. As per the guideline all state

Governments/SDMA will adopt the model techno – legal framework for ensuring compliance of earthquake – resistant designed construction practice. MHA has circulated Model Bye – Laws to the state governments for review of the bye – laws currently in force and ensuring adaption of the model bye – law circulated by MHA.

Hospitals should be **fully operational** immediately after an earthquake. The medical equipment's A/c ducts, pipelines, false ceiling, shelves, racks, structural glazing works etc done in hospitals are to be fastened to the wall properly, so that they do not fall down during earthquakes. These are to be inspected and certified periodically to ensure safety. *(Study conducted in Kochi by UNDP & PWD shows that the 70% of the hospitals in Kochi are not designed as earthquake resistant structures).*

Proof checking of design of high rise buildings and major projects – Structural design of life line buildings, buildings taller than 7 stories and major projects are to be scrutinised to ensure compliance regulation and earthquake code compliance by ULBs.

Licensing and Certification of professionals – All professionals dealing with safety aspects of buildings and structures will be certified through a licensing process. Compliance certification of design and construction by the professionals is mandatory. Model building rule & NBC has listed out the qualifications and competency of these professionals in detail. An attempt is made in this report to rationalise the qualifications with respect to the existing KMBR so that the interest of all the stake holders presently working at different levels can continue to function.

Powers of NDMA & SDMA

As per cl. 6& 10 of the Disaster Management Act, NDMA has the powers to issue guidelines to state governments. SDMA has the power (cl.18 & 22) to direct the Town and country planning department to amend the Kerala Municipal building rules, in line with the Model building rules and NDMA guidelines for earthquake Management. SDMA has the powers (Cl. 56) to take action against an officer who refuses the duty &implement the direction of the SDMA / NDMA.

We thank all the members of the Expert Technical Committee who have spent their valuable time and energy for making draft recommendations for Techno – Legal – Regime in Disaster Management including ensuring safer construction practices and safety in construction field. We once again whole heartedly thank each and every members for their active participation and contribution for bringing out this document and endorse the hard work exhibited by all.

Team Coordinator

Shri. Eapen Varghese

Certification

We the below mentioned members of Expert Technical Committee (ETC) on Techno Legal Regime in Disaster Management constituted by the Department of Revenue and Disaster Management, Government of Kerala vide G.O (Rt) No. 2204/2011/DMD, dated 08/04/2011 do hereby certify that, the recommendations suggested to amend Kerala Municipal Building Rule under three sub-committees namely; Town Planning; Geotechnical and Structural Safety has been done in good faith and to incorporate disaster management components and safety concerns in the Municipal Building Rule of Kerala as per NDMA norms. The suggested recommendations may be considered by The Government of Kerala to ensure techno legal regime in disaster management is included in all amendments of Kerala Municipal Building Rule.

Name of sub-committee	Name of sub-committee leader and members	Signature
Town Planning	Shri. Eapen Varghese (Team Leader)	
	Smt. T.M. Sudha (Member)	
	Smt. Ann Jacob (Member)	
Structural Safety	Dr. Yacub Mohan George (Team Leader)	
	Mr. K. Sundaran (Member)	
	Dr. S. Sheela (Member)	
	Prof. Dr. Ruby Abraham (Member)	
	Dr. E.V. Nampoothri (Member)	
	Mr. Rahul Leslie (Member)	
Geo technical	Dr. Balan (Team Leader)	
	Dr. K.G. Thara (Member)	
	Dr. S. Chandrakaran (Member)	
	Shri. John Mathai (Member)	

Part 1: Recommendation of Sub-Committee (Town Planning)

Introduction

Every single disaster that may occur can cause massive damage to human lives and properties. For those who live in disaster prone areas in the state, reduction of damages in any disaster is one of the urgent issues. The risk of any disaster is ever increasing as urbanisation is adding extra pressure on building construction.

The impact of any disaster on livelihood of people can be reduced by measures such as adherence to disaster proof design and construction standards, proper planning, education and training. The present goal is to review and recommend amendments to the existing building rules and development regulations, discussing in detail the town planning related issues such as access, open spaces, safety provisions for high rise buildings and parking facilities.

REVIEW OF PRESENT PROVISIONS IN THE KERALA MUNICIPALITY BUILDING RULES 1999 EVALUATING IT BASED ON THE PROVISIONS OF NATIONAL BUILDING CODE 2005

I. Safety Provisions regarding Access

Table 4.2 of Rule 33 of KMBR 99 stipulates the various minimum clear widths of access to a building and plot as well as the width of the street giving access to the plot from the main street in general, for all occupancies based on two restrictive criteria i.e. in ranges of the total floor area of the building and the number of storeys. For lesser floor areas, based on the no. of storeys and the built up area, access widths from 1.2m-5m are stipulated. For buildings with total floor area upto 12000m² and having 61-90 units in the case of A1 occupancy and upto 8000 m² and four storeys in all other occupancies, the minimum access width stipulated is 6m. An access width of 8m is prescribed for constructions with total floor area in the range of 12000 m² to 16000 m² in A1 occupancy and in the range of 8000 m² to 12000 m² for all other occupancies. For large constructions with a total floor area of 16000 m² for A1 occupancy and 12000 m² for all other occupancies, a higher access width of 10m is stipulated in the present rules.

In addition to this, special rules are stipulated with regards to access in the G1, G2 (Industrial), H(storage), I1, I2 (Hazardous) occupancies in KMBR rules 57(5), 58 (3b) and 59(4) respectively taking into consideration the safety aspect. With respect to high rise buildings, Rule 116 stipulates that the minimum access width required shall be 7m.

In the case of planned residential plot subdivision, access width of minimum 6m is stipulated where the total extent of land is more than 2 hectares. Rule 27(iii) further directs that every street in the layout shall not be less than 7m. In the case of commercial and industrial plot subdivisions, the minimum width of every new street giving access to the commercial precinct is stipulated as 7-10m in Rules 28 (i) and 29 (i) respectively.

When compared to the stipulations in National Building Code 2005, the provisions in the Kerala Municipality Building rules 99 with regards to access are very less. It must be noted that Para. 4.3.1 of Part 3 Development Control Rules and General Building Requirements in the National Building Code, stipulates a minimum 6m access width for developments on any plot. Furthermore, it mandates that for all industrial buildings, theatres, cinema houses, assembly halls, stadia, educational buildings markets, other buildings, which attract large crowd, the means of access shall not be less than 12m.

Also from the safety point of view Para 3.4.6.1 of Part 4, Fire and Life Safety stipulates a minimum 12 metres wide access for highrise buildings and the width of the main street on which the a high rise building abuts shall not be less than 12 metres and one end of this street shall join another street not less than 12 metres in width. It further stipulates that the road shall not terminate in a dead end; except in the case of residential building, upto a height of 30 metres.

It is with due regard to the general lower width of streets prevailing and the settlement characteristics of the state, such a reduced street/access width standard is adopted in the Kerala Municipality Building Rules from the National Building Code 2005.

However, based on the concerns raised by different stakeholders, revising the maximum access width from 10m to 7m is now under the consideration of the Government.

II. <u>Safety Provisions regarding Setbacks/ Open spaces</u>

Rule 26 of KMBR99 prohibits any construction abutting public roads such as National Highways, State Highways or other roads notified by the Municipality. This is in accordance to provisions contained in sn.383A of the Kerala Municipality Act 1994.

Rule 24 of KMBR 99 stipulates in general the mandatory open air spaces required for any building from safety, environment and aesthetic point of view. Every building upto 10m height requires a minimum front yard of 3m, rear yard of 2m and side yards of 1 and 1.2m. For buildings above 10m in height, in addition to the minimum front, rear and side open spaces required for a 10m height building, an increase at the rate of 0.5m for every 3m height exceeding 10m is stipulated.

Higher setbacks deviating from rule 24 are stipulated considering the safety aspect and other necessities for certain occupancy buildings. Rule 54(3) stipulates that all buildings upto 10m height under Group B Educational, C Medical, E Office and H Storage occupancies shall have the following minimum open yards:

(i) front yard- average 6m with minimum 4.5

(ii) side yards- average 2m with minimum 1.5m

(iii) rear yard – average 3m with minimum 1.5m

Furthermore rule 55(2) of KMBR99 prescribes the following open spaces in ranges of total floor area for Group D Assembly occupancy as below:

Floor area in the range	Minimum open space
300m²-500 m²	(i) Front yard – average 6m with min. 4.5m (ii) Side yard – average 2m with min 1.5m (iii) Rear yard- average 2m with min. 1.5m
500m²-800 m²	(i) Front yard – average 7.5m with min. 5m (ii) Side yard – average 4m with min 1.5m (iii) Rear yard- average 3m with min. 1.5m
Above 800 m²	(i) Front yard – average 10.5m with min. 6m (ii) Side yard – average 5m with min 1.5m (iii) Rear yard- average 3m with min. 1.5m

With regards to Group G1 Industrial occupancy, a front yard of 7.5m, side yard of 3m and rear yard of 7.5m is stipulated for a 10m high building in Rule 57(4). Finally Rule 59(3) stipulates 3m minimum open yard all around the building in the case of Group I1 hazardous building and an open yard of 7.5m all around the building in the case of Group I2 hazardous building.

The open space provisions mandatory for a building is further constrained based on the width of the road in Rule 25. The minimum distance between the central line of the street and any building is regulated as 5m. This is in accordance to Para 8.2.1.1.(b) of 'PART 3, Development Control Rules and General Building Requirements'(page 23) of NBC 2005.

Adequate open space around any building is further regulated by the maximum permissible FAR and coverage. KMBR99 Rule 31 stipulates the maximum permissible coverage and FAR for various occupancies. Specific FAR which may vary from the values prescribed in KMBR99 is stipulated in Town Planning Schemes based on the existing density and development pattern of the urban area.

Para 8.3 of Part 3 Development Control Rules and General Building Requirements in NBC regulates the open space around the building in the case of educational building, institutional buildings to not less than 6m. It further stipulates that the open space at front shall not be less than 12m and the other open space around the building shall not be less than 6m. Furthermore, Table 2 of 'PART 3, Development Control Rules and General Building Requirements' (page24) of NBC stipulates a maximum open space of 16 m for buildings of height 55m or more.

It is with due regards to the settlement pattern and density of urban areas of the state, a lesser standard for open spaces is adopted in KMBR compared to NBC provisions. Moreover, it is under the consideration of the Government to limit the mandatory open space/yard around a building to 16 metres.

III. Safety Provisions regarding High rise buildings

As per rule 110 of the Kerala Municipality Building Rules, a high rise building is defined as a building having more than four floors and or 15m of height which is in accordance to para 2.25 of Part 4, Fire and Life Safety of NBC, which stipulates that a highrise building shall be a building 15 metres or above in height.

The maximum height of any building is restricted based on the width of the street in Rule 32. This rule is in accordance to Para 8.2.4 Part 3 Development Control Rules and General Building Requirements which stipulates that the front open space would govern the height of the building.

Regarding access width, Rule 116 mandates a minimum width of 7m access to a high rise building and plot. As highlighted above, Para 4.6 of Part 3 Development Control Rules and General Building Requirements and Para 3.4.6.1 of Part 4 Fire & Life safety of the NBC2005 stipulates a minimum 12 metres wide access for high-rise buildings. The rules also stipulate that one end of this street shall join another street not less than 12m in width. It is with due regard to the general lower width of streets prevailing and the settlement characteristics of Kerala, such a reduced street/access width standard is adopted for high rise buildings in the Kerala Municipality Building Rules 99.

With regards to the safety point of view, of the open spaces provided for a high rise building as per KMBR, rule 117 mandates a clear motorable open space of minimum 5m all around the building. NBC 2005 states that the approach of the building and open spaces on all its sides upto 6m width and the layout for the same shall be done in consultation with the Chief Fire Officer of the city and the open space shall be kept free of obstructions and shall be motorable. The regulation of 5m open

motorable space around a high rise building is adopted in KMBR 99 with due regards to the lack of built up space and high density of urban areas.

Rules 112 – 115, 118,119 of KMBR99 prescribes the safety provisions regarding staircase, guard rails or parapets, fire escape stairway, ducts, lifts, parapets to terrace floor, for a high rise building.

Structural safety and soundness of high rise buildings are regulated under Rule 120 of KMBR. This rule stipulates that the application for construction or reconstruction or addition or alteration of any high rise building shall be accompanied by one set of structural design including that regarding seismic forces as per the provisions contained in NBC as amended from time to time and drawings and a structural stability certificate prepared and issued by a registered engineer. In addition to this, rule 120B (4) regulates that adequate safety measures as in PART VII 'Constructional practices and safety' in NBC of India 2005 is ensured by the owner and the developer for protection against damage to health, life, buildings and property on the inhabitants around, during and after building construction and land development.

Furthermore, rules 120A and 120B ensures adequate safety measures to be undertaken while the high rise building is being constructed.

IV. Safety Provisions regarding Parking facilities

The present provisions in KMBR99 mandates an area of each off street parking space provided for motor cars to be 15m² (i.e. 5.5mx2.7m). This is in accordance to para. 10.3 Part 3 Development Control Rules and General Building Requirements which stipulates a minimum car parking space of 3m x 6m when individual parking space is required and 2.75mx5m when common parking is required.

The general occupancy wise parking provisions are detailed in Rule 34 of KMBR99. The parking standards adopted in KMBR take into consideration the narrow street widths of the State which does not provide any scope for on-street parking. In addition to the mandatory off street parking provisions for motor cars, rules are stipulated for accommodating 2-wheeler parking for all buildings. Considering the high growth in automobile ownership and change in lifestyles along with the narrow street width, 15% additional parking space is allotted for visitors parking in apartments.

V. Telecommunication Towers

Rules stipulated in Chapter XIX of KMBR 99 ensure the structural stability and soundness of Telecommunication Towers. Structural stability certificate issued by a Post Graduate structural Engineer is mandated in rule 141(5) of KMBR99. Clearances required from various Authorities such as Electrical line clearance and Clearance from Defence Establishments are also stipulated in these rules.

VI. Other major Safety provisions stipulated in KMBR

At present, the following provisions are also stipulated in KMBR99

1. Rule 11A details the provisions which shall apply to constructions regarding approval of site and issue of permit where excavations to depths more than 1.5m is involved.
2. Rule 23 of KMBR99 stipulates general requirements regarding the plot:
    a. Rule 23(3) prohibits any land development or redevelopment or construction of buildings on a plot liable to flood or on a slope forming an angle of more than 45 degrees with horizontal or on soil unsuitable for percolation or on areas shown as floodable area in

any Town Planning scheme or in sandy beds, unless it is proved by the owner to the satisfaction of the Secretary that construction of such a building will not be dangerous or injurious to health and the site will not be subjected to flooding or erosion, or cause undue expenditure of public funds in the provision of roads, sewers, sanitation, water supply or other public services.

b. Rule 23(4) states that any land development or redevelopment of land or construction in any area notified by Government of India as Coastal Regulation Zone shall be subjected to the restrictions that may be imposed by Government of India contained in the said notification as amended from time to time.

c. Rule 23(5) prohibits any building construction or re-construction and no additions or alterations to any existing building in the intervening spaces between the building and any overhead electric supply line

3. Rule 42 stipulates the requirements of a fire escape staircase for any building. Rule 44 of KMBR further ensures that all fire protection requirements are provided in the building in accordance to Part IV, Fire Protection in National Building Code of India, 1983 and amendment No.3 under Fire Protection Annexure II.

4. Special provisions are adopted in the KMBR for certain occupancy groups to obtain clearances from the Chief Electrical Inspector, Director of Fire Force, Kerala State Pollution Control Board, Water Authority, District Collector.

VII. Certifications stipulated in KMBR

KMBR mandates that the plans/ drawings shall be certified by Architect, Building Designer, Engineer, Town Planner or Supervisor, wherever stipulated in the rules. The qualifications required for registration into any of these category is stipulated in Appendix L of KMBR '99.

PROVISIONS IN THE KERALA PANCHAYT BUILDING RULES 2011

Constructions in village Panchayats of the State are governed by the Kerala Panchayat Building Rules 2011. Corresponding rules to that of the Kerala Municipality Building Rules are stipulated in the Kerala Panchayat Building Rules. Considering the low density of development in Panchayat areas, the availability of undeveloped land and with focus on planned development, the provisions stipulated in KPBR are more restrictive in nature than KMBR99.

PROVISIONS IN VARIOUS DEVELOPMENT CONTROL REGULATIONS

I. Kerala Town and Country Planning Bill

The draft of the Kerala Town and Country Planning Bill has been submitted and is under the consideration of the Government.

The bill proposes the formulation of State perspective plan, District plan, Local Development Plan, Detailed Development Plans incorporating policies, strategies, priorities and major projects regarding various matters for a period of twenty years. 'Natural hazard prone areas' has been included as a matter which may be considered (if necessary) while preparing policies and strategies for such plans.

RECOMMENDED AMENDMENTS TO BUILDING RULES

After due consideration from the disaster management point of view, the following recommendations are suggested for amending the Kerala Municipality Building Rules 1999 as well as Kerala Panchayat Building Rules 2011. The recommendations are with respect to the Kerala Municipality Building Rules and corresponding recommendations may be incorporated into the Kerala Panchayat Building Rules, if approved.

I. Definitions recommended

The following definitions may be reviewed for insertion in Rule 2 of KMBR99 based on the proposals/amendments to KMBR99 which are finalized by the Expert Technical Committee with the exception of Lifeline buildings and Special Buildings:

(qa)'Compliance' means the verification of the properties of construction materials based on test data and verification of the strength and structural adequacy for various components of buildings and structures.

(Note: It may also be examined whether the word 'compliance' in rule 146 of KMBR99 has to be changed)

(ata) 'Lifeline buildings' means those buildings which are of post disaster importance. For the purpose of these rules, all buildings under Group C medical or hospital occupancy, operational constructions such as power house buildings, telephone exchange buildings, telecommunication towers, office of the district administration (Collectorate/Civil stations), office of the state administration (Government Secretariat), emergency shelters, shall be considered as Life line buildings.

(av1) 'Mitigation' means measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and on environment including preparedness and prevention.

(av2) 'Natural Disaster' means a serious disruption of the functioning of a society causing widespread human, material or environmental losses caused due to earthquake, cyclone, flood or landslide which exceeds the ability of the affected society to cope using only its own resources.

(av3) 'Natural Hazards' means the probability of occurrence within a specified period of time in a given area of a potentially damaging natural phenomenon.

(av4) 'Natural Hazard Prone Area' means areas likely to have moderate to very high damage risk zone of earthquake or moderate to very high damage risk of cyclones or significant flood flow or inundation or landslide potential or proneness or one or more of these hazards.

(bia) 'Quality Assurance' means planned and systematic actions necessary to ensure that the final product i.e. structure or structural elements will perform satisfactorily in service life.

(bib) 'Quality Control' means to control the variation in the material properties and structural adequacy of the construction.

(bla) 'Retrofitting' means upgrading the strength of an unsafe building by using suitable engineering techniques.

(bwa) 'Special Buildings' means those buildings which are intended to house large gatherings at a time. For the purpose of these rules, all buildings under group B educational occupancy and all buildings under Group D Assembly occupancy with total floor area exceeding 300m² shall be considered as Special buildings

II. Proposed amendments to Rule 33 Access

The present provisions in KMBR are stipulated after taking into consideration the existing settlement character of the State, the high density in urban areas and the lack of availability of undeveloped land. As mentioned before, the standards adopted in KMBR are very less when compared to the rules stipulated in the National Building Code 2005. Furthermore, based on the concerns raised by different stakeholders, revising of the existing access width to lesser standards is now under the consideration of the Government.

Taking into consideration the disaster aspect, it is advisable to provide larger access widths for life line buildings. In this regard, after the 5thprovisio in sub rule 1 of Rule 33, a new provision shall be inserted namely:

"Provided further that all life line buildings and special buildings with total floor area above 8000m² upto 12000m² shall have an access width of 10m and all those having total floor area above 12000m² shall have a minimum width of access of 12m."

III. Proposed amendments to open spaces in Special Buildings and Life line Buildings

The present standards of the mandatory open space to be provided around a building adopted in KMBR are lesser compared to the rules stipulated in the National Building Code 2005 owing to the settlement pattern and density of urban areas of the state. However, adequate open space around any building is ensured by regulating the maximum permissible FAR and coverage of the plot.

With due consideration to the safety aspect of life line buildings and special buildings, the open yards insisted in Rules 54 and 55 may be amended after detailed discussion by the Expert Technical Committee.

In Sub rule (3) of rule 54 a third provisio shall be inserted namely:

All life line and special buildings upto 10 metres height under group B and C occupancy with more than 300m² floor area and shall have the minimum open yards as shown below:-

(i) front yard – average 6 metres with minimum 5 metres

(ii) side yard – minimum 2 metres (each side)

(iii) rear yard – minimum 3 metres

Also, sub rule (2) of rule 55 shall be substituted as follows:

Every building upto 10 metres height under assembly occupancy shall have the minimum open yards as shown below:

Sl. No.	*Total floor area*		*Minimum open space*
1.	Exceeding 300 m² but not exceeding 500 m²	(i)	Front yard – Average 6 m with minimum 5 m
		(ii)	Side yards, (each side) – minimum 2m
		(iii)	Rear yard – minimum 2m
2.	Exceeding500 m² but not	(i)	Front yard – Average 7.50 metres with minimum 5

	exceeding 800 m²		metres
		(ii)	Side yard (each side) – minimum 4 metres
		(iii)	Rear yard – minimum 3 metres
3.	Exceeding 800 sq. metres	(i)	Front yard – Average 10.5 metres with minimum 6 metres
		(ii)	Side yard (each side) – minimum 5 m
		(iii)	Rear yard – minimum 3 m

IV. Proposed amendments to Rule 34 Parking

Considering the additional parking requirement that may arise at the time of a disaster, a new sub rule (10) may be inserted in rule 34:

"Provided further that in the case of medical buildings under Group C occupancy having a total carpet area exceeding 8000 m², an additional off-street car parking of 15% may be provided.

A new sub-rule (9) with regards to Mechanical parking is under the consideration of the Government.

V. Proposed amendments to safety provisions of high rise buildings

The safety provisions of a high rise building may be reviewed by the Expert Technical Committee, examining the provisions of the National Building Code 2005 and with due regard to the present settlement character of the State. From the fire and safety point of view, it is advisable to adopt standards with regards to open space and access as stipulated in NBC 2005 which are highlighted below:

(i) As highlighted above, Para 4.6 of Part 3 Development Control Rules and General Building Requirements and Para 3.4.6.1 of Part 4 Fire & Life safety of the NBC2005 stipulates a minimum 12 metres wide access for high-rise buildings. The rules also stipulate that one end of this street shall join another street not less than 12m in width.

(ii) In addition to this, para. 3.4.4 of Part 4 Fire and Life safety of NBC 2005 restricts the height of every building above ground level and the number of storeys depending upon its occupancy and the type of construction. It further states that the maximum permissible height for any construction should necessarily be related to the width of street fronting the building, or floor area ratios and the local fire fighting facilities available.

(iii) Cl b) of Para 4.6 of Part 3 Development Control Rules and General Building Requirements the approach of the building and open spaces on all its sides upto 6m width and the layout for the same shall be done in consultation with the Chief Fire Officer of the city and the open space shall be kept free of obstructions and shall be motorable.

(iv) Cl c) of Para 4.6 of Part 3 Development Control Rules and General Building Requirements: The main entrance to the plot shall be of adequate width to allow easy access to the fire engine and in no case shall it measure less than 6m. the entrance gate shall fold back against the compound wall of the premises, thus leaving the exterior access way within the plot free for movement of fire service vehicle. If the main entrance at the boundary wall is

built over, the minimum clearance shall be 4.5m. A turning radius of 9m shall be provided for fire tender movement.

Furthermore, Rule 120 of the KMBR shall be substituted as follows:

"Application for the construction or reconstruction or addition or alteration of any high rise building shall be accompanied by one set of structural design including that regarding seismic forces as per the provisions contained in the National Building Code of India as amended from time to time and drawings and a structural stability certificate prepared and issued by a an engineer having Post graduate degree in Structural Engineering or Head of the Department concerned of any government or quasi government institution offering post graduate degree in Structural Engineering."

This provision regarding the structural stability certificate has already been incorporated in rule 115(2) of KPBR11.

VI. Amendments to Appendix L of KMBR '99

Appendix L may be revamped based on the recommendation of the Expert Technical Committee.

VII. Aspects regarding fire safety

The various aspects regarding fire safety, in particular, access widths, mandatory open spaces around high rise buildings, fire protection systems with due regard to standards of the fire escape staircase, exit widths, venting systems; fire detection/ extinguishing system, Fire NOC required, fire drill and evacuation systems etc, may also be reviewed by the Expert Technical Committee in consultation with the Department of Fire and Rescue Services.

CONCLUSION

Preparedness is the most important way to minimize the impact of any disaster. The draft Kerala Town and Country Planning Bill which is under the consideration of the Government has ensured that 'Natural hazard prone areas' has been included as a matter which may be considered (if necessary) while preparing policies and strategies while formulating State perspective plan, District plan, Local Development Plan and Detailed Development Plans.

The amendments proposed above are with regards to the various provisions stipulated in the Kerala Municipality Building Rules 1999. Corresponding provisions may be stipulated for the Kerala Panchayat Building Rules 2011, after the proposals are finalised by the Expert Technical committee.

The Fire and Rescue Department may be requested to render their expert opinion regarding the provisions related to fire and life safety, to be included in the Building Rules.

However, it is may be ascertained that it is not advisable nor recommended to further lower the minimum standards stipulated in the Kerala Municipality Building Rules 1999 (prevailing as on 21.6.2010) and Kerala Panchayat Building Rules 2011 (prevailing as on 14.02.2011) for occupancies under lifeline buildings, special buildings and high rise buildings.

Part 2: Recommendation of Sub-Committee (Structural)

Chapter 1

STRUCTURAL DESIGN & SAFETY PROVISIONS FOR HIGH RISE BUILDINGS

Disaster Resistant Construction

STRUCTURAL DESIGN & SAFETY PROVISIONS

1. Introduction

The *four virtues of disaster-resistant construction* are *strength*, *stiffness*, *ductility* and *configuration*.

2. Current Practice of Construction-Related Projects

2.1 Currently, construction projects in Kerala are expected to comply with several technical provisions that are specified in Disaster Management Acts, Bye-laws, Building Rules and Regulations enforced by Urban Local Bodies (ULBs) or local Urban Development Authorities - Corporations / Municipalities / Panchayaths and National Building code. However, experiences from recent natural disasters and man made disasters clearly illustrate that the provisions of the **Techno-Legal Regime** envisaged by National Disaster Management authority are not strictly complied with, resulting in avoidable damage to the built environment and the consequent adverse economic impact. Secondly, the techno-legal regime implemented in the jurisdiction of ULBs or local Urban Development Authorities do not have any regulatory control over building constructions in rural areas.

2.2 In the context of disaster resilience, there are three critical gaps in the current practice in the issue of building permits:

a) When an application for building permit is submitted to the Local Authority to construct a building or structure, it is not necessary that it is designed in full. The architect and/or structural engineer provides a certificate that they will undertake the design (at a later stage)

b) Before the commencement of construction of the building or structure, the design of the whole structure is not furnished either to the local authority, due to the lack of any definitive provisions in the prevailing local building bye-laws (KMBR). Assumptions are made regarding imposed and live loads on the upper levels based on the expected nature of use, and designs are prepared for parts of the building on the lower levels. There is a possibility of not necessarily adhering to the assumptions made regarding the nature of use and expected imposed and live loads in the upper levels, when they are eventually designed much later.

c) The Local authorities issue Building permits without necessarily seeing the design of the complete structure, and sometimes simply based on the perception of the credentials of the architect and structural engineer of the proposed project. In many cases the builder may not be engaged qualified Architect nor Structural Engineer to design the building.

d) The local authorities do not insist on the supervision of the designers during the construction stage nor insist upon their completion certificate.

All these are disparities of the construction practice that do not bind well for ensuring multi-hazard safety of the construction of buildings and structures in the country.

2.3 In general, independent assessment of the disaster resilience of buildings is often missed by the Local Authorities, themselves as indicated by the devastating structural damage and economic losses to the built environment in the past.

2.4 In view of above, Kerala Government has published **Kerala State Disaster Management Policy** and has emphasized its desire to adhere to the **National Building Code 2005 (NBC 2005)** and **Guide lines of National Disaster Management Authority**, especially **Model Building rules**, while approving Building Permits and occupancy certificates for any building construction.

2.5 While the above proactive steps of Kerala Government for ensuring safe construction is recognized as a boost to promote disaster risk reduction in the built-up environment of the state, much remains to be done for creating a user-friendly, and enabling environment that facilitate the stake holders to comply with the directives. The National Disaster Management Authority (NDMA) has prepared these Guidelines for integrating the **techno-legal compliance** into the building permit application process. These Guidelines provide guidance by prescribing to the clients, specific simplified check-memos for ensuring compliance of the techno-legal regime. The current practice in ULBs is to seek only ***assurances*** from the architects and/or engineers that disaster-resilience *will be* incorporated in the assets during the design process. The structural design of the proposed buildings and structures are *NOT* completed *before submitting the Application for building permit*, and no checks are in place in the ULBs to ensure that disaster-resilience has indeed been incorporated in the assets *during the design process before construction begins*. This is a major disparity in both the techno-legal and techno financial processes. The NDMA Guidelines aims at addressing these critical gaps in the current processes of approving the building permit applications without ascertaining compliance to the techno-legal regime, Building Codes and other Safety Standards and Regulations.

3. The Way Forward

3.1 An improved techno-legal regime for the construction of buildings and infrastructure in both urban and rural areas is seen as an opportunity to ensure disaster resilience of buildings and structures in the construction sector. Depending upon the nature of the assets and the vulnerability of the location to one or more of the disasters, the ULBs could insist on ensuring that disaster resistant features are incorporated in the actual construction before the Building permit / occupancy certificate is sanctioned or disbursed. The improved techno-legal regime should be applicable to both new construction as well as additions, modifications, extensions or alterations to the full or part of an existing construction, including.

(a) The entire range of housing construction, from those built for self occupation to those provided by builders and developers to individual buyers, and

(b) Critical lifeline structures, infrastructure, and commercial complexes and buildings.

3.2 These Guidelines propose the patterns that will aid the ULBs for putting in place an improved and robust techno-legal regime that will help to ensure disaster-resilience and safety of asset. Using these Guidelines, the approval wings of ULBs and/or their **empanelled technical experts** will be in a position to check that the codes and regulations related to building and structural safety, codes and regulations, as specified in **NBC-2005** and various Indian Standards, are complied with and the designs of the proposed buildings and structures are multi-disaster-resilient. In case of a natural disaster, the assets will perform as per the codes and standards, and the natural disaster will not be expected to have an adverse impact on these assets.

3.3 With above intention, a set of checklists are appended with these technical guidelines to aid *the structural engineers and architects* in assessing building constructions. These checklists are meant for ensuring that necessary aspects of safety are addressed in the construction of the building as well as in the completion and subsequent furnishing for use. For assessing safety of construction related to non-building structures, the technical professionals (e.g., structural engineers and architects) may use these formats to ensure that all aspects of safety are accounted for in the design of the proposed structure. The list of items and aspects included in these checklists are only indicative, and not exhaustive; the peer reviewers for proof checking may improve the list based on their experience in carrying out peer review of buildings and infrastructure projects.

3.4 The implementation of these techno-legal regime would require Local bodies to equip themselves with the necessary technical expertise, by either developing suitable technical human resources internally or by outsourcing the peer review of technical documents submitted by the builders to empanelled professional architects / civil engineers, geo-technical engineers and structural engineers (structural Design Review Panel) . This approach would offer to the ULBs an independent verification of disaster-resilience of the project under consideration, in addition to ensuring multi-hazard resilience in all buildings constructed and thereby securing the investments made in construction and contributing to a multi-hazard resilient built environment in the state.

4. Types of Structures Considered

4.1 Broadly, the structures constructed in the country can be divided into two categories, namely ***buildings* and *non-buildings***. Buildings can be sub-divided into different groups based on ***function of use*, *material of construction* and *total height above ground*.** Based on the function of use, three further sub-groups can be identified, namely ***Residential*, *Non-Residential* and *Critical Lifeline* Building**s. Based on material of construction, four sub-groups can be identified, namely *Reinforced Concrete (RC)*, *Steel*, *Masonry* and *Other Materials*. Based on total height of the building above ground level, three sub-groups are identified, namely **less than 15m tall, between 15m and 45m tall, and taller than 45m**. Most masonry buildings in Kerala are less than 15m tall.

4.2 *Non-buildings* include all other structures including industrial structures, civic amenities, and infrastructure projects. Infrastructure projects are required to be developed using technical and professional inputs along with understanding of social, technical, financial and sustainability aspects of the projects. The financial out lay for any construction can be any one of three funding modes, namely *government sources*, *public-private-partnership (PPP)*, or *private sources*.

4.3 Broadly, infrastructure projects fall into the following sectors,

i. *Water*, *e.g.,* dams, irrigation structures, and water transport;

ii. *Power*, *e.g.,* thermal power, hydro power, wind power, and solar power;

iii. *Communications*, *e.g.,* wired and wireless communications;

iv. *Transportation*, *e.g.,* railways (including trans-country railway systems, and metro-rail systems), roadways (including bridges, flyovers, pavements, passenger terminals, highway conveniences, and vehicle emergency facilities), airways (including airport terminals, runways &taxiways, ATC towers, and fuel tanks) and waterways (including port and harbour structures, passenger & cargo terminals, and light houses); and

v. *Urban Services (including infrastructure and amenities) e.g.,* water supply, piped-cooking gas supply, and sewage treatment, waste water treatment & drainage, storm water drainage, and solid waste treatment and disposal.

4.4 While there is extreme urgency to ensure the multi-hazard resilience of urban services, the other four sectors are also very important. Infrastructure projects can be sub-divided into discrete developments and linear developments, based on their geometric spread on ground. *Discrete developments* include individual stand-alone construction with relatively small footprint, *e.g.,* a water tank for municipal water supply, and cooling tower inside a power plant area, while *Linear Developments* include long span or long length facilities spreading over large distances and crossing different terrains vulnerable to different natural hazards, *e.g.,* trans-country pipelines for petroleum fuel crossing earthquake fault zones, large diameter water lines laid on different soil terrains, national highways, sub-surface tunnels, and long-span bridges, etc.)

5. Natural Hazards

5.1 While the available national standards and guidelines consider the potential impact of each individual hazard, the safety of the built environment needs to be assured to withstand the adverse impact of multiple hazards like *earthquakes*, *cyclones*, *landslides* and *floods*, based on the risk and vulnerability profiles of the Specific areas. Some design features favourable to resist effects of one hazard may conflict with the features required for another hazard; the implications of these need to be incorporated before arriving at the final designs. Experience of performance of the built environment with certain design features helps in resolving such conflicts.

6. Loading types & Safety Items

6.1 While the demands of all other natural hazards are of *force-type loading*, those of temperature and earthquake hazards are of *displacement-type loading*. Lateral action is a dominant feature of the hazard especially under wind, wave and earthquakes, in addition to the usual gravity loads. In the design of structures, the virtues of configuration, stiffness, strength and ductility are required to be provided to ensure disaster resilience of structures. While the first three virtues are essential to resist force-type loading, ductility is necessary to resist earthquake loading in addition to the other three.

7. Safety of Structural System and Non-Structural Systems

7.1 The construction of structures consists of two parts, namely the ***Structural System*** and ***Non-Structural Systems***. The *Structural System* is that part of the building which carries the loads acting on the structure (including its self weight, finishes, furnishings and occupants) and ensures safety to the occupants and function of the construction. It consists of the soil system, the foundation, the vertical and horizontal members (namely columns, braces, beams, slabs and walls). The members of the Structural System performing these functions are called ***structural elements* (SEs).**

7.2 Apart from these, there are many items of buildings, such as contents of buildings, appendages to buildings, services and utilities, which are supported by SEs, and whose weight and other forces are carried down to foundations by SEs, called ***non-structural elements*** **(NSEs**). During strong earthquake, if NSEs are not secured firmly to structural elements of the building, they can (a) topple, slide or fall down from an elevation or (b) move or swing by large amounts in translation and rotation. These actions can cause loss of life, as well as, cause secondary failures. For instance, spill of chemicals in an industrial unit or a laboratory can cause fire, and toppling of unreinforced

masonry parapet wall or chimney or water tank of a house can cause injury and death to persons below. NSEs can be listed under three groups, namely

(a) ***Contents of buildings***: Items required for functionally enabling the use of spaces, .such as

(i) Furniture and minor items, e.g., storage shelves,

(ii) Facilities and equipment, e.g., refrigerators, washing machines, gas cylinders, TVs, multi-level material stacks, false ceilings, generators and motors, and

(iii) Door and window panels and frames, large-panel glass panes with frames (as windows or infill walling material), and other partitions within the buildings;

(b) ***Appendages to buildings***: Items projecting out of the buildings, either horizontally or vertically, such as chimneys projecting out from buildings, glass or stone cladding used as façades, parapets, small water tanks resting on top of buildings, sunshades, advertisements hoardings affixed to the vertical face of the building or anchored on top of building, and communication antennas mounted atop buildings; and

(c) ***Services and utilities*** of buildings including water supply mains, electricity cables, gas pipelines, sewage pipelines and telecommunication wires from outside to inside of the buildings and within the buildings, air-conditioning ducts, rainwater drain pipes, elevators, fire hydrant systems including water pipes through the buildings.

7.3 The multi-hazard resilience and safety of both structural elements and non-structural elements are of priority concerns. It is estimated that out of the total cost of construction of buildings, the structural elements may cost between 25-50%, and the remaining 50-75% is of the non-structural elements. Thus, there is a need to recognize the critical role of non-structural elements in the financial Liability in buildings. In non-building systems, the share of non-structural elements may be less, but the cost of equipment and facilities housed is typically very high. Hence, the safety and multi hazard resilience of non-structural elements including equipments and facilities from the adverse impact of natural hazards is as serious an issue as that of the structural elements.

8. Retrofitting / seismic strengthening of Existing Construction

8.1 It is easier to incorporate safety in new buildings than in existing buildings. During construction of a new building, the overall geometry (shape and size), choice of materials, proportioning of members, connection detailing, and quality construction of the building are decided in advance. But in existing buildings, many of these are already built, but these aspects need to be improved in stages or extensively modified to ensure compliance with the prevalent safety-related standards. This activity is called seismic strengthening or *retrofitting*; it must assess the condition of the existing building, identify deficiencies (if any) and provide quantitative evidence in favour of the proposed retrofit scheme (if required). Retrofitting of buildings is a detailed technical activity requiring expertise. It involves the safety assessment of both the building structure(s) and their non-structural components (e.g., appendages, equipment, etc.) and utilities (*e.g.,* power, water, sewage, gas, communications, etc.).

8.2 **Criteria for Retrofitting**

When buildings are to be evaluated to assess their multi-hazard safety, their expected performance needs to be determined. The ability of a building to perform adequately is a function of the performance of both the structural system as well as the non-structural components. The combined

performance of buildings is typically specified in terms of Performance Levels, which are most commonly used for evaluation of safety against earthquake shaking, and are described below.

8.2.1 **Performance Levels**

8.2.1.1 Buildings are expected to remain elastic under force-type loading, but go into inelastic range under displacement-type loading such as an earthquake shaking. *Performance-Based Assessment & Design* needs to be undertaken to ensure that both the building and its non-structural components are safe during the expected strong earthquake shaking. Performance-based design typically recognizes four levels of performance, which may be *qualitatively* defined as follows:

i. *Fully Operational (FO) Level*: The *building,* its *contents and utilities* are shaken by an earthquake, but no damage occurs in either of the above; the function of the building is not disrupted due to the occurrence of the earthquake;

ii. *Immediate Occupancy (IO) performance level*: The *building, it's contents and utilities* are shaken predominantly in their linear range of behaviour and only minor damage may occur in them; the use of prevailing functions of the building and facilities is not restricted after the earthquake so that its functioning can be resumed immediately after the earthquake.

iii. *Life Safety (LS) performance level*: The *building, it's contents and utilities* are shaken severely in the building's nonlinear range of behaviour. Significant damage occurs in them, but the building remains within it's reserve capacity and does not reach the state of imminent collapse. The use of the facility is restricted after the earthquake until detailed structural safety assessment is performed to ascertain the suitability of the building for retrofitting. If found suitable for retrofitting, the building may be retrofitted.

iv. *Collapse Prevention (CP) performance level*: The *building, it's contents and utilities* are shaken severely in their nonlinear range of behaviour. Major damage occurs in them. The building does not have any additional reserve capacity and is in the state of imminent collapse. The building cannot be used after the earthquake.

8.2.1.2 In an earthquake, the critical lifeline buildings should be able to perform their functions and services immediately after the earthquake. Hence, it is desirable that the following performance levels are satisfied under the expected strong shaking in regions where the critical lifeline buildings are situated:

i. *Critical Lifeline Buildings*: The building structures should achieve *IO performance level*. This will help the immediate use of the building without perceiving any threat to the people and the contents in the event of aftershocks in the region.

ii. *Contents and Utilities of Critical Lifeline Buildings*: The *contents and utilities* within the building structures should achieve *FO performance level*. This will help the continuity of the services of the critical lifeline buildings to persons affected during the earthquake and requiring such services.

8.2.2 **Performance Objectives**

8.2.2.1 It is not an easy task to *quantitatively* define the desired performance level of a building. Currently, there is no single acceptable, *quantitative* definition for the *FO, IO, LS and CP* performance levels, as there are many parameters (including the structural type) that govern the overall performance. The subject of *Performance-Based Design* of Buildings is being discussed at the research level only in a few institutions in India, and the philosophy has not been included yet in the Indian Seismic Codes for design and construction developed by the Bureau of Indian Standards;

the Indian codes adopt *force-based* approach to design new buildings and not the *displacement-based* approach required by *Performance-Based Design concepts*. Considering that most buildings in India have been constructed without much attention to disaster risk and vulnerability and with inadequate or weak compliance and enforcement of disaster resistant building codes and standards, the efficiency of retrofitting scheme proposed must be able to withstand damage in the entire structure during the worst expected ground shaking.

8.2.2.2 Compounded with the desirable levels of retrofit discussed above, other competing demands that the country is currently faced with are, namely:

(a) The number of trained professionals currently available in the country is inadequate to undertake such a mammoth exercise;

(b) There is no document that is officially approved in the country by bodies like the Bureau of Indian Standards that can be readily adopted for seismic retrofitting of existing buildings in India, even though CPWD and IIT Chennai has brought out a Handbook on Seismic Retrofitting;

(c) The limited number of professionals available in the country with background in seismic retrofitting have to yet arrive at a consensus to set an agreed approach for seismic retrofitting of buildings; and

(d) The retrofitting of critical lifeline buildings in the moderate and severe seismic zones of the country needs to be carried out on priority after **structural safety audits** have been carried out.

8.2.2.3 Therefore, a mixed approach may be advisable in the short run to minimize the damage and ensure that the buildings, especially the critical lifeline buildings (hospitals, overhead water tanks, electric substations, telecommunication towers) remains operational even after strong earthquake shaking. The recommended approach consists of *force-based* analysis check to ensure no collapse of the building structure and no toppling or sliding damage of building contents under strong shaking, and *displacement-based* analysis check, like pushover analysis to ensure that the inelastic damage level accrued in the building structure is within specified limits to prevent any damage to the building contents and building utilities. Thus, for the *Building Structure,* it will be ensured that it will possess at least a minimum required *design* strength and stiffness to resist the expected strong earthquake shaking, and will sustain inelastic lateral displacement in them under the said strong ground shaking without collapse, as per Table 1.

Table 1:

Target Performance Levels of Building Structures for Seismic Retrofitting

Building Category	**Performance Level Expected**	
	Design Base Earthquake (DBE)	***Maximum Considered Earthquake (MCE)***
Normal	*Life Safety (LS)*	Collapse Prevention (CP)
Critical and Lifeline Buildings	*Immediate Occupancy (IO)*	Life Safety (LS)

8.2.2.4 *Building Content and Building Utilities* will be secured with retrofit measures against overturning or sliding under the expected strong earthquake shaking, and in a manner to ensure that no damage will occur under the inelastic displacement of the structure imposed on them under the said strong shaking, as per Table 2.

Table 2:

Target Performance Levels of Building Contents and Building Utilities for Seismic Retrofitting

Building Type	**Target Performance Level**
Normal	Collapse Prevention (CP)
Critical and Lifeline Buildings	Fully Operational (FO)

8.2.2.5. Since both the structure and it's contents and utilities of the critical lifeline buildings are required to be functional for immediate use after the expected severe shaking, retrofitting of such buildings will be done to comply with force and deformations levels more stringent than those specified in the Indian Seismic Code IS:1893 intended for the design of new buildings. Thus, compliance with current Indian Standard Code provisions *alone* will not suffice.

8.2.2.6 Given the large built environment that is ageing, the shortage of trained manpower to undertake retrofitting and rehabilitation of existing constructions before and after impending natural disasters respectively is one of the major critical concerns today. In case professional agencies are already involved in assessing the disaster-resistance of the new and ongoing projects to ensure that the said professionals have the required experience to undertake the said technical audit.

8.2.2.7 Some owners of buildings are found to modify their buildings by adding extensions or additional floors either for personal use or for commercial purposes, depending on the availability of funds with them. As recommended in the Model Building Regulations/Byelaws for Structural Safety in Natural Hazard Zones of India prepared by the Committee of Experts constituted by the Ministry of Home Affairs, Government of India in September 2004, in the case of applications for modifications, extensions or alterations of **buildings older than fifty years**, the ULBs may get such buildings inspected by a Registered Structural Engineer and insist on the Certificate from the Registered Structural Engineer to along with the application for building permit.

9 Proposed Reforms in Ensuring Disaster Resilience

9.1 These Guidelines propose the following reforms in ensuring disaster resilience by empowering the Techno-legal Regime of ULBs, ie, Kerala Municipal Building rules, by prescribing the following provisions:

(a) ***Application for building permit*** new construction or to make any addition, alteration, modification or retrofitting of existing construction *will submit to the Municipality* the *complete architectural and structural designs and drawings of the said construction* demonstrating that the proposed structure/alteration is capable of withstanding all the natural hazards posing risk and vulnerability to the region where the construction of the building is proposed, and

(b) *The* ***Corporation / Municipality*** will undertake *independent technical review* of the complete architectural and structural designs of the proposed construction, with the assistance of its own internal **peer reviewers / *Structural design Review Panel*,** before issuing the building permit.

9.2 **Implementation of the Techno-legal Regime**

9.2.1 The following are the roles and responsibilities of the different stake holders in the construction in focus:

(a) ***The application for building permit*** should be accompanied by the ***complete architectural and structural design*** of the proposed construction especially technical design documents including the following:

(i) Architect's Design Basis Report,

(ii) Structural Engineer's Design Basis Reports,

(iii) Complete set of construction drawings related to both the structural and non-structural elements,

(iv) Architect's Certificate, and

(v) Structural Engineer's Certificate.

The professional Architect on Record / Engineer on record and Structural engineer on Record associated with the proposed construction will ensure that these design documents provide all necessary details for facilitating the technical peer review of the design. It is envisaged that the submission of all relevant design-related information upfront will reduce the time taken for the peer review.

(b) *The Municipality / Corporation* will undertake the **technical peer review** (for buildings taller than 15 m or 4 stories) of these architectural / engineering designs and documents of the proposed construction, either internally with their own technical human resources or externally with the help of qualified professional architects and structural engineers (Structural Design Review Panel) of *proven track record*, *experience* and *repute* in the design of such structures. The structural engineers undertaking the peer review will adopt an objective and transparent approach to ensure compliance with the national standards and guidelines. In the peer review of some structures, peer reviewers may not have any national standards or Guidelines to ensure compliance. In such cases, peer reviewers should seek the best technical knowledge (available nationally or internationally) to assess suitability of the proposed design to withstand the adverse impact of potential natural hazards. The Corporation / Municipality may empanel competent structural engineers as Structural Design Review Panel for carrying out peer review of these design documents.

(c) *The Municipality / Corporation* should consider the comments of its peer reviewers and issue building permit, based on their report, *protecting the safety of the users and functions of the assets*.

9.2.2 A set of forms are provided as appendices to these Guidelines to assist the Designers. Forms to assist the peer reviewers for undertaking the assessment of the designs of the proposed constructions are also, but they are not included in this document.

9.2.3 The Architect on Record / Engineer on record and structural engineer on Record shall prepare their inputs in these forms for the high rise building for stage 2 clearance.

(1) Peer Reviewer Architect's/ engineer's comments on the Architectural Design Basis Report submitted by the architect on Record / Engineer on record of the project, including comments on the deficiencies or presence of the architectural elements, if any, that may affect the performance of the building during natural hazards;

(2) Peer Reviewer Structural Engineer's comments on the Structural Design Basis Report submitted by the structural designer on record of the project, including deficiencies, if any; and

(2) Peer Reviewer Structural Engineer's Certificate giving his comments on the suitability of the design of the proposed construction.

9.3 Additional Technical Requirements for Structural System Safety

9.3.1 **New Constructions:** To ensure that the proposed building /structure will be able to withstand the adverse impact of potential natural hazards, the structural design of new constructions shall comply with *all* requirements of the prevalent national standards and Guidelines. Where such standards and guidelines are not available, those of any other country with advanced technical practices shall be adopted.

9.3.2 **Alterations to or Retrofitting of Existing Constructions:** The structural design of the whole existing construction being altered / retrofitted to resist all natural hazards applicable for the site of the said construction, shall comply with *all* requirements of the prevalent national standards and guidelines as laid out for the design of *new constructions* of the same type. Where such standards and Guidelines are not available, the reviewing professionals may adopt those of any other country with advanced technical practices.

10 High rise building - High rise building means a building or a structure having **more than four floors and / or 15 metres of height**. [For the purpose of this rule, the word 'height' shall be the 'height of building', as defined in clause (aq) of sub rule (1) of rule 2.]

10.1 STRUCTURAL DESIGN

For any building under the jurisdiction of these regulations structural design/ retrofitting shall be carried out under the supervision of a Structural Engineer on Record (SER) or Structural Design Agency on Record (SDAR). **Proof checking** of various designs/ reports shall be carried out by empanelled structural design review panel selected from Registered Structural Engineers (RSE) and appointed by competent authority as per Table-3, wherever applicable.

Generally, the structural design shall be carried out as per **National Building code**. Foundation design, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete and structural steel shall conform to the provisions of part VI Structural Design Section – 1 Loads, Section – 2 Foundation, Section – 3 Wood, Section – 4 Masonry, Section – 5 Concrete & Section – 6 Steel of National Building Code of India (NBC), taking into consideration the Indian Standards.

10.2 STRUCTURAL DESIGN BASIS REPORT

In compliance of the design with the above Indian Standard, the Structural Engineer on Record will submit a Structural Design Basis Report (SDBR) in the Performa Attached **(Form no. 6)** (Refer the model building rules proposed by NDMA) herewith covering the essential safety requirements specified in the Standard.

(i) The "**Structural Design Basis Report (SDBR**)"consists of four parts (**FormNo.6**)

Part-1 - General Information/ Data

Part-2 - Load Bearing Masonry Buildings

Part-3 – Reinforced Concrete Buildings

Part-4 - Steel Buildings

(ii) Drawings and Documents to be submitted for approval of appropriate authorities shall include SDBR as detailed below:

Part - 1 Completed

Part - 2 (if applicable) – completed

Part - 3 (if applicable) – undertaking that completed Part 3 will be submitted before commencement of construction.

Part - 4 (if applicable) – undertaking that completed Part 4 will be submitted before commencement of construction.

(iii) SDBR as detailed below shall be submitted to the appropriate authority along with the application for building permit – stage 1

Part - 1 Completed

Part - 2, 3 or 4 (if applicable) Completed

11 SEISMIC STRENGTHENING/RETROFITTING

Seismic Strengthening / retrofitting all existing life line buildings, special buildings, cinema theatres, meeting halls, assembly halls, auditoriums, malls, shopping complexes, factories, schools, colleges, TV towers, water tanks, telephone exchanges, over bridges, metro rails, are to be conducted periodically (Every 3 years) under the supervision of a RSE. Prior to seismic strengthening/ retrofitting the existing structure, evaluation of the existing structure as regards structural vulnerability in the seismic hazard zone / specified wind shall be carried out by a RSE/RSDA. If as per the evaluation of the RSE/RSDA the seismic resistance is assessed to be less than the specified minimum seismic resistance as given in the note below, action has to be initiated to carry out the upgrading of the seismic resistance of the building as per applicable standard guidelines.

Note: (a) for masonry buildings reference is to be made to IS: 4326 and IS: 13935 and (b) for concrete buildings and structures reference to be made to BIS code on evaluation and seismic strengthening for retrofitting of RCC buildings under preparation at present.

12 REVIEW OF STRUCTURAL DESIGN / PROOF CHECKING

(i) The Competent Authority shall create a **Structural Design Review Panel** (SDRP) consisting of senior Structural Engineers (SER), whose task will be to review and certify the design prepared by SER, whenever referred by the competent authority.

(ii) The Reviewing Agency (SDRP) shall submit addendum to the certificate or a new certificate in case of subsequent changes in structural design.

(iii) Table-3 gives requirements of SDRP for different seismic zones namely III, IV and V and for structures of different complexities. Kerala falls in seismic Zone III, hence the following table is to be followed.

TABLE – 3

PROOF CHECKING REQUIREMENTS FOR STRUCTURAL DESIGN (Ref NBC)

SR.NO	TYPE OF STRUCTURE	SUBMISSION FROM SER or SDAR	TO BE PROOF CHECKED
1	LOAD BEARING BUILDINGS UPTO 3 STOREYS	SDBR*	NOT TO BE CHECKED
2	BUILDINGS UPTO 7 STOREYS (R.C.C / STEEL-FRAMED STRUCTURE)	SDBR*	TO BE CHECKED
		PRELIMINARY DESIGN & drawings	TO BE CHECKED
3	BUILDINGS GREATER THAN 7 STOREYS OR 40 M (R.C.C / STEEL-FRAMED STRUCTURE)	SDBR*	TO BE CHECKED
		PRELIMINARY DESIGN	TO BE CHECKED
		DETAILED STRUCTURAL DESIGN AND STRUCTURAL DRAWINGS	TO BE CHECKED
4	PUBLIC BUILDINGS (A) LOAD BEARING BUILDINGS UPTO 3 STOREYS	SDBR*	NOT TO BE CHECKED
	(A) Public buildings more than 3 stories (B) R.C.C/ STEEL STRUCTURES (span more than 10m)	SDBR*	TO BE CHECKED
		PRELIMINARY DESIGN	TO BE CHECKED
		DETAILED STRUCTURAL DESIGN AND STRUCTURAL DRAWINGS	TO BE CHECKED
5	SPECIAL STRUCTURES & BUILDINGS LIKE, HOSPITALS, MALLS, SHOPPING COMPLEXES, SCHOOLS, COLLEGES, UNIVERSITIES, LARGE SPAN STRUCTURES LIKE STADIUM, AUDITORIA, TALL STRUCTURES LIKE TV / telecommunication TOWERS, hoardings, CHIMMINEY, WATER TANKS AND FUEL STORAGE TANKS, FACTORIES, Bridges, flyovers, metro rail, aqua ducts, dams, docks, wharfs, cranes,	SDBR*	TO BE CHECKED
		PRELIMINARY DESIGN	TO BE CHECKED
		DETAILED STRUCTURAL DESIGN AND STRUCTURAL DRAWINGS	TO BE CHECKED

* SDBR – Structural Design Basis Report (required)

Notes:

- Public building means assembly of large number of people including schools, hospitals, courts etc.
- Special structure means large span structures (more than 10 m), such as stadium, assembly halls, factories and / or tall structures such as water tanks, TV tower, chimney, special buildings, etc.

  It will be seen from the table that there is a wide range of structure typology, and the requirement by the Competent Authority for third party verification will depend on the type of structure.

12.1 CERTIFICATION REGARDING STRUCTURAL SAFETY IN DESIGN

Structural Engineer on Record (SER) or Structural Design Agency on Record (SDAR) shall give a certificate of structural safety of design as per Performa given in **Form-3** and **Form 14** at the time of completion.

12.2 CONSTRUCTIONAL SAFETY

12.2.1 Supervision

All construction, ***except load bearing buildings up to 3 storeys***, shall be carried out under supervision of the **Construction Engineer on Record (CER)** for various seismic zones. Construction safety certificate shall be issued by the Construction engineer on record in form -13. Construction safety officer is to be appointed for buildings of height 45 m or above or projects with total built up area more than 50,000 m2.

12.2.2 Certification of structural safety in construction

CER/ CMAR shall give a certificate of structural safety of construction as per Performa given in **Form-13** at the time of completion**.**

12.3 QUALITY CONTROL AND INSPECTION

12.3.1 Inspection

As per the NBC, all the construction for high-rise buildings higher than **seven storeys**, public buildings and special structures shall be carried out under **quality inspection program** prepared and implemented under the **Quality Auditor on Record** (QAR) or Quality Auditor Agency on Record (QAAR) in seismic zones IV & V. Even though Kerala falls in Zone III, this clause may be included in the KMBR and quality inspection and certification of all buildings higher than 7 stories, public buildings, life line structure's and special buildings shall be made mandatory.

12.3.2 Certification of safety in quality of construction

Quality Auditor on Record (QAR) or Quality Auditor Agency on Record (QAAR) shall give a certificate of quality control as per Performa given in **Form-15.**

Quality Inspection Programme to be carried on the site shall be worked out by QAR/ QAAR in consultation with the owner, builder, CER/ CMAR.

12.4 INSPECTION & CERTIFICATION

The building shall be inspected periodically (during construction) by the Architect / Engineer on Record, Structural Engineer on Record and Construction engineer on record and **submit progress**

report to the Secretary in Form No. 7, 8, 9 & 10. The general requirement for inspection of the development shall also include the following regulation.

12.4.1 General Requirements

The building unit intended to be developed shall be in conformity with Regulation on requirement of site. Generally all development work for which permission is required shall be subject to inspection by the Competent Authority as deemed fit.

The applicant shall keep a board at site of development mentioning the survey No, city survey No, Block No, Final Plot No., Sub plot No., etc. name of owner and name of Architect on Record, Engineer on Record , Developer, Structural Engineer on Record , Construction Engineer on Record

12.4.2 Record of Construction Progress

a. Stages for recording progress certificate and checking:-

i) Plinth, in case of basement before the casting of basement slab.

ii) First storey.

iii) Each middle storey in case of High-rise building.

iv) Last storey.

(b) At each of the above stages, the owner / developer / Builder shall submit to the designated officer of the Competent Authority a progress certificate in the given formats **(Form No. 7, 8, 9 & 10)** This progress certificate shall be signed by the Construction Engineer on Record.

c) The progress certificate shall not be necessary in the following cases:

i) Alteration in Building not involving the structural part of the building.

ii) Extension of existing residential building on the ground floor up to maximum 15 sq. m in area.

(d) Completion Report

i) It shall be incumbent on every applicant whose plans have been approved, to submit a completion report in **Form No.11 along with an "as built drawings"**.

ii) It shall also be incumbent on every person / agency who is engaged under this Development Control Regulations to supervise the erection or re-erection of the building, to submit the completion report in **Form No.12 and 13** prescribed under these Development Control Regulations.

iii) No completion report shall be accepted unless completion plan (as built drawings) is approved by the Competent Authority.

(e) The final inspection of the work shall be made by the concerned Competent Authority within 21 days from the date of receipt of notice of completion report.

12.4.3 Issue of Occupancy Certificate

1. The Authority issuing occupancy certificate before doing so shall ensure that following are complied from consideration of safety against natural hazard.

(i) Certificate of lift Inspector has been procured & submitted by the owner, regarding satisfactory erection of Lift.

(ii) The Certificate of Competent Authority and or fire department for completion and or fire requirements as provided in these regulations has been procured and submitted by the owner.

(iii) If any project consists of more than one detached or semi detached building / buildings in a building unit and any building / buildings there of is completed as per provisions of D.C.R. (Such as Parking, Common Plots, Internal Roads, Height of the Building, Infrastructure facilities, lift and fire safety measures), the competent authority may issue completion certificate for such one detached or semi detached building / buildings in a building unit.

(i) Completion Certificate issued by the 1) Architect / Engineer on record, 2) Structural Engineer on record and 3) Construction Engineer on record in the prescribed forms

2. The occupancy certificate shall not be issued unless the information is supplied by the Owner and the Architect on Record/ Engineer on Record concerned in the schedule as prescribed by the Competent Authority from time to time. **–**

STRUCTURAL REQUIREMENTS OF LOW COST HOUSING

Not withstanding anything contained herein, for the structural safety and services for development of low cost housing, the relevant provisions of applicable IS Codes shall be enforced.

12.5 MAINTENANCE OF BUILDINGS

In case of building older than **fifty years**, it shall be the **duty of the owner** of such buildings, to get his building inspected by a Registered Structural Engineer (RSE) within a year from the date of coming into force of these regulations. The Structural Inspection Report **(Form No.16)** shall be produced by the Owner to the Appropriate Authority / Corporation / Municipality. If any retrofitting action is to be taken for ensuring the structural safety and stability of the building, as recommended by SER, it shall be completed within **one year**. The occupancy certificate of such buildings stands cancelled until the retrofitting works recommended by the RSE is carried out and fresh structural Inspection report is submitted to the secretary for issuing fresh occupancy certificate.

12.6 PROTECTIVE MEASURES IN NATURAL HAZARD PRONE AREAS

In natural hazard prone areas identified under the land use zoning regulations, structures buildings, bridges, dams, special structures, life line structures and installations which cannot be avoided, protective measures for such construction/ development should be properly designed and certified by a Registered Structural engineer and safeguarded against hazards .

Chapter 2

REGISTRATION OF PROFESSIONAL – ARCHITECTS /ENGINEERS, STRUCTURAL ENGINEERS , CONSTRUCTION ENGINEERS, TOWN PLANNERS, ETC.

REGISTRATION OF PROFESSIONALS

Presently, the legislation for profession of architecture is applicable in the country in the form of Architects Act 1973. Accordingly, the qualifications of architects, competence and service conditions, fees followed in the profession of architecture are in accordance of the provision of the said Act and the rules made there under. Whereas, there is no legislative frame available/applicable in the country for other professions and professionals like engineers, developers/promoters, town planners for taking up the projects,. In the absence of such legislation, the appropriate qualifications, service conditions, scope of work, professional fees and charges in the engineering profession etc. are varying and are not based on any uniform formula. Therefore, keeping in view that the responsibility of safety of buildings / infrastructure projects rests up on the engineers, the Committee has worked out the detailed qualifications / competence / responsibilities for different type of buildings depending up on the importance factor & height of the building. The Appendix L of KMBR is to be replaced with the Appendix L given in this report. (Care is taken to ensure that the interests of all the stakeholders are taken care of.)

13.1 .1 Registering Authority.-The Regional Joint Directors of Municipal Administration shall be the Registering Authority for the respective regions of the State.

13.1.2 Application and procedure for registration.—(1) Any person having the requisite qualification may submit an application for registration in the form prescribed in KMBR**.**

(2) A person employed in the service of Government or Quasi-Government or Government owned Corporation or Board, Authority or Government Companies or Banks are not eligible for registration:

Provided that paid Apprentices under the Apprentices Act are [considered as not employed] for this purpose.

(3) The application shall be affixed with necessary court fee stamp and shall be attached with true copy of certificate showing educational qualification and experience.

(4) The Registering Authority shall, if convinced of the genuineness of the documents, issue registration certificate in the form in KMBR after collecting the registration fee.

(5) The registration once made shall be valid for **three years** from the date of certificate and shall be renewable on payment of renewal fee with a request in white paper affixed with necessary court fee stamp made within the valid period of registration:

Provided that a licence issued under the Kerala Building Rules, 1984 shall be deemed to have been issued under these rules and shall continue to be valid for the period for which that licence was issued and the holder of the said licence shall be eligible for registration under these rules.

[(6) The fee for registration as professionals shall be fixed by the government for all categories. Period of registration is 3 years. The re registration fees shall be Rs. 1000/-.

13.1.3 Qualification for registration- No person shall be eligible for registration unless he possesses the qualification as in this Chapter**.**

13.1.4 Registration in more than one category- A person shall be eligible for registration in more than one category if he possesses the requisite qualification and submits separate application, and fee for registration in each such category.

13.1.5 Responsibilities and functions of registered Architects / Engineer on record etc.- (1) Plans and drawings shall be prepared strictly in conformity with the provisions contained in the Act and the Rules and direction issued by Government or Municipality and a certificate to that effect shall be recorded and signed in the plans and drawings.

(2) A certificate of verification of site shall be recorded and signed in the site pan.

(3) Plans and drawings shall be prepared after inspecting the site and convinced of the boundaries.

(4) The person issuing the certificate or affixing signature on the plan, drawing or specification shall be responsible for the correctness or truthfulness of the recording in the certificate or plan, drawings or specifications.

(5) Function shall be restricted to the category on which registration is obtained.

(6) Any person violating the rules under this chapter shall be liable to action under sub- rules (7) and (8).

(7) The Registering Authority may, on complaint by any person or on report from any Municipality or suomotu take action against any person registered, for violating any of the provisions under these rules.

(8) The Registering Authority may, if convinced on enquiry that the person against whom action has been taken under sub rule (7) has violated any rule, provision or issued false certificate or recorded false information, suspend the registration for a period not exceeding one year or cancel the registration or disqualify him for future registration:

Provided that before finalising the decision, the person concerned shall be given sufficient opportunity to explain and the explanation, if any, submitted shall be duly considered by the Registering Authority.

(9) Any person aggrieved by the decision of the Registering Authority under sub rule (8) may appeal to Government within 30 days from the date of receipt of the decision.

(10) The appeal shall be submitted in white paper stating the reasons there for, typed or written in ink, affixed with necessary court fee stamp, along with copy of the order of registering authority.

(11) Government shall dispose of the appeal within 60 days, after hearing the appellant in person

13.2 APPOINTMENT OF PROFESSIONALS

The Owner/Developer shall appoint 1) Architect on Record (AR)/ Engineer on Record (ER), 2) Structural Engineer on Record (SER/, 3) Construction Engineer on Record (CER) for supervise the work. Local authorities should ensure that these professionals are registered with the competent authorities before issuing building permit, The detail of qualification and requirement of registration are given in Appendix L. A proper written agreement(s) showing the scope of work, responsibilities and fees, in the standard format(s), should be entered upon with such professional(s) engaged.

13.2.1 The Owner / Developer shall appoint the following professionals, out of the registered professionals described in 14.1.1, and inform the competent authority about their appointment along with their consent letter for every project as required.

a) Architect on Record (AR) or Engineer on Record (ER)

b) Structural Engineer on Record (SER) or Structural Design Agency on Record (SDAR)

c) Construction Engineer on Record (CER) or Construction Management Agency on Record (CMAR)

The following professionals may also be engaged as specified else where

d) Geo-technical Engineer on Record (GER) or Geo technical Agency on Record

e) Quality Auditor on Record (QAR) or Quality Audit Agency on Record (QAAR)

f) Town Planner on Record (TPR)

13.2.2 The Owner / Developer shall submit a list of the professionals on Record appointed by him for the project, along with the application for Development Permission / building permit to the competent authorities. (Consent/ undertaking from these professionals in the required format should be submitted at the time of seeking Development Permission / building permit)

13.2.3 In case the Owner / Developer changes any of the professional on Record, intimation to that effect shall be intimated to the competent authorities with in 7 days, along with a no-objection certificate from the professional who is being changed. The owner /developer should not proceed with the construction until the professional is replaced and a new one is appointed and approved by the competent authority.

13.3 GENERAL DUTIES AND RESPONSIBILITIES APPLICABLE TO ALL PROFESSIONALS

a) Each Professional shall clearly indicate on every plan, document & submission, prepared by him the details of his / her designation with registration number and date, full name and his/her address below the signature for identification.

b) The Structural Engineer on Record, Architect on Record / Engineer on Record, Construction Engineer on Record, shall be responsible for adhering to the provisions of the relevant and prevailing Indian Standard Specification. How ever, they will not be held responsible for the damages or collapse that may occur under the natural forces going beyond the design forces provided in the above 'Indian Standard Specifications' and for damages or collapse that may occur after 5 years of completion.

c) Once the building is completed and handed over, the builder / owner / occupier will be responsible for the safety of the building. Periodical maintenance of the building is their collective responsibility. Structural changes / retrofitting of the building shall be done only under the supervision of a Registered Structural engineer (RSE).

13.4 ARCHITECT ON RECORD (AR) / ENGINEER ON RECORD (ER)

Duties & responsibilities

- To prepare & submit plans, drawings and specification, completion certificate and other documents for obtaining development permit up to 1 hectare and
- To prepare & submit plans, drawings and specification, completion certificate and other documents for obtaining building permit of all buildings, including High rise buildings of all heights, Educational institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings and the likes.

- All duties and responsibilities listed out by the Council of Architects

13.5 STRUCTURAL ENGINEER ON RECORD (SER)

Duties and Responsibilities

(A) At the time of seeking permission from Competent Authority for starting construction, the Owner shall submit an undertaking from SER or SDAR that

1. The SER / SDAR is agreeable to accept the assignment to prepare designs, drawings and specifications.
2. The designs shall be carried out according to relevant national codes and specifications and good engineering practice.
3. A structural design report giving salient features of the structure, loads and soil characteristics and capacity, etc. shall be submitted in the prescribed format

(B) In the case of high-rise buildings and Special Structures, SER/ SDAR shall

1. Prepare Preliminary Design of the structure in addition to the Report indicated in A (3) above.
2. Verify the soil (geo-technical) investigation done from an approved laboratory and submit report concerning the same in prescribed format to the Competent Authority.
3. Prepare Preliminary Design (SDBR – Form 6) and submit the same along with the application for permit to the competent authority for third party verification by a member of Structural Design Review Panel. In case of high-rise buildings having seven or more structural floors and special structures, detailed design and drawings are to be prepared and submitted for proof checking.

(C) All Reports and other submissions to the Competent Authority by and on behalf of the SDAR shall only be signed by Registered Structural Engineer (SER) as a proprietor, partner or as a designated officer of the company.

1. To prepare a report of the structural design.
2. To prepare detailed structural design and to describe the method and technique of its execution strictly on the basis of National Building Code or relevant Indian Standard Specifications.
3. To prepare detailed structural drawings and specifications for execution indicating thereon, design live loads, safe soil bearing capacity, specifications of material, assumptions made in design, special precautions to be taken by contractor to suit the design assumptions etc whatever applicable.
4. To supply two copies of structural drawings to the supervisor.
5. To advise the Owner/Architect/Engineer for arranging for tests and their reports for soil, building material etc. for his evaluation and design consideration.
6. To prepare the revised calculations & drawings in case of any revision with reference to the earlier submission of drawings & design in a particular case.

7. To inform in writing the Competent Authority within 7 days, if for any reason, he/she is relieved of his appointment/responsibilities as the registered Structural designer for the development.

13.6 CONSTRUCTION ENGINEER ON RECORD (CER)

All construction work shall be carried out under the supervision of a Construction Engineer on Record only.

Duties and Responsibilities:

1) To adhere strictly to the structural drawings, specifications and written instructions of the Structural Engineer on Record and Architect on Record / Engineer on Record
2) To follow the provisions of N.B.C. or I.S. specifications as regards materials, components, quality control and the process of construction.
3) To provide for safety of workers and others during excavation, construction and erection.
4) To provide safe and adequate temporary structure required for construction and erection.
5) To bring to the notice of the structural designer and Architect/Engineer any situation of circumstances which in his opinion are liable to endanger the safety of the structure.
6) To deposit with the Competent Authority one set of working drawings of the works executed along with the progress certificates before proceeding with the next stage of the work.
7) He/she shall be in overall charge of the site and responsible for overall supervision of the work.
8) He/she shall ensure that all the work under his charge is carried out in conformity with the approved drawings and as per the details and specifications supplied by the registered Architect/Engineer.
9) He/she shall take adequate measures to ensure that no damage is caused to the work under construction and adjoining properties.
10) He/she shall also ensure that no undue inconvenience is caused in the course of his/her work to the people in the neighborhood.
11) He shall also ensure that no nuisance is caused to traffic & neighboring people by way of noise, dust, smell, vibration etc. in the course of his/her work.

13.7 CONSTRUCTION MANAGEMENT AGENCIES ON RECORD (CMAR)

Construction work for a high-rise buildings or Special Structures shall be carried out by a Construction Management Agency on Record.

Duties and Responsibilities:

(A) At the time of seeking permission from Competent Authority for starting construction of a high-rise building or special structures, the Owner shall submit an undertaking from CMAR that

1) the CMAR is agreeable to accept the assignment to execute the project as per designs, drawings and specifications

2) *the CMAR shall install a Quality Assurance programme by retaining an independent Quality Audit Agency on Record (QAAR) and submit a certificate concerning the same to the Owner/Developer as well as to the Competent Authority. The appointed QAAR shall be acceptable to the Owner/Developer. (The text is put in italics as it does not specifically apply/relate for registration.)*

(B) Upon completion of the construction work of the high-rise building and Special Structures the CMAR shall intimate to the Owner/Developer that the work has been carried out according to the design drawings and specifications and written instructions of SDAR and as per guidance of the QAAR.

(C) The CMAR shall submit a report and certificate in the prescribed format from the QAAR that the quality assurance programme has been satisfactorily carried out on the construction work. This report and certificate shall be submitted to the Owner/Developer for final submission to the Competent Authority.

(D) All Reports and other submissions to the Competent Authority by and on behalf of the CMAR shall only be signed by Construction Engineer ON Record (CER) as a proprietor, partner or by as a designated officer of the company.

13.8 QUALITY AUDITOR ON RECORD (QAR)

(A) The construction work of a high-rise building executed by CMAR shall be under an independent quality inspection programme prepared and implemented under the supervision of an independent QAR.

13.9 QUALITY AUDIT AGENCY ON RECORD (QAAR)

For all high-rise construction and special structures, it will be necessary to have an Independent Quality Inspection Programme, which will be determined and executed by and independent Quality Audit Agency on Record (QAAR).

(A) At the time of seeking permission from competent authority for starting construction of a high rise building of special structures CMAR shall submit an undertaking form QAAR that:

(1) The QAAR is agreeable to accept the assignment to implement the quality inspection programme. AND that the appointed QAAR is acceptable to the Owner/Developer.

(2) The QAAR will get all the testing of building materials, concrete etc. done by an independent approved testing laboratory.

(B) During construction of a high rise building and special structures the QAAR shall carry out necessary testing of materials as well as non-destructive testing of structural components with the help of approved testing laboratory and submit to the CMAR and the owner/developer the reports as per quality inspection programme.

(C) Upon completion of the construction of high-rise building or the special structure the QAAR shall submit the report and certificate in the prescribed format based on the quality inspection programme. This report and certificate will be submitted to the CMAR and the owner/developer for final submission to the competent authority.

(D) All reports and other submissions to the CMAR by QAAR shall only be signed by Quality Auditor on Record (QAR) as proprietor, partner or as a designated officer of the company.

13.10 GEO–TECHNICAL ENGINEER ON RECORD (GER) / GEO-TECHNICAL AGENCY ON RECORD (GAR):

All high rise buildings, life line building, special buildings shall engage a geotechnical engineer on record the design of foundation work.

Duties and Responsibilities:

(a) To carry out soil investigation at proposed locations as per specifications of Structural Engineer on Record (SER) of Structural Design Agency on Record (SDAR).

(b) To recommend various type foundation for proposed structure and loading with supporting calculations

(c) To enable SER or SDAR to take site decision in case strata different than soil investigation report is met with.

(d) To list out precautionary measures so that there is no damage to adjacent property.

13.11 DEVELOPER / BUILDER

Duties and responsibilities

The responsibilities of developers shall be:

1. To obtain and submit to the Competent Authority, along with application for development permission, each progress report and application for occupation certificate.
2. To appoint an Architect on Record/ Engineer on Record and Structural Engineer on Record.
3. To obtain at relevant stages certificates from them, for submission to the Competent Authority, that in designing the real estate development and providing detailed drawings and specifications for it they have complied with requirements as laid out in the GDCR Regulations.
4. To appoint a Construction Engineer on Record (CER) for site supervision.
5. To obtain and adhere to the quality assurance procedure and construction safety procedures prepared by the registered CER / safety officer
6. To adequately enable the site supervisor (CER) to carry out his responsibilities.
7. To certify along with the site supervisor (CER) that construction of the real estate development has been carried out as per the design, detailed drawings and specifications provided by the Architect on Record/ Engineer on Record and Structural Engineer on Record.
8. To obtain development permission from the Competent Authority prior to commencement of construction of the real estate development
9. To regularly submit progress reports and certificates signed by professional on record as required by the Competent Authority.
10. To inform in writing the Competent Authority within 7 days, if for any reason he ceases to be the developer or is relieved of his responsibilities as the developer of the real estate development

11. To inform in writing the Competent Authority within 7 days, if for any reason any of the registered professionals appointed by him have been relieved of their responsibilities or have resigned.
12. The appointment of the registered Architect/ Engineer on Record shall mean that he (the Developer) has authorized the Architect on Record / Engineer on Record to do all things necessary and to take all adequate measures for preparing the design, drawings and specifications for the project as per NBC & IS Codes. Appointment of registered Construction Engineer on Record, means that he shall execute the project as per the design, IS codes & NBC.
13. The Builder shall appoint a safety officer to ensure safety during construction and shall take adequate precautionary measures as required by NBC and other safety rules.
14. He shall not cause or allow any deviations from the approved drawings in the course of the execution of the project against the instruction of Architect on Record /Engineer on Record / Construction Engineer on Record /Clerk of Works on Record / Structural Engineer on Record and shall bear all responsibility for any irregularity committed in the use and function of the building or its parts for which the approval has been obtained.
15. When no registered construction contractor or site supervisor or safety officer is required to be appointed and not appointed he shall be responsible for their duties and responsibilities under the regulations.
16. He shall not commence the use of building or shall not give the possession to occupy the building to any one before obtaining the occupancy certificate from the Competent Authority.
17. He shall provide adequate construction safety measures during construction, for structural stability and protection against fire hazards likely from installation of services like electrical installation, plumbing, drainage, sanitation, water supply etc. wherever required under the regulations during construction. He shall be responsible for the safety of the laborers and shall take adequate insurance for third party during construction.
18. He shall exhibit the names of registered persons only, on site and no additional names will be exhibited/ displayed.
19. He shall explain the construction design and its intended use as per approved plan only, to the prospective purchaser of the premises under construction.
20. He shall make available copies of titles for the land, approved plans and all certificates issued to the Competent Authority under these Regulations.

13.12 OWNER

“Owner”, who holds the legal ownership and possession of the property in relation to any property, includes any person who is for the time being, receiving or entitled to receive, whether on his own account or on account of or on behalf of, or for the benefit of, any other person or as an agent, trustee, guardian, manager or receiver for any other person or for any religious or charitable institution, the rents or profits of the property; and also includes a mortgaging possession thereof or by authorized representative.

Appendix L of KMBR (to be amended)

QUALIFICATION AND FUNCTION OF REGISTERED PROFESSIONALS

14 REGISTRATION, QUALIFICATIONS AND DUTIES OFPROFESSIONALS

14.1 REGISTRATION OF PROFESSIONALS

14.1.1 B1.1 The competent Authority shall register Town Planners (RTP), Architects (RA), Engineers (RE), Structural Engineers (RSE), Structural Design Agencies (RSDA), Geo-technical Engineers (RGE), Construction Engineers (RCE), Construction Management Agency (RCMA), Quality Auditors (RQA) and Quality Audit Agencies (RQAA), Developers (RD), wherever applicable, till such time there is no legislative frame for the professionals like engineers and others similar to Architects Act 1973. Application for registration shall be submitted by these professionals to the competent authority.

Registration of professionals is **mandatory** and shall be valid for a period of **three** years and shall be renewable except in the case of Architects, registered with Council of architects and corporate members of Institution of Engineer (Civil).However, they have to take one time registration with the competent authority.

The entire registered professional should attend relevant technical workshops / seminars for 30 hours / year conducted by accredited professional Associations / Engineering Colleges / skill development institutes, to improve their technical skills. Documentary evidence should be produced while applying for re registration.

14.2 REGISTERED ARCHITECT / REGISTERED ENGINEER

(a) Architect

(Ref: Appendix L – KMBR '99)

1. Architect shall be B. Arch or its equivalent, registered with Council of Architecture and shall be bound with the terms & conditions as prescribed under the professional rules by the Council of Architecture to render professional services with relevant experience.
2. Degree in architectural engineering /associate membership of Indian Institute of architects *(equivalent to Building designer A of KMBR '99*)

(b) Engineer

1) B. Tech / B. Sc (Engg) Civil engineering or membership in Institution of Engineer (Civil) or equivalent with experience in planning and design of buildings OR
2) Diploma in Civil Engineering with relevant experience as building engineer / supervisor

Scope of work & eligibility to function will depend up on the **grade** of registration

- The experience shall be under one or more Registered Engineer / Registered Architect
- The registration shall be renewed every three years.
- The registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.2.1 REGISTERED ARCHITECT / REGISTERED ENGINEER Grade-I

(Equivalent to Architect / Building designer A / Engineer A of KMBR 1999)

Scope of work:

- To prepare & submit plans, drawings and specification, completion certificate and other documents for obtaining development permit up to 1 hectare and
- To prepare & submit plans, drawings and specification, completion certificate and other documents for obtaining building permit of all buildings, including High rise buildings of all heights, Educational institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings and the likes.

Eligibility:

1) B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 5 years experience (after attaining the degree) in planning and design of buildings at a responsible position as design engineer *(equivalent to Engineer A of KMBR 1999*) OR
2) B. Arch or its equivalent with relevant experience of 5 years *(equivalent to Architect of KMBR 1999*)
3) M. Tech / M. Sc (Engg) Civil /Structural engineering or equivalent with 3 years experience
4) Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience*(equivalent to Building designer A of KMBR 1999*)
5) The experience as stated above shall be under a Registered Engineer / Registered Architect and should have designed at least one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced)

14.2.2 REGISTERED ARCHITECT / REGISTERED ENGINEER - Grade-II

(Equivalent to Supervisor A of KMBR 1999)

Scope of work: To prepare submit building plans &3drawings, completion certificate and other documents for obtaining development permission of Buildings up to 7 stories or 40 m with Plinth area upto 750 m2.

Eligibility:

1. B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 3 years experience (after attaining the degree) in planning and design of buildings at a responsible position as building engineer *(equivalent to Engineer A of KMBR 1999*) OR
2. B. Arch or its equivalent with relevant experience of 3 years *(equivalent to Architect of KMBR 1999*)
3. M. Tech / M. Sc (Engg) Civil /Structural engineering or equivalent with 2 years experience
4. Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience *(equivalent to Building designer A of KMBR 1999*)
5. Diploma in Civil Engineering with 5 years experience in planning and design of buildings at a responsible position as building engineer / supervisor.
6. Three years architectural Assistantship / Diploma in Architecture with 5 years experience in planning and design of buildings.

7. The experience as stated above shall be under a Registered Engineer / Registered Architect and should have designed at least one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced)

14.2.3 REGISTERED ARCHITECT / REGISTERED ENGINEER - Grade-III

(Equivalent to Supervisor B of KMBR 1999)

Scope of work: To prepare submit building plans & drawings, completion certificate and other documents for obtaining development permission of low rise Buildings excluding the above mentioned structures for Grade –I and Grade – II, up to 2 stories or 7.5 m height, with Plinth area upto 300 m2.

Eligibility:

1. B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 1 years in planning and design of buildings at a responsible position as building engineer or
2. B. Arch or its equivalent with relevant experience of 1 years.
3. M. Tech / M. Sc (Engg) Civil / Structural engineering or equivalent with 1 years experience
4. Diploma in Civil Engineering with 3 years experience in planning and design of buildings at a responsible position as building engineer / supervisor
5. Degree in architectural engineering /associate membership of Indian Institute of architects with 1 years experience *(equivalent to Building designer A of KMBR 1999*)
6. Three years architectural Assistantship / Diploma in Architecture with 3 years experience in planning and design of buildings.
7. The experience as stated above shall be under a Registered Engineer / Registered Architect

14.3 REGISTERED STRUCTURAL ENGINEER (RSE)

On the basis of their academic qualifications and experience, Structural Engineers shall be "Registered" in three "Grades". The eligibility criteria for registration in each "Grade" and the "Scope of Work" which can be entrusted to the Structural Engineer of each "Grade" are given below.

Scope of work & eligibility to function will depend up on the grade of registration

- The experience shall be under one or more Registered Structural Engineer
- The registration shall be renewed every three years.
- The registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.3.1 REGISTERED STRUCTURAL ENGINEER (RSE) - Grade-I

Scope of work: To prepare structural design and structural drawings of any High rise buildings, Educational institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings, factories, bridges, flyovers, water tanks, and the likes.

Eligibility:

1. M. Tech / M. Sc (Engg) Structural/ Earthquake Engineering or Ph.D. in Structural Engineering or equivalent with minimum 5 years of experience (after attaining the degree) in structural design work at a responsible position as structural designer or

2. B. Tech / B. Sc (Engg) Civil or equivalent with minimum 10 years experience (after attaining the degree) in structural design work at a responsible position as a structural designer

14.3.2 REGISTERED STRUCTURAL ENGINEER (RSE) - Grade-II

Scope of work: To prepare structural design and structural drawings of various buildings up to 7 stories or 40 m having plinth area up to 750 m2.

Eligibility:

1. M. Tech / M. Sc (Engg) Structural engineering / Earthquake Engineering or Ph.D. in Structural Engineering or equivalent with minimum 3 years of experience (after attaining the degree) in structural design work at a responsible position as a structural designer or
2. B. Tech / B. Sc (Engg) Civil or equivalent with minimum 5 years experience (after attaining the degree) in structural design work at a responsible position as a structural designer.
3. The experience as stated above shall be under a Structural Engineer on Record Engineer and should have designed at least one 4 storied multistoried building or three 3 storied building during the last 3 years. (Documentary evidence to the same is to be produced).

14.3.3 REGISTERED STRUCTURAL ENGINEER (RSE) - Grade-III

Scope of work: To prepare structural design and structural drawings of Low rise buildings up to 2 stories or 7.5 m height & not more than 6m span, with Plinth area up to 300 m2, excluding above mentioned structures for Grade-I and Grade-II

Eligibility:

1. M. Tech / M. Sc (Engg) Structural/ Earthquake Engineering or equivalent, with minimum 1 years of experience (after attaining the degree) in structural design work at a responsible position as a structural engineer
2. B. Tech / B. Sc (Engg) Civil or equivalent with five years experience in Geotechnical engineering /structural engineering (after attaining the degree) in structural design work at a responsible position as a structural engineer
3. The experience as stated above shall be under a Structural Engineer on Record and should have designed at least three 3 storied building during the last 3 years. (Documentary evidence to the same is to be produced).

14.4 REGISTERED CONSTRUCTION ENGINEER (RCE)

(A) The requirements for registration shall be:

a) B. Tech / B. Sc (Engg) Civil or equivalent with 5 years experience in construction or

b) M. Tech / M. Sc (Engg) Civil engineering or equivalent with 3 years experience in Construction engineering /structural engineering

c) Diploma in Civil Engineering with 7 years practice in construction

d) B. Arch or its equivalent with a degree or diploma in Construction Management and 5 years of experience in construction.

e) Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience *(equivalent to Building designer A of KMBR 1999*)

f) The experience as stated above shall be under one or more Construction Engineer on Record of under one or more reputed construction companies. Such company of companies established within of outside the area of jurisdiction of the competent authority shall be of minimum ten years of standing.

g) The registration shall be renewed every three years.

h) The registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.4.1 REGISTERED CONSTRUCTION ENGINEER (RCE) - Grade-I

(Equivalent to Architect / Building designer A / Engineer A of KMBR 1999)

Scope of work: To supervise & Certify construction of any building, including High rise buildings of all heights, Educational institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings, factories, special structures, and the likes and bridges, flyovers, etc.

Eligibility:

1. B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 5 years in construction management at a responsible position as construction / project engineer OR
2. B. Arch or its equivalent with a degree or diploma in Construction with relevant experience of 5 years in construction
3. Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience *(equivalent to Building designer A of KMBR 1999*)
4. The experience as stated above shall be under a Registered Construction Engineer and should have supervised at least one 7 storied multistoried building or
5. 3 numbers of 4 storied building during the last 3 years. (Documentary evidence to the same is to be produced).

14.4.2 REGISTERED CONSTRUCTION ENGINEER (RCE)-Grade-II

(Equivalent to Supervisor A of KMBR 1999)

Scope of work: To supervise & Certify construction of Buildings up to 7 stories or 40 m with Plinth area upto 750 m2.

Eligibility:

1. B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 3 years in construction management at a responsible position as construction / project engineer OR
2. B. Arch or its equivalent with a degree or diploma in Construction with relevant experience of 3 years in construction
3. Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience*(equivalent to Building designer A of KMBR 1999*)
4. Diploma in Civil Engineering with 5 years practice in construction management
5. Three years architectural Assistantship / Diploma in Architecture with 5 years experience

14.4.3 REGISTERED CONSTRUCTION ENGINEER (RCE) - Grade-III

(Equivalent to Supervisor B of KMBR 1999)

Scope of work: To supervise & Certify construction of low rise Buildings excluding the above mentioned structures for Grade –I and Grade – II, up to 2 stories or 7.5 m with Plinth upto 300 m2.

Eligibility:

1) B. Tech / B. Sc (Engg) Civil engineering or equivalent with minimum 1 years in construction management
2) B. Arch or its equivalent with relevant experience of 1 years in construction
3) Degree in architectural engineering /associate membership of Indian Institute of architects with 5 years experience*(equivalent to Building designer A of KMBR 1999*)
4) Diploma in Civil Engineering with 3 years practice in construction management
5) Three years architectural Assistantship / Diploma in Architecture with 3 years experience in building construction.
6) Draftsman in Civil engineering Industrial Training Institute with 5 years experience in building construction.
7) The experience as stated above shall be under a Registered Construction Engineer

14.5 REGISTERED CONSTRUCTION MANAGEMENT AGENCY (RCMA)

Construction work for a high-rise buildings or Special Structures shall be carried out by a Construction Management Agency on Record.

(A) The requirement for registration shall be

(i) Owner of a RCMA if a proprietary firm shall be an RCE (Grade 1)

(ii) Fifty per cent partners of a partnership firm shall be RCE

(iii) A designated officer of a limited company shall be RCE (Grade 1)

(B) The registration shall be renewed every three years.

(C) The registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.6 REGISTERED QUALITY AUDITOR (RQA)

(A) The requirements for registration shall be:

(i) B. Tech / B. Sc (Engg) Civil or equivalent with 5 years experience in testing of building materials including concrete and/or experience in quality control work with a reputed construction agency / Civil engineering laboratory.

(ii) M. Tech / M. Sc (Engg) Civil or equivalent with 2 years experience as above.

(iii) B. Arch or equivalent with a degree or diploma in Construction Management and five years of experience in quality (iv) The experience as stated above shall be under one or more registered quality inspector/s of quality work under one or more reputed construction agencies of minimum ten years of standing from within or outside the area of jurisdiction of the Competent Authority

or with a government engineering testing laboratory or an Engineering College which teaches Civil Engineering.

(B) Registration shall be renewed after every three years.

(C) Registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.7 REGISTERED QUALITY AUDIT AGENCY (RQAA)

(A) The requirements for registration shall be:

(i) Owner of a proprietary firm shall be QAR

(ii) Fifty percent partners of a partnership firm shall be QAR

(i) A designated officer of a limited company shall be a QAR

(B) The Registration shall be renewed every three years.

(C) Registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.8 REGISTERED GEO-TECHNICAL ENGINEER (RGE)

(C) The requirements for registration shall be:

(i) B. Tech / B. Sc (Engg) Civil or equivalent with 5 years experience in Geotechnical engineering /structural engineering or

(ii) M. Tech / M. Sc (Engg) Civil or equivalent with 2 years experience in Geotechnical engineering /structural engineering.

(iii) The experience as stated above shall be under one or more Geotechnical Engineer on Record of under one or more reputed soil mechanical laboratories. Such company of companies established within of outside the area of jurisdiction of the competent authority shall be of minimum ten years of standing or with a government engineering testing laboratory or an Engineering College which teaches Civil Engineering.

(iv) The registration shall be renewed every three years.

(v) The registration may be cancelled for unprofessional conduct permanently or for a specified period

14.9 REGISTERED GEO-TECHNICAL AGENCY (RGA)

For designing foundation works

(A) The requirements for registration shall be:

(i) Owner of a proprietary firm shall be M. Tech / M. Sc (Engg) (or equivalent) in Geo-technical Engineering /Structural engineering with minimum 10 years of experience

(ii) 50% per cent partners of a partnership firm shall have educational qualifications as in (i) but a minimum 5 years experience.

(iii) A designated officer of a limited company shall have qualifications as (i)

(iv) The experience as stated above shall be under one or more Geo-technical Engineer on Record. Such agencies established within of outside the area of jurisdiction of the competent authority shall be of minimum ten years of standing.

(v) The agency should have a Registered Laboratory. Any individual possessing qualifications as in (i) and hiring services of either RGA or Registered Testing Laboratory shall also be eligible for registration.

(B) The registration shall be renewed every three years.

(C) The registration may be cancelled for unprofessional conduct permanently or for a specified period.

14.10 REGISTERED TOWN PLANNER ON RECORD

Scope of work: To prepare & submit plans, drawings and specification, completion certificate and other documents for obtaining development permit above 1 hectare

Eligibility

The qualifications, responsibility and the professional charges shall be applicable as prescribed by the Institute of Town Planners, India for their members for rendering professional services.

14.11.1 REGISTERED PLUMBING ENGINEER - Grade-I

Scope of work: To Design, supervise & Certify plumbing design and execution of High rise buildings, Educational institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings, hospitals, factories. special structures, and the likes above 7 stories or 40 m.

Eligibility:

1) B. Tech / B. Sc (Engg) Civil / Mechanical engineering or equivalent with minimum 5 years experience in plumbing design & execution at a responsible position as plumbing engineer OR

2) The experience as stated above shall be under a Registered plumbing Engineer and should have designed & supervised at least one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced

14.11.2 REGISTERED PLUMBING ENGINEER - Grade-II

Scope of work: To Design, supervise & Certify plumbing design and execution of Buildings up to 7 stories or 40 m with Plinth area upto 5000 m2.

Eligibility:

1) B. Tech / B. Sc (Engg) Civil / mechanical engineering or equivalent with minimum 3 years experience in plumbing design & execution at a responsible position as plumbing engineer OR

2) Diploma in Civil Engineering with 5 years experience in plumbing design and execution

3) The experience as stated above shall be under a Registered Plumbing Engineer and should have designed & supervised at least one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced)

14.11.3 Registered Plumber

Scope of work: To supervise & Certify plumbing works of low rise Buildings excluding the above mentioned structures for Grade –I and Grade – II, up to 2 stories or 7.5 m with Plinth area up to 300 m2.

Eligibility:

1) Diploma in Civil Engineering with 3 years experience in plumbing design and execution
2) Plumbers approved by KWA to submit application for water connection.

Chapter 3

Procedure for Obtaining Building Permit

15.1 Notice for obtaining building permit –

Every person who intends to erect, re-erect or make alterations in any place in a building or demolish any building shall give notice in writing to the Authority, of his said intention in the prescribed form and such notice shall be accompanied by plans and statements in sufficient copies, as required under the By-law. The plans may be computer prints on white paper or ammonia paper or through approved electronic software. One of them shall be cloth mounted. One set of such plans shall be released and the rest retained in the office of the Authority for record after the issue of permit or a refusal.

15.1.1 Copies of Plans and Statements –

Normally 4 copies of plans and statements shall be made available along with the notice.

15.2 Documents to Accompanying Notice –

The notice shall be accompanied by an application for building permit in the prescribed form, site plan, key plan, building plans, structural design basis report, services plans, specifications and ownership title and certificate of undertaking for hazard safety and for design / supervision by 1) Architect – on – record / Engineer – on - record, 2) Structural Engineer – on – Record, 3) Construction Engineer – on – Record and other documents as prescribed by the Authority.

15.2.1 The **size of drawing sheets** shall be any of those specified in Table 1.

TABLE I

DRAWING SHEET SIZES		
Sl .No	**Designation**	**Trimmed Size, mm**
1	AO	841 X 1189
2	A1	594 X 841
3	A2	420 X 594

15.2.2 Dimensions –

All dimensions shall be indicated in metric units.

15.2.3 Colouring Notations for Plans –

The plans shall be coloured as specified in Table 2. Further, prints of plans shall be on one side of paper only.

TABLE 2

COLOURING OF PLANS

Sl .No	Item	Site Plan			Building Plan		
		White plan	Blue print	Ammonia print	White plan	Blue print	Ammonia print
1	Plot Lines	Thick black	Thick black	Thick black	Thick black	Thick black	Thick black
2	Existing Street	Green	Green	Green	…	…	…
3	Future Street, if any	Green dotted	Green dotted	Green dotted	…	…	…
4	Permissible building lines	Thick dotted Black	Thick dotted Black	Thick dotted Black	…	…	…
5	Open spaces	No colour					
6	Existing work	Black (out line)	White	Blue	Black	White	Blue
7	work proposed to be demolished	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched	Yellow hatched
8	Proposed work	Red filled in	Red	Red	Red	Red	Red
9	Drainage& sewerage work	Red dotted	Red dotted	Red dotted	Red dotted	Red dotted	Red dotted
10	Water supply work	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin	Black dotted thin

15.2.4 **Key plan and Approval of Site** – A key plan drawn to a scale of not less than 1 : 10,000 shall be submitted along with notice , showing boundary, location of the site with respect of neighbourhood land marks, in areas where there is no approved layout plans. In case of lease hold plot clearance from the lessor regarding lease conditions shall be obtained. Leasehold plot clearance from the lesser regarding lease conditions shall be obtained.

15.2.5 **Site Plan**- The site plan sent with an application for permit shall be drawn to a scale of not less than 1:1000 and shall show-

a) The boundaries of the site and of any contiguous land belonging to the owner there of ;

b) The position of the site in relation to neighbouring street;

c) The name of the streets in which the building is proposed to be situated , if any;

d) All existing buildings standing on, over or under the site;

e) The position of the building, and of all other buildings (if any) which the applicant intends to erect upon his contiguous land referred to in (a) in relation to –

(i) The boundaries of the site and in case where the site has been partitioned, the boundaries of the portion owned by the applicant and also of the portions owned by others;

(ii) All adjacent streets, buildings (with number of storey's and height) and premises with in a distance of 12 m of the site and of the contiguous land (if any) referred to in (a) ; and

(iii) If there is no street within a distance of 12 m of the site, the nearest existing streets;

f) The means of access from the street to the building, and to all other buildings (if any) which the applicant intends to erect upon his contiguous land referred to in (a);

g) Space to be left about the building to secure a free circulation of air, admission of light and access for scavenging purposes;

h) The width of the street in front and of the street (if any) at the side or rear of building:

i) The direction of north direction relative to the plan of the buildings;

j) Any existing physical features, such as wells, drains, trees etc.;

k) The ground area of the whole property and the break up of covered area on each floor with the calculations for percentage covered in terms of the total area of the plot as required under the Bye-laws governing the coverage of the area;

l) Parking plans indicating the parking spaces for all buildings except for individual residential buildings;

m) Such other particulars as may be prescribed by the authority ;and

n) Building number or Plot No. of the property on which the building is intended to be erected is to be indicated on the drawing.

15.2.6 **Building Plan (up to 15 m)** –

The plans of the building and elevations and sections accompanying the notice shall be drawn to a scale of 1: 50, for plots measuring up to 250 sq.m. and plots measuring above 250 sq.m. to a scale of 1: 100. The plan shall include

a) floor plans of all floors together with the covered area clearly indicating the size and spacing of all framing members and size of rooms and the position and the width of staircases , ramps and other exit ways, lift wells, lift machine room and lift pit details.

b) Elevation and section drawings indicating the height of building and rooms and also the height of the parapet; and the drainage and the slope of the roof. At least one section should be taken through the staircase & fire escape

c) Joinery details of doors , windows and other openings including ventilators with sizes in proper schedule form

d) Structural Design Basis Report (form 6) & structural drawings showing clearly the size of the footings, columns, beams, and thickness of basement, walls, framing plan, floor and roof slabs & beam lay out.

e) details of service plan, location of essential services, septic tank, drinking water tank, rain water harvesting tank, fire water tank

f) dimensions of the projected portions beyond the permissible building line

g) terrace plan indicating the drainage and the slope of the roof

h) the use or occupancy details of all parts of the buildings;

i) indications of the north direction relative to the plan;

j) details of parking space provided

k) Undertaking / certificate of registered professionals – Form No. 1, 2,3,4

l) such other particulars FAR, Coverage, Occupancy, as may be required to explain the proposal clearly and as prescribed by the Authority.

15.2.7 Application for Building Plans for Multi-storied buildings (taller than 15 m and 4 stories), life line structures, & Special Buildings

For Life line structures' / multi-storied buildings, which are more than 15 m height and for special buildings like assembly, institutional, industrial, storage and hazardous occupancies, having covered area more than 500 m2, building sanction / permit shall be done in 2 stages (Ref NBC cl. 12.2.5.1). The following additional information shall be furnished / indicated in the Building Plans.

(Building permit shall be issued in 2 stages. In the 1st stage the, Local authorities will verify the general requirements like coverage, FAR, access, setbacks, road width, SDBR, undertakings of professionals, etc and issue clearance to proceed with the second stage of design. Stage 1 clearance is not a permit to start the construction of the building.

The second stage of application for building permit shall be accompanied by detailed structural design calculations, Drawings, service plans etc. Construction of the structure shall be permitted only after obtaining the 2nd stage of permit.)

Stage 1. First stage for planning clearance

a) Access to fire appliances/ vehicles with details of vehicular turning circle and clear motor able access way around the building;

b) Size (width) of main and alternate staircases along with balcony approach, corridor, ventilated lobby approach;

c) Location and details of lift enclosure;

d) Location and size of fire lift;

e) Smoke stop lobby/ door where provided;

f) Refuse chutes, refuse chamber, service duct, etc.;

g) vehicular parking space;

h) refuge area, if any;

i) Details of Building Services- air conditioning system with position or dampers , mechanical ventilation system, electrical services , boilers, gas pipes etc.;

j) Details of exits including provision of ramps, etc. for hospitals and special risks / facilities provided as per NBC for handicapped persons

k) Location of generator, transformer and switch gear room;

l) Smoke exhauster system if any;

m) Details of fire alarm system net work;

n) Location of centralized control, connecting all fire alarm system, built –in fire protection arrangements and public address system etc.;

o) Location and dimension of static water storage tank and pump room;

p) Location and details of fixed fire protection installations such as sprinklers, wet risers, hose reels, drenchers, CO2 installations etc.; and

q) Location and details of first aid fire fighting equipments/ installations

r) Undertaking / certificate of registered professionals – Form No. 1, 2,3,4

s) Structural design basis report (Form 6)

t) Structural design & drawings as per NBC (Stage 2 for high rise buildings, life line buildings & special buildings only)

u) Form no A, C, S (Stage 2 -relevant forms only)

v) Proof checking report by the Pier reviewer.

Stage 2: Second stage for building permit clearance

After obtaining sanction for planning (Stage 1) from authority, request for Stage 2 building permit is to be applied. A complete set of Structural plans, sections, details & design calculations duly signed by Structural Engineer on Record, is to be submitted. The structural design and drawings shall be proof checked by the ULB either internally or through Structural Design Review Panel before the building permit is issued. The construction of the building shall be commenced only after obtaining the permit for stage 2 from the Authority.

15.2.8 Service Plan –

Design & drawings of plumbing, water supply, rain water harvesting, fire fighting, sewage disposal system and details of other building services, where required by the Authority, shall be made available on a scale not less than 1: 100.

15.2.9 Specifications–

General specifications of the proposed construction giving type and grade material of public use, duly signed by the Architect – on –record / Engineer – on – record and Structural Engineer - on – record, may be shown accompanying the notice.

15.2.7. **Supervision**-

Notice shall be further accompanied by certificate of supervision by the 1) Architects - on - record/Engineers - on - record, 2) Structural engineer on record and 3) Construction engineer on Record (Form 1,2,3,4) as the case may be .

15.2.8 **Execution of drainage/plumbing/Sanitary works**-

Notice shall be further accompanied by a certificate of supervision/ execution of the water supply and drainage works etc. in the prescribed form duly signed by licensed Plumbing Engineer on record / plumber.

15.2.9 Documents–

Application for building permit shall be accompanied by the following documents:

a) Ownership Documents- Lease- deed, sale –deed etc. duly accompanied by an annexed site plan giving the physical description of the plot/ property. In such cases where lease-deed has not been executed , no objection certificate from the competent Authority shall be submitted;

b) Documents under Urban Land (Ceiling and Regulation) Act,1976;

c) In case of any deviation from the terms and conditions stipulated in the lease- deed / ownership document, necessary clearance from the Competent Authority;

d) No objection Certificate from the Competent Authority regarding land use as per Master/ Zonal plan, if required;

e) Approval from the Chief Inspector of Factories in case of Industrial Buildings, if required;

f) Approval from the Chief Controller of Explosive, Nagpur and Chief Fire Officer, Delhi (in case of hazardous buildings)

g) Indemnity Bond in case of proposal for the construction of basement.

15.3 Signing the Plans-

All the plans shall be duly signed by the 1) owner, 2) Architect on record / Engineer on record, 3) Construction engineer on record and 4) Structural engineer on record and shall indicate their names , address, license and enrolment number.

15.4 Small buildings up to 2 stories & plot up to 100 m2 area,

Plans in respect of plots up to 100 sq.metre and up to 2 storey's may be signed by a Engineer grade III, (licensed supervisor) instead of Architect on record subject to it being approved by the Competent Authority.

16. Occupation of Building–

No person shall occupy or allow any other person to occupy any building or part of a building for any purpose until such building or part has been granted the occupancy certificate.

16.1 Notice of Completion –

Every owner shall have to submit a notice of completion of the building to the Authority regarding completion of the work described in the building permit. The notice of completion shall be submitted by the owner through the 1) Architect / Engineer on record 2) Structural Engineer on record 3) Construction Engineer on record, as the case may be, who has supervised the construction, in the Performa given in 7, 8, 9, 10, 11, 12, 13, 14, accompanied by three copies of completion plan /as – built - drawing and the following documents and along with a fee prescribed by the government.

1) Copy of lease deed

2) Clearance from Chief Fire Officer (if applicable)

3) Clearance from Chief Controller of Explosives, Nagpur (as required).

4) Structural design & drawings, Structural Design Basis Report duly signed by the registered Structural Engineer on record. Proof checking report of SDRP.

5) Certificate from the Lift Manufacturer, as required.

6) Certificate from Air conditioning Engineer, Manufactures as required.

7) A certificate by the owner and Construction Engineer on Record for covering up the underground drain, sanitary and water supply work, under their supervision and in accordance with Building Bye- Laws and sanctioned building plans stipulated in the applicable.

8) In case of large campus / complex, completion of individual block/ building will be issued by the local body in accordance with the construction work completed phase wise.

9) The extension of Time up to the date of applying for completion certificate. In case, if the completion certificate is refused due to deviation, which cannot be compounded, the completion will be rejected and extension of time will be required accordingly.

10) NOC for regular water supply and electricity may be issued only after the completion certificate is obtained

11) Certificates of Professional on record - Form no. 7, 8, 9, 10, 11, 12, 13, 14, 15, C, S (relevant forms only)

16.2 Occupancy Certificate – The Authority, on receipt of the notice of completion, shall inspect the work and communicate the sanction or refusal or objections there in the Performa given in Appendix 'H' of KMBR with in 60 days from the date of receipt of Notice of Completion. If nothing is communicated with in this period, it shall be deemed to have been approved by the Authority for occupation. Where the occupancy certificate is refused, the various reasons shall be quoted for rejecting at the first instance itself.

16.2 <u>THE SPECIAL CONDITIONS FOR THE CONSTRUCTION OF MULTISTOREYED BUILDINGS (With FAR up to 4)</u>

Construction of High rise building constructions are to be regulated subject to compliance with conditions of detailed urban design clearance , fire fighting requirement and requirements under other provisions like the Master plan, zoning regulations, building bye-law, road width, structural design requirements, and other requirements mentioned elsewhere and as per NBC, etc., but further subject to the following modifications:-

a) The space to be constructed should be guided by per floor coverage and floor area ratio (FAR) norms. These would, in general, influence the height of buildings, at the same time leaving some independence to the builders /architect with regard to height of the building. There is, therefore, no need to impose any specific height restrictions.

b) The aim of imposing such restrictions is to have more green space around the building. High rise buildings may be granted **more FAR, if the total coverage is reduced to 25%.** The maximum per **floor coverage should be 25%** of the net plot for all zones. This will include the area required for all services except passage to the building. The remaining 75% must include only the passage to the building and the green area round.

c) As already stated the maximum per floor coverage of 25% should include the area required for all services except passage to the building. Thus the facility must be included in the 25%

and it must be under ground. How ever, basement parking may be allowed up to 3 m from the boundary line.

d) While the maximum per floor coverage does not exceed 25%, relaxation in **FAR up to 4** may be granted to allow taller constructions, provided that the builder pays in appropriate mode the additional cost incurred by the government on infrastructure development, such as water and fire fighting services by the urban body on account of additional FAR height.

Note:

These guidelines are applicable only to high rise construction i.e.to buildings with height above 15 m or having more than 4 storeys. (Law rise buildings will continue to be governed by the earlier guidelines regarding FAR , floor coverage etc.), provided at least 50 % of the area of the plot is left green. The parking and passage to the building will have to be accommodated in the other 50%.

i. The underground basement for parking may be permitted to extend beyond the building line up to the envelop line, subject to the condition that the top roof level of the basement beyond the actual building line should be flush with or below the ground and that it should be properly landscaped to make it green.

CHAPTER 4
Telecommunication Towers

17. Essentiality of permit.— No person shall erect or re-erect any telecommunication tower [or telecommunication pole structures or accessory rooms] or make alteration or cause the same to be done without first obtaining a separate building permit for each such tower [or telecommunication pole structures] from the Secretary.

17.1 Distance from road and boundaries.—(1) The base of the tower or poles shall have minimum distance of 1.5 times the height of the tower from the plot

(2) In addition to the distance specified under sub rule (1), set back required for road widening proposed in any Town Planning Scheme shall also be provided.

(3) Distance from other boundaries of the plot to the base of the telecommunication tower or pole structure or accessory rooms shall be minimum of 1.5 times the height of the tower

Provided also that no portion of the telecommunication tower pole structure or accessory room shall project or over hang into the neighbouring plots].

17.2 Provisions regarding FAR and height.- The provisions regarding FAR, coverage, [height restriction with regard to width of road and distance from the boundary abutting road], distance from central line of road and dimension of parts of building shall apply to telecommunication towers or [pole structures or accessory rooms such as equipment rooms, shelters or generator rooms.]:

Provided that the height of the telecommunication towers or pole structure or accessory rooms, including the height of the building if they are proposed over a building, shall be restricted as shown in Table 3 of sub rule (2) of rule 32 and for exceeding the height restriction specified under Table 3 of the said rule, clearance from the concerned airport authority shall be obtained and produced before issuing permit.

Provided further that additional distance from boundary abutting the road and other boundaries of the plot proportionate to increase in height shall not be necessary for the telecommunication tower or pole structures or accessory rooms or for the building over which they are proposed.

17.3 [Accessory rooms].— [(1) Accessory rooms such as equipment rooms, shelters or generator rooms essential for the service shall be permitted along with a telecommunication tower or telecommunication pole structures or separately, if a request is made in the application and plans/drawings of the rooms are attached either along with the application for permit or separately.].

(2) The cabin may be made with non combustible material but the area of such cabin shall not exceed 15 Sq.mts.

(3) Installation of electricity generator may be allowed if the generator is covered with insulated sound-proof cabin.

(4) Every construction or installation ancillary or necessary for the telecommunication system shall conform to the relevant rules of fire and safety applicable to such construction or installation and licence or permit required under such rules shall also be obtained.

(5) The telecommunication tower or ancillary structures shall not prevent or block the access, exit or entry or reduce the width of such access, exit or entry of building or in no way badly affect the safety measures or amenities provided in the building in which it is erected.

17.4 ***Electrical line clearance.***— Every tower or ancillary construction shall satisfy the minimum vertical and horizontal clearance from electrical lines as stipulated in the Indian Electricity Act, 1910 and Indian Electricity Rules, 1956 as amended from time to time and also any regulation issued by the State Electricity Board.

17.5 Protective Wall— (1) Every tower erected on the ground and through which electric power is transmitted or passed shall be provided with protective wall or grill at a distance of one metre from any point of the base.

(2) The wall or grill shall have a minimum of 1.20 metres height and shall be kept under lock and key, if provided with door.

17.6 ***Protection from lightening***— Every telecommunication tower shall be provided with sufficient protection against lightning, conforming to I.S. 2303-1969-Code of Practice, as amended from time to time.

17.7 Warning lights and colour specifications— (1) Every telecommunication tower shall be provided with two Aviation Warning Lights (ANL) each at 40 metres and 70 metres height from the ground level and one at the top, the two lights at 40 metres height shall be fixed in one set of opposite and that at 70 metres height shall be fixed at the other set of opposite corners.

(2) Every telecommunication tower shall be painted with international orange and international white colours alternatively each with 5 meter band, starting with international orange at the top.

17.8 Damage and liability— The applicant/owner shall be responsible for the safety of the structure. The application for building permit shall be accompanied by the **structural design basis report** (form 6) prepared by a **Registered Structural Engineer**. The supervision of the erection of the **telecommunication tower shall be supervised by a Registered Construction engineer.** The structural design of the building and tower, shall be proof checked by the **Structural design review panel**.

17.9 Building to be authorised — Erection of any telecommunication tower or pole structures or accessory rooms shall be permitted only over authorised **structurally safe** buildings.(to be certified by a Registered Structural engineer.

17.10 Clearance from Defence Establishment etc.— In case the erection of telecommunication tower is proposed within 200 metres from any property maintained by Defence Establishment or 100 metres from any railway, clearance from the concerned officer in charge or authority, as the case may be, shall also be obtained before issuing permit.

17.10(A) Site approval etc.—(1) site approval is necessary for the construction of telecommunication towers, telecommunication pole structures or accessory rooms essential for such service.

(2) Telecommunication towers or pole structures or accessory rooms shall be permitted in any zone or over any building irrespective of its occupancy.].

17.11 Submission of application and its disposal.— (1) Application for building permit shall be submitted to the Secretary along with 4 copies of site plan, location, elevation, sections, structural design & Drawings, Structural design basis report, Consent of the Engineer on record, consent of the structural engineer on record, consent of the construction engineer on record [copy of agreement executed with department of Telecommunications or license or permit issued by an authority approved by Government of India from time to time] and document to prove ownership.

Note- (1) Ownership document may be a sale deed or mortgage deed or deed of agreement or license or consent document, etc.

(2) Structural design & Drawings prepared by a registered structural engineer should accompany the application for permit in the case of telecommunication poll structures, taller than 15m from the ground level.

(3) In case the telecommunication tower is proposed above any building, structural design and the completion certificate of the building shall also be submitted along with the application for building permit

(4) The site plan shall show plot dimensions, access street width, details of existing structures within the plot with their uses, height, number of floors, set back from the plot boundaries and between them; proposed tower and ancillary structures.

(5) The Structural Design Basis Report shall be issued by a Registered Structural Engineer - grade 1, having [post graduate degree in Structural Engineering.

(6) Application fee shall be fixed by GOK and permit fee shall be,-

(a) For towers [of any height], rupees ten thousand;

(b) For pole structures (one unit with any number of poles) rupees two thousand and five hundred].

(c) No separate application fee shall be necessary for the accessory rooms essential for the use of telecommunication tower or pole structures but permit fee shall be remitted corresponding to their area as in the case of a pucca building].

(7) The height of the tower shall be taken from the top of the tower to the base of the tower or to the base of the building, whichever is taller.

(8) The Secretary shall, if convinced of the boundaries and ownership of the plot, plans structural design and drawings and genuineness of the certificates, issue permit, not later than 30 days from the date of receipt of the application.

(8.a) All procedures required for obtaining the building permit, completion certificates and occupancy certificates as in the case of high rise buildings shall be strictly followed in the erection of telecommunication towers.

(9) The permit issued under sub rule (8) shall be a work permit and the construction or erection of telecommunication tower or telecommunication pole structures or accessory rooms essential for the use of such tower or pole structures shall be completed within one year from the date of issue of the permit.

(10) The period of the permit shall be extended for a further period of one year if an application for the same is submitted to the Secretary, within the valid period of the permit.

(11) The application for extension of the period of permit shall be submitted in white paper, typed or written in ink, affixed with necessary court fee stamp; original permit shall also be attached.

(12) No application fee shall be necessary for extension of period of permit but fee for extension shall be equal to fifty per cent of the fee for original permit in force at the time of extension.

17.12 Completion Certificate.-(1) After completion of the work of the telecommunication tower or pole structures and accessory rooms as per permit, the owner and the construction engineer on record and Structural engineer on record shall submit to the Secretary, the completion certificates, along with a certificate of structural safety/stability of the tower and the building, if the tower or pole is constructed over a building.

(2) The Secretary shall, if satisfied that the work has been completed as per permit, issue use certificate as in Appendix allotting a number, included in a different series from that allotted to buildings, on the basis of which the authorities concerned may allow power connection, etc. for use of the service.

Following additional provisions shall apply for telecommunication infrastructure as per the guidelines of NDMA

a) Location: The Telecommunication Infrastructure may be placed either on the building roof tops or on the ground or open space within the premises subject to other regulations.

b) Type of structure

(i) Steel fabricated tower or antennae's on M.S. pole.

(ii) Pre-fabricated shelters of fibre glass or P.V.C. may be used on the building roof top/terrace for equipment.

(iii) Masonry Structure/ Shelter on the ground for equipment.

(iv) D.G. Set should be with sound proof cover to reduce the noise level.

c) Requirement:

(i) Every applicant has to obtain/ procure the necessary permission from the "Standing Advisory Committee on audio Frequency Allocation" (SACFA) issued by Ministry of Telecommunications.

(ii) Every applicant will have to produce the structural safety & stability certificate (SDBR) (Form no. 6) / Structural inspection report (Form No. 16) and the detailed Structural design and drawings of the tower as well as the building issued by the Structural Engineer on Record (SER) , as in the case of other buildings. In case the total height of the tower & building is more than 15 m, the structural design shall be got proof checked by a member of the SDRP

(iii) Applicant has to produce / submit plans and structural design & drawings of structure to be erected.

d) Projection: No Pager and/or Telephone / TV Tower shall project beyond the existing building line of the building on which it is erected in any direction.

FORMS

FORM NO 1

CERTIFICATE OF UNDERTAKING FOR HAZARD SAFETY REQUIREMENT

TO,

REF : Proposed work of _____

(Title of project)

C.S.No./R.S.No/sy.no. _____ Inward No. _____at

Village _____Taluka (F.P. _____Scheme No. _____

of _____ Village/Town/City

1. Certified that the building plans submitted for approval will satisfy the safety requirements as stipulated under NBC / KMBR /Building Regulation No. ……and the information given therein is factually correct to the best of our knowledge and understanding.
2. It is also certified that the structural design including safety from hazards based on soil conditions shall be duly incorporated in the design of the building and these provisions shall be adhered to during the construction.

Signature of Owner with date _____

Name in Block Letters _____

Address_____

_____

Structural Engineer on Record with date

Name in Block Letters _____

Address_____

Signature of Developer

with date _____

Name in Block Letters _____

Address_____

Signature of the Architect on Record/

Engineer on Record with date _____

Name in Block Letters _____

Address_____

FORM NO 2

CERTIFICATE OF UNDERTAKING OF ARCHITECT – ON - RECORD / ENGINEER – ON - RECORD

To

Ref : Proposal work of

_____

(Title of the project)

C.S.No./R.S.No./F.P.No. _____Inward No. _____at

Village _____Taluka _____

Scheme No. _____ of_____

(Village/Town/City)

For_____

(Name of Owner /Developer/Builder)

Address: _____

Tel.No.:_____

I am a member of Council of Architects/Institution of Engineers (India) and I am possessing current registration to act as registered Architect / registered Engineer. I hereby certify that I am appointed as the Architect on Record / Engineer on Record to prepare the plans, sections and details as required under the provisions of the Act / Development control Regulations / KMBR for the above mentioned project and that I have prepared and signed the same and that the execution of the project shall be carried out under my direction, and supervision of a Construction Engineer on Record, as per the approved drawings.

I am fully conversant with the provisions of the Regulations, which are in force, and about my duties and responsibilities under the same and I undertake to fulfil them in all respects, except under the circumstances of natural calamities. I also undertake to provide my guidance for the adequate measure to be taken by the owners for installation of plumbing, drainage, sanitation and water supply. The appointment of Structural engineer on record, construction Engineer on Record, building contractor, plumbing engineer / contractor and electrical engineer / contractor shall be made at the appropriate stage by the owner before the relevant work commences.

Signature : _____

Reg. No. _____ Date :

Name : _____

Address :_____

_____

Tel. No._____

FORM NO. 3

CERTIFICATE OF UNDERTAKING OF STRUCTURAL ENGINEER ON RECORD (SER)

To

Ref : Proposed work of

_____

(Title of the project)

C.S.No./R.S.No./F.P.No. _____Inward No. _____

at Village _____Taluka _____

Scheme No. _____of _____

(Village/Town/City)

Owner:_____

Address:_____

Tel. No.: _____

I am a Registered Structural Engineer (RSE). This is to certify that I have been appointed as the Structural Engineer on record to prepare the Structural design basis report, detailed structural design and detailed structural drawings for above mentioned project. I am fully conversant of my duties and responsibilities under the Regulations and assure that I shall fulfil them in all respects.

I have prepared and signed a structural design basis report (SDBR). I undertake to carry out a detailed structural design and prepare detailed structural drawings of the proposed building as per the latest Indian Standard Specifications, and as indicated in the Structural design basis report.

I undertake to supply the owner and the supervisor the detailed structural drawings. If my services are terminated, I undertake to intimate the Authority in writing.

Signature : _____

Reg. No. _____ Date :

Name : _____

Address :_____

_____

Tel. No. _____

FORM NO.4

CERTIFICATE OF UNDERTAKING OF THE CONSTRUCTION ENGINEER ON RECORD

To.....

.....

Ref : Proposed work of

.....

(Title of the work)

C.S..NO. /R.S.NO. /F.P.NO.....in word.....at

village.....Taluka.....

Scheme NO.....at.....

Owner :.....

Address:.....

Tele. No.....

I possess a current Registration to act as Registered Construction Engineer. I hereby certify that I am appointed as a Construction Engineer on Record on the above mentioned project and that all the works under my charge shall be executed in accordance with the drawings and specifications prepared for this project.

I am fully conversant with the provisions of the Regulations which are in force and about the Duties and Responsibilities under the same and I undertake to fulfil them in all respect.

* I undertake not to supervise more than ten works at a given time as provided in Development Control Regulations.

* I undertake not to supervise work simultaneously at one point of time on any other sites during my supervision of the execution of this work.

Signature : _____

Reg. No. _____ Date :

Name : _____

Address :_____

_____

Tel. No. _____

FORM NO. 5

DEVELOPMENT PERMISSION

_____

Permission is hereby granted / refused under Section _____

_____*

to_____

(Name of the person)

for_____

(Description of work)

On the following conditions / grounds Conditions:

(in case of grant)

subject to the submission of structural design basis report along with soil investigation report at least one month in advance and subsequent approval before the commencement of the work.

Grounds:

(in case of refusal)

a) Documents / N.O.C. etc.: -

Following documents / plans / N.O.C/ undertakings as mentioned in form no. -----(application for Development permission) are not submitted.

b) Site Clearance: -

(i) Site is not cleared as per the provisions of Development Plan with respect to

- Road line
- Reservations
- Zone
- Other (specify)

(ii) Site is not cleared as per the provision of T.P. Scheme ……. with

respect to

- Road
- Reservation
- Final plot
- Other (specify)

(iii) Proposed use is not permissible according to the width of road as per the provision No…….

---

*The applicable sections should be stated by the local body/ authorities according to its law/ DCR regulations

FORM NO. 6

STRUCTURAL DESIGN BASIS REPORT

Part I	**General Data**		
Sl. No	Description	Information	Notes
1	Address of the building • Name of the building • Plot number / sy. no • Subplot number / re sy. no • TPS scheme a. Name b. Number • Locality/Township • District		
2	Name of owner		
3	Name of Builder on record		
4	Name of Architect/Engineer on record		
5	Name of Structural engineer on record		
6	Proposed use of the building		
7	Number of storey's above ground level & height (including storey's to be added later, if any)		
8	Number of basements below ground level		
9	Type of structure • Load bearing walls • R.C.C frame • R.C.C frame and Shear walls • Steel frame		
10	Soil data -Type of soil • Is the site geologically fit for the construction of the proposed structure? • Any ground improvement is needed? If so what type of improvement is suggested?		IS: 1893 Cl. 6.3.5.2 IS : 1904

	• Type of foundation • Design safe bearing capacity / pile capacity		
11	Dead loads (unit weight adopted) • Earth • Water • Brick masonry • Plain cement concrete • Reinforced cement concrete • Floor finish • Other fill materials • Plazza floor fill and landscape		IS: 875 Part 1
12	Imposed (live) loads • Plazza floor accessible to Fire Tender • Plazza Floor not accessible toFireTender • Floor loads Roof loads		IS: 875 Part 2
13	Cyclone / Wind • Speed • Design pressure intensity		IS: 875 Part 3
14	Seismic zone	III / IV / V	IS:1893 2002)
15	Importance factor		IS:1893 (2002) Table 6
16	Seismic zone factor(Z)		IS:1893 Table 2

17	Response reduction factor		IS: 1893 Table-7
18	Fundamental natural period - approximate		IS: 1893 Cl. 7.6
19	Design horizontal acceleration spectrum		IS: 1893 Cl. 6.4.2
20	Expansion / Separation Joints		

Signature

Name

Address of the Structural engineer on Record

FORM NO. 6 (Continued)

<table>
<tr><td colspan="7">Part 2 for Load bearing masonry buildings (only)</td></tr>
<tr><td>Sl. No</td><td>Description</td><td>Information</td><td colspan="4"></td><td>Notes</td></tr>
<tr><td>1</td><td>Building category</td><td></td><td colspan="5">IS:4326 Cl. 7, read with IS: 1893

Big/ Zone | II | III | IV | V
Ordinary | B | C | D | E
Important | C | D | E | E</td></tr>
<tr><td>2</td><td>Basement Provided</td><td></td><td colspan="5"></td></tr>
<tr><td>3</td><td>Number of floors including Ground Floor (all floors including stepped floors in hill slopes)</td><td></td><td colspan="5"></td></tr>
<tr><td>4</td><td>Type of wall masonry</td><td></td><td colspan="5"></td></tr>
<tr><td>5</td><td>Type and mix of Mortar</td><td></td><td colspan="5">IS:4326 Cl. 8.1.2</td></tr>
<tr><td>6</td><td>Re: size and position of openings (See note No.1)
• Minimum distance (b5)
• Ratio (b1+b2+b3)/l1 or (b6+b7)/l2
• Minimum pier width between</td><td></td><td colspan="5">IS:4326 Table 4, Fig.7
(Information in item 6 should be given on separate A4 sized sheets for all walls with large</td></tr>
</table>

	consequent opening (b4) • Vertical distance (h3) • Ratio of wall height to thickness 4 • Ratio of wall length between cross wall				number of openings.)
7	Horizontal seismic band	P	IP	NA	(see note)
	• at plinth level				IS:4326 Cl. 8.4.6 IS:4326 Cl. 8.3 IS:4326 Cl. 8.4.2 IS:4326 Cl. 8.4.3 IS:4326 Cl. 8.4.3 IS:4326 Cl. 8.4.4
	• at window sill level				IS:4326 Cl. 8.3
	• at lintel level				IS:4326 Cl. 8.4.2
	• at ceiling level				IS:4326 Cl. 8.4.3
	• at eave level of sloping roof • at top of gable walls • at top of ridge walls				IS:4326 Cl. 8.4.3 IS:4326 Cl. 8.4.4
8	Vertical reinforcing bar • at corners and T junction of walls • at jambs of doors and window openings				IS:4326 Cl. 8.4.8 IS:4326 Cl. 8.4.9
9	Integration of prefab roofing/flooring elements through reinforced concrete screed				IS:4326 Cl. 9.1.4
10	Horizontal bracings in pitched truss • in horizontal plane at the level of ties • in the slopes of pitched roofs				

Signature

Name

Address of the Structural engineer on Record

Note:

P indicates **"Information Provided",** TP indicates **"Information to be Provided",** NA indicates **"Not Applicable"**

(Tick mark one box)

FORM NO. 6 (Continued)

Part 3	for **Reinforced concrete framed buildings (only)**		
Sl.No	Description	Information	Notes
1	Type of Building * Regular frames * Regular frames with Shear walls * Irregular frames * Irregular frames with shear walls * Soft storey		IS: 1893 Cl. 7.1
2	Number of basements		
3	Number of floors including ground floor		
4	Horizontal floor system * Beams and slabs * Waffles * Ribbed Floor * Flat slab with drops * Flat plate without drops		
5	Soil data * Type of soil * Recommended type of foundation - Independent footings - Raft - Piles * Recommended bearing capacity of soil * Recommended, type, length, diameter and		IS: 1498

	load capacity of piles * Depth of water table * Chemical analysis of ground water * Chemical analysis of soil		
6	Foundations * Depth below ground level * Type * Independent * Interconnected * Raft * Piles		
7	System of interconnecting foundations * Plinth beams * Foundation beams		IS: 1893 Cl. 7.12.1
8	Grades of concrete used in different parts of building		
9	Method of analysis used		
10	Computer software used		
11	Torsion included		
12	Base shear a. Based on approximate fundamental period b. Based on dynamic analysis c. Ratio of a/b		IS: 1893 Cl. 7.5.3
13	Distribution of seismic forces along the height of the building		IS:1893 Cl. 7.7 (provide sketch)
14	The column of soft ground storey specially designed		IS:1893 Cl. 7.10
15	Clear minimum cover provided in • Footing • Column • Beams • Slabs • Walls		IS: 456 Cl. 26.4
16	Ductile detailing of RC frame • Type of reinforcement used		IS: 456 Cl. 5.6

	• Minimum dimension of beams • Minimum dimension of columns • Minimum percentage of reinforcement of beams at any cross section • Maximum percentage of reinforcement at any section of beam • Spacing of transverse reinforcement in 2-d length of beams near the ends • Ratio of capacity of beams in shear to capacity of beams in flexure • Maximum percentage of reinforcement in column • Confining stirrups near ends of columns and in beam-column joints a. Diameter b. Spacing • Ratio of shear capacity of columns to maximum seismic shear in the storey		IS:13920 Cl. 6.1 IS:13920Cl. 7.1.2 IS: 456 Cl. 26.5.1.1(a) IS:13920 Cl. 6.2.1 IS: 456 Cl. 26.5.1.1(b) IS:13920 Cl. 6.2.2 IS: 13920 Cl. 6.3.5 IS: 456 Cl. 26.5.3.1 IS: 13920 Cl. 7.4

Signature

Name

Address of the Structural engineer on Record

FORM NO. 6 (Continued)

Part 4		for **Buildings with Structural Steel (only)**		
1	Adopted method of Design	Simple Semi-rigid Rigid		IS: 800; Cl. 3.4.4 IS: 800; Cl. 3.4.5 IS: 800; Cl. 3.4.6
2	Design based on	Elastic analysis Plastic analysis		IS: 800; Section-9 SP: 6 (6)
3	Floor Construction	Composite Non-composite Boarded		
4	Roof Construction	Composite Non-composite Metal Any other		
5	Horizontal force resisting system adopted	Frames Braced frames Frames & shear		Note: Seismic force As per IS: 1893 Would depend on system
6	Slenderness ratios maintained	Members defined in Table 3.1,		IS: 800; Cl. 3.7
7	Member deflection limited to	Beams, Rafters Crane Girders Purlins Top of Columns		IS: 800; Cl. 3.13
8	Structural members	Encased in Concrete/ Not encased		IS: IS: 2062 IS: 8500 IS: 801, 811 IS: 806 800; Section-10
9	Proposed material	General weld-able High strength Cold formed Tubular		
10	Minimum metal thickness Specified for corrosion protection	Hot rolled sections Cold formed sections Tubes		IS: 800, Cl. 3.8 Cl. 3.8.1 to Cl. 3.8.4 Cl. 3.8.5 Cl. 3.8.5

11	Structural connections	Rivets C T Bolts S H F G Bolts Black Bolts Welding- Field		IS: 800; Section-8 IS: 1929,2155,1149 IS: 6639, 1367 IS: 3757, 4000 IS: 1363, 1367
12	Minimum Fire rating Proposed, with method	Composite Rating -- hours Method proposed- - In tumescent Painting - Spraying - Quilting - Fire retardant boarding		IS: 816, 814, 1395, 7280, 3613, 6419 6560, 813, 9595 IS: 1641, 1642, 1643

Signature,

Name & Address of the Structural engineer on Record

General Notes on form 6

1. This report shall accompany the application for Building Development Permission.
2. In case information on items 3, 10, 17, 18 and 19 (Part 1) cannot be given at this time, it should be submitted at least one week before commencement of construction**.**
3. A certificate to the effect that this report will be completed and submitted at least one month before commencement of Construction shall be submitted with the application for Building Development Permission.
4. In addition to the completed report following additional information shall be submitted, at the latest, one month before commencement of Construction.

    4.1 Foundations design

    4.1.1 In case raft foundation has been adopted, indicate K value used for analysis of the raft

    4.1.2 In case pile foundations have been used, give full particulars of the piles, type, dia, length, capacity

    4.1.3 In case of high water table, indicate system of countering water pressure, and indicate the existing water

    table, and that assumed to design foundations.

    4.2 Idealization for Earthquake analysis

4.2.1 In case of a composite system of shear walls and rigid frames, give distribution of base shear in the two systems on the basis of analysis, and that used for design of each system.

4.2.2 Indicate the idealization of frames and shear walls adopted in the analysis with the help of sketches

4.3 Submit framing plans of each floor

4.4 In case of basements, indicate the system used to contain earth pressures.

FORM NO 7

PROGRESS CERTIFICATE

Plinth Stage/In case of basement casting of basement slab

Reference No.

Owner's Name: _____ Location :_____

Submitted on :_____ Received on :_____

The Chief Executive Authority

Urban/Area Development Authority

Sir,

We hereby inform you that the work of execution of the building as per approved plan, working drawing and structural drawings has reached the Plinth Level and is executed under our supervision. We declare that the amended plan is not necessary at this stage.

Yours faithfully,

Signature of the	Signature of the
Construction Engineer on Record	Owner/ Developer/ Builder

Date: _____ Date: _____

Name in block letters: _____ Name in block letters_____

Address: _____ Address _____

_____ _____

_____ _____

FORM NO. 8

PROGRESS CERTIFICATE - FIRST STOREY

Reference No. : _____

Owner's Name : _____Location:_____

Submitted on :_____ Received on: _____

The Chief Executive Authority

Urban/Area Development Authority

Sir,

We hereby inform you that the work of execution of the building as per approved plan, working drawing and structural drawings has reached the first storey level and is executed under our supervision. declare that the amended plan is not necessary at this stage.

Yours faithfully,

Signature of the
Construction Engineer on Record

Signature of the
Owner/ Developer/ Builder

Date:_____

Name in block letters: _____

Address: _____

_____

_____

Date: _____

Name in block letters_____

Address_____

_____

_____

FORM NO. 9

PROGRESS CERTIFICATE – (Every) MIDDLE STOREY IN CASE OF HIGH-RISEBUILDING

Reference No._____

Owner's Name:_____ Location :_____

Submitted on: _____ Received on :_____

The Chief Executive Authority /Secretary

Urban/Area Development Authority

Sir,

We hereby inform you that the work of execution of the building as per approved plan, working drawing and structural drawings has reached _____storey level and is executed under our supervision.We declare that the amended plan is not necessary at this stage.

Certified that the form work & Scaffolding has been inspected by me and is found to be adequate and as per relevant IS Codes

Yours faithfully,

Signature of the

Construction Engineer on Record

Date:_____

Name in block letters: _____

Address: _____

_____

_____

Signature of the

Owner/ Developer/ Builder

Date: _____

Name in block letters_____

Address_____

_____

_____

FORM NO. 10

PROGRESS CERTIFICATE - LAST STOREY

Reference No._____

Owner's Name: _____ Location :_____

Submitted on : _____ Received on : _____

The Chief Executive Authority /Secretary

_____ Area Development Authority

Sir,

We hereby inform you that the work of execution of the building as per approved plan, working drawing and structural drawings has reached _____ storey level and is executed under our supervision.

We declare that the amended plan is not necessary at this stage.

Yours faithfully,

Signature of the	Signature of the
Construction Engineer on Record	Owner/ Developer/ Builder
Date:_____	Date: _____
Name in block letters: _____	Name in block letters_____
Address: _____	Address_____
_____	_____
_____	_____

FORM NO. 11

COMPLETION REPORT

Reference No._____

Owner's Name:_____ Location :_____

Submitted on :_____ Received on :_____

The

Chief Executive Authority / Municipal Commissioner,/Secretary

Urban Development Authority / Municipal Corporation

Sir,

The work of erection/re-erection of building as per approved plan is completed under the Supervision of Architect on record / Engineer on Record, Construction Engineer on Record who have given the completion certificate which is enclosed herewith.

We declare that the work is executed as per the provisions of the Act and Development Control Regulations/Byelaws and to our satisfaction. We declare that the construction is to be used for _____ the purpose as per approved plan and it shall not be changed without obtaining written permission.

We hereby declare that the plan as per the building erected has been submitted and approved.We have transferred the area of parking space provided as per approved plan to an individual/association before for occupancy certificate.

Any subsequent change from the completion drawings will be our responsibility.

Yours faithfully,

(Developer's / Builder's Signature): _____ (Owner's Signature): _____

Name of Developer / Builder: _____ Name of Owner: _____

Date: _____

Address: _____

Encl: Completion Certificate

FORM NO. 12

BUILDING COMPLETION CERTIFICATE BY ARCHITECT ON RECORD/ENGINEER ON RECORD

Reference No. _____

Owner's Name: _____ Location : _____

Submitted on : _____ Received on : _____

The Chief Executive Authority /Secretary

Urban / Area Development Authority

Sir,

1. The building/s has/have been constructed according to the sanctioned plan.
2. The building/s has /have been constructed as per approved plan and design as per detailed architectural drawings and specifications prepared by Architect on Record /Engineer on record.
3. Certified that adequate parking provision as required in the rules is given.
4. Certified that provisions for handicapped persons as listed in the relevant rules are provided in the building.
5. Construction has been done under our supervision / guidance and adheres to the drawings submitted.

Signature of the Owner

Date: _____

Name in block letter: _____

Address: _____

_____

_____

Signature of Architect on Record /Engineer on Record

Date: _____

Name in block letters : _____

Address: _____

_____

_____

FORM NO. 13

BUILDING COMPLETION CERTIFICATE BY CONSTRUCTION ENGINEER ON RECORD

Reference No. _____

Owner's Name: _____ Location : _____

Submitted on : _____ Received on : _____

The Chief Executive Authority / Secretary

Urban / Area Development Authority

Sir,

1. The building/s has/have been constructed under my supervision according to the sanctioned plan.

2. The building/s has / have been constructed as per

    1 the detailed structural drawings and structural specifications prepared by the Structural Engineer on Record

    2 the detailed Architectural drawings and Architectural specifications prepared by the Architect on Record.

    3 detailed drawings and specifications of all services

1. All materials used in the construction have been tested as provided in specifications and a record of test reports has been kept.
2. Certified that the non structural elements attached to the building (Structural glazing, cladding, false ceiling, canopy, hoardings, A/c ducts, pipe lines, fire fighting lines) were fixed firmly to the building as specified in the relevant IS codes.

Signature of the Owner

Date: _____

Name in block letter: _____

Address: _____

_____

Signature of Construction

Engineer on Record

Date: _____

Name in block letters : _____

Address: _____

_____

FORM NO. 14

BUILDING COMPLETION CERTIFICATE BY STRUCTURAL ENGINEER ON RECORD

Reference No. _____

Owner's Name: _____ Location : _____

Submitted on : _____ Received on : _____

The Chief Executive Authority/secretary

Urban / Area Development Authority

Sir,

1. This is to certify that detailed structural drawings of the buildings/ structure (*elaborate the type of structure*) has / have been prepared on the basis of a detailed analysis and a detailed design carried out according to relevant previsions of the latest Indian Standard Codes, National Building Code and as indicated in the structural design basis report.
2. Certified that the structural design including safety from natural hazards based on soil conditions has been duly incorporated in the design of the building and that these provisions were adhered to during construction.
3. Certified that the non-structural elements attached to the building (Structural glazing, cladding, false ceiling, canopy, hoardings, A/c ducts, pipe lines, fire fighting lines) were inspected by me and are found to be fixed to the building as specified in the relevant IS codes.

Signature of the Owner

Date: _____

Name in block letter: _____

Address: _____

_____

_____

Signature of Structural Engineer on Record

Date: _____

Name in block letters : _____

Address: _____

_____

_____

FORM NO. 15

(Para 5.7.1)

MODEL PROFORMA FOR TECHNICAL AUDIT REPORT

DESCRIPTION	**COMMENTS**
1.1 Design/Drawings available	Y/N
Design category Type design? Specific design?	Y/N Design to be collected to refer to Design Consultant/H.O.
Drawings prepared/checked by competent Authority?	Y/N
Design Drawings/details Structural detailed included Y/N Design verified/vetted by Dept./Govt. approved Earthquake/cyclone resistant features included?	 Y/N Y/N
Design changes approved by dept./govt. approved agency / competent authority?	Y/N

2. **Foundation**

2.1 Foundation used — Existing/New

2.2.1 **If existing foundation used**

2.2.1 Depth of foundation below ground : <50cm/50-70/>70cm

2.2.2 Type of masonry : Stone/Bricks/PCC Blocks

2.2.3 Thickness of masonry (above ground) : 23cm/35/>35

2.2.4 Mortar used : Cement-Sand/Lime/Mud

2.2.5 Mix of cement mortar : 1:4/1:6/Leaner

2.2.6 Height up to Plinth : _____ cm

2.2.7 If stone masonry

2.2.7.1 Through Stones : Yes/No, if Yes Adequate/Inadequate

2.2.7.2 Corner Stones : Yes/No, if Yes Adequate/Inadequate

2.3 If new foundation used

2.3.1 Depth of foundation below ground : _____ <50/50-70/>70cm

2.3.2 Type of masonry blocks : stone/bricks/PCC

2.3.3 Thickness of Masonry above plinth : 23 cm/35/>35cm

2.3.4 Mortar used : Cement – sand/lime/mud

2.3.5 Mix of cement mortar (1:4) : Yes/No

2.3.6 Height up to Plinth : <60/>60cm

2.3.7 If stone masonry

2.3.7.1 Through Stones : Yes/No, if Yes Adequate/Inadequate

2.3.7.2 Corner Stones : Yes/No, if Yes Adequate/Inadequate

2.4 Vertical reinforcement in foundation : Yes/No

3 **Walling**

3.1 Type of masonry : Stone/Brick/PCC Blocks

3.2 Mortar used : Cement – Sand/Lime/Mud

3.3 Mix of cement mortar : 1:4/1:6/Leaner

3.4 Thickness of wall : >23cm/23cm/23cm

3.5 Mixing of mortar : OK/Not OK

3.6 Joint Property filled : OK/NOT OK

3.7 Wetting of bricks : Good/ Medium/ Poor

3.8 If stone masonry

3.8.1 Through Stones : Yes/No

3.8.2 Corner Stones : Yes/No

3.9 Overall workmanship : Good / Medium / Poor

4 **Roofing**

4.1 Type of roof : Flat/Sloping

4.2 If sloped : Morbid tiles/ A.C. sheet/ G.I. sheet

4.3 Purlins : Angle-Iron / Timber / NA

4.4 Truss type : _____

4.5 Anchorage with wall : Adequate/ Inadequate/ NA

5 **Materials**

5.1 Cement

5.1.1 Source	: Authorised Dealer/ Market
5.1.2 Type of cement	: OPC/PPC/PSC
5.1.3 If OPC	: Grade (33/ 43/ 53)

5.2 Sand

5.2.1 Type of sand	: River sand / Stone dust
5.2.2 Presence of deleterious materials	: Mild / Moderate/ High

5.3 Coarse Aggregates

5.3.1 Type coarse Aggregates	: Gravel/ Crushed Stone
5.3.2 Presence of deleterious material	: Mild/ Moderate / High

5.4 P.C.C. Blocks (Applicable for onsite production)

5.4.1 Type of P.C.C. Blocks	: Solid blocks/Hollow blocks
5.4.2 Ratio of concrete in blocks	: _____
5.4.3 Interlocking feature	: Yes/No
5.4.4 Course aggregates used	: Natural/ Crushed stone

5.5 Bricks Blocks, Stone etc.

5.5.1 Strength (field assessment)	: Low/Medium/High
5.5.2 Dimensional accuracy	: Yes/No

5.6 Concrete

5.6.1. Mix of concrete	: (1:1 ½:3)/ (1:2:4)/Design Mix
5.6.2 Batching	: Weigh batching/Volume batching
5.6.3 Compaction	: Vibrators/Thappies and rods
5.6.4 Workability	: Low / Medium / High
5.6.5 Availability of water	: Sufficient / Insufficient
5.6.6 Curing	: Satisfactory/Unsatisfactory.

5.7 Reinforcing Steel

5.7.1 Type of Steel	: Plain mild steel/HYSD bars
5.7.2 Source	: Authorised Dealer/Market
5.7.3 Whether IS marked	: Yes/No
5.7.4 Conditions of bars	: Clean/Corroded
5.7.5 Fixing of reinforcement as per drawing	: Yes/No
5.7.6 Suitable cover	: Yes/No

5.7.7 Spacing of bars : Regular/Irregular

5.7.8 Overlaps as per specifications : Yes/ No

5.8 Form Work

5.8.1 Type of Form Work : Timber / Plyboard/ Steel

5.8.2 Use of mould oil : Yes/No

5.8.3 Leakage of cement slurry : Observed/Not observed

5.9 Source

5.9.1 Cement

5.9.2 Sand

5.9.3 Coarse Agg.

5.9.4 Bricks

5.9.5 PCC blocks.

6 **Seismic resistance features**

6.1 Masonry Structures

6.1.1 Provision of bands

	At	Provided	Adequate
6.1.1.1 Plinth level	Yes/No		Yes/No
6.1.1.2 Sill level	Yes/No		Yes/No
6.1.1.3 Lintel level	Yes/No		Yes/No
6.1.1.4 Roof level (if applicable)	Yes/No		Yes/No

6.1.2 If sloped Roof, whether seismic bands are provide at

6.1.2.1 Gable wall top	Yes/No		Yes/No
6.1.2.2 Eaves level	Yes/No		Yes/No

6.1.3 Provision of vertical steel in masonry at

	Provided	Adequate
6.1.3.1 Each corner	Yes/No	Yes/No
6.1.3.2 Each T-junction	Yes/No	Yes/No
6.1.3.3 Each door joint	Yes/No	Yes/No
6.1.3.4 Around each window	Yes/No	Yes/No

6.1.4 Openings

6.1.4.1 Total width of openings : <50%/50*-60%/>60%

(*-42% for double storey)

6.1.4.2 Clearance from corner : OK/Not OK

6.1.4.3 Pier width between two openings : OK/Not OK

6.2 Framed Structures

6.2.1 Ductile detailing

6.2.1.1 Spacing of stirrup : OK/Not OK

6.2.1.2 Sizes of members : OK/Not OK

6.2.1.3 End anchorage : OK/Not OK

6.2.1.4 Lapping (length, location etc.) : OK/Not OK

6.2.1.5 Angle of stirrup hook : 90 / 135 degrees

6.3 Any testing carried out by Owner/Engg. Supervisor on

	Testing done	Testing results
6.3.1 Water	Yes/No	OK/Not OK
6.3.2 Cement	Yes/No	OK/Not OK
6.3.3 Bricks/PCC blocks/Stones	Yes/No	OK/Not OK
6.3.4 Aggregate	Yes/No	OK/Not OK
6.3.5 Mortar	Yes/No	OK/Not OK
6.3.6 Concrete	Yes/No	OK/Not OK
6.3.7 Reinforcement	Yes/No	OK/Not OK

Signature of Structural Engineer on Record

Date: _____

Name & Registration No: _____

Address: _____

List of Reference IS codes:

For General Structural Safety

1. IS:456-2000 “Code of Practice for Plain and Reinforced Concrete”
2. IS:5525-1969 “Recommendations for Detailing of Reinforcement in Reinforced Concrete Works”
3. SP:34-1987 “Handbook On Concrete Reinforcement And Detailing”
4. IS:800-2007 “Code of Practice for General Construction in Steel”
5. IS:801-1975 “Code of Practice for Use of Cold Formal Light Gauge Steel Structural Members in General Building Construction”
6. IS:875 (Part 2)-1987 “Design loads (other than earthquake) for buildings and structures Part2 Imposed Loads”
7. IS:875 (Part 4)-1987 “Design loads (other than earthquake) for buildings and structures Part 4 Snow Loads”
8. IS:875 (Part 5)-1987 “Design loads (other than earthquake) for buildings and structures Part 5 special loads and load combination”
9. IS:883-1966 “Code of Practice for Design of Structural Timber in Building”
10. IS:1905-1987 “Code of Practice for Structural Safety of Buildings: Masonry Walls”

For Cyclone/Wind Storm Protection

11. IS:875 (Part 3)-1987 “Design loads (other than earthquake) for buildings and structures Part 3 Wind Loads”
12. Guidelines *(Based on IS 875 (3)-1987)* for improving the Cyclonic Resistance of Low rise houses and other building

For Earthquake Protection

13. IS: 1893-2002 "Criteria for Earthquake Resistant Design of Structures(Fifth Revision)"
14. IS: 1893-1984 "Criteria for Earthquake Resistant Design of Structures (Fourth Revision)" (for those building types not yet covered under IS:1893-2002)
15. IS:13920-1993 "Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces - Code of Practice"
16. IS:4326-1993 "Earthquake Resistant Design and Construction of Buildings- Code of Practice (Second Revision)"
17. IS:13828-1993 "Improving Earthquake Resistance of Low Strength Masonry Buildings - Guidelines"
18. IS:13827-1993 "Improving Earthquake Resistance of Earthen Buildings -Guidelines"
19. IS:13935-1993 "Repair and Seismic Strengthening of Buildings –Guidelines”

For Foundation Design

20. IS:1904-1987 “Code Of Practice For Design And Construction Of Foundations In Soils: General Requirements”
21. IS:4651 (Part III) “Code of Practice for planning and design of ports and harbors: Loading”
22. IS:2950 “Code Of Practice For Design And Construction Of Raft Foundations”
23. IS:9214 “Method Of Determination Of Modulus Of Subgrade Reaction (K-Value) Of Soils In Field”
24. IS:2911 (Part 1): Section 1 - 1979 “Code of Practice for Design and Construction of Pile Foundation Section 1

    Part 1: Section 2 Based Cast-in-situ Piles

    Part 1: Section 3 Driven Precast Concrete Piles

    Part 1: Section 4 Based precast Concrete Piles

    Part 2: Timber Piles

    Part 3 Under Reamed Piles

    Part 4 Load Test on Piles

For Protection of Landslide Hazard

25. IS 14458 (Part 1)- 1998 Guidelines for retaining wall for hill area: Part 1 selection of type of wall.
26. IS 14458 (Part 2)- 1997 Guidelines for retaining wall for hill area: Part 2 Design of retaining/breast walls
27. IS 14458 (Part 3)- 1998 Guidelines for retaining wall for hill area: Part 3 Construction of dry stone walls
28. IS 14496 (Part 2)- 1998 Guidelines for preparation of landslide – Hazardzonation maps in mountainous terrains: Part 2 Macro-zonation
29. National Building Code 2005

Guide lines of NDMA

Earth Quake management

Model building rule Volume 1

Note: Whenever an Indian Standard including those referred in the National Building Code or the National Building Code is referred, the latest revision of the same shall be followed except specific criteria, if any, mentioned above against that code.

Part 3: Recommendation of Sub-Committee (Geotechnical)

While damaging effects of earthquakes have been known for long time, the contribution of soils to the magnitude and pattern of earthquake damage was not widely appreciated until recently. The local geological and soil conditions can profoundly influence all of the characteristics – amplitude, frequency content, and duration – of strong ground motion. Significant earthquake damage and loss of life has been directly related to the effect of local site conditions and liquefaction in several recent earthquakes (eg., 1985 Mexico earthquake, 1989 Loma Prieta Earthquake, 1994 Northridge, 1995 Kobe Earthquake, and Bhuj earthquake 2001). The local site effects play an important role in earthquake resistant design. Both the local site conditions and liquefaction related damage are very essential component of a comprehensive assessment of seismic hazard and are attributed to geotechnical / geophysical characteristics of soil overburden closure to the ground. A complete site characterization is essential for the seismic site classification and site response studies, which are carried out by detailed geotechnical/geophysical investigations. There is a clear role for geological and geotechnical data in evaluating the ground motions and in turn in the study of seismic hazard.

A major thrust of many studies was the classification of strong motion sites according to surface geology, average shear wave velocity in the upper 30 m (Vs-30, calculated as the ratio of 30 m to travel time for shear waves to travel from 30 m depth to the ground surface), and a geotechnical classification scheme. Further, seismic site response is also reported to be a function of soil depth. Thus ignoring soil depth may introduce a desirable level of uncertainty in ground motion prediction. Factors such as geologic age and cementation may also affect the nonlinear response of soil and rock, and the effect of soil nonlinearity is largely a function of soil type. Site effects have also been introduced into most of the current ground motion attenuation relationships and most of these relationships account site effects only through a broad site classification system that divides the sites into either rock or soil or with the additional soft soil (BIS 1893:2002). Potentially liquefiable sand deposits (Site class F) and soft soils (Site Class E) were excluded from the ground motion attenuation relationships, because response at these sites is mainly a function of whether or not liquefaction is triggered or partially triggered. Data from recent earthquakes clearly highlights that a detailed studies are required and also suggest that a refinement in the soil classification system is warranted to achieve the improved prediction of ground motions.

Ground in particular subsurface overburden weathered soil is highly heterogeneous and also very complex. There are very large number of geotechnical and geophysical tests available for characterization of subsurface soils. Each of the method has its own advantages and also limitations over other methods. There is always an ambiguity over the selection of a particular method for site characterization. Selection of a particular method depends upon the many factors starting from the purpose and the scope of the study, availability of resources (equipment and expertise personal), type of analysis to be carried, type of soil, etc.

1. Sub soil investigation should be made compulsory as a part of building permit application for all buildings more than 4 storey.
2. Sub soil investigation should be executed through approved agencies.
3. Registration of Geo-Technical Agency/Engineer and their Duties and Responsibilities.

1. REGISTERED GEO-TECHNICAL AGENCY /Engineer (RGA)

For foundation work, where required as per Regulation services of a Geo- technical Agency on Record.

(A) The requirements for registration shall be:

(i) Owner of a proprietary firm shall be M.E. (or equivalent) in Geo-technical Engineering with minimum 10 years of Experience

(ii) Fifty per cent partners of a partnership firm shall have Educational qualifications as in (i) but a minimum 5 years experience.

(iii) A designated officer of a limited company shall have qualifications as (i)

(iv) The experience as stated above shall be under one or more Geo-technical Agency on Record. Such agencies established within or outside the area of jurisdiction of the competent authority shall be of minimum ten years of standing.

(v) The agency has a Registered/Approved Laboratory.

Any individual possessing qualifications as in (i) and hiring services of either GAR or Registered / Approved Testing Laboratory shall also be eligible for registration.

(B) The registration shall be renewed every three years.

(C) The registration may be cancelled for unprofessional conduct permanently or for a specified period.

2. GEO-TECHNICAL AGENCY /ENGINEER ON RECORD (GAR):

All buildings described in Table-1 shall have, for foundation work, services of a Geo-technical Agency on Record.

Duties and Responsibilities:

(a) To carry out soil investigation at proposed locations as per specifications of Structural Engineer on Record (SER) of Structural Design Agency on Record (SDAR).

(b) To recommend various type foundation for proposed structure and loading with supporting calculations.

(c) To enable SER or SDAR to take site decision in case strata different than soil investigation report is met with.

(d) To list out precautionary measures so that there is no damage to adjacent property.

(e) Report should clearly mention about the dewatering methods to be adopted at the foundation trenches.

(f) Distance of the adjacent properties, foundations of such properties etc should be clearly mentioned in the report.

(g) If the area is seismically vulnerable, subsoil investigation report should provide measures to be adopted for the safety of the structure against such potential seismic effects.

(h) The subsoil investigation report should contain laboratory test results of the soil samples collected as wells as field tests conducted by approved laboratories/Govt. Engg. College Laboratories. All graphs and details of test adopted should be provided in the test results.

(i) Natural drainage paths available in the site should be clearly shown along with diversion of rainwater from the site safely to drainage channels in the nearby area.

(j) Detailed Site Analysis and to avoid construction in Landslide prone areas as well as to develop proposals for diversion of the natural water coming from uphill side away from foundation.

(k) No site notified as geologically weak zones by the Authorities and any land falling within 30 meters from the boundary thereof shall be used for the construction of any building.

(l) The structural design of the foundations shall be determined as per the recommendation in the National Building Code of India.

(m) The cutting of slopes in the creation of steps and terraces for development work shall be carried out while ensuring the stability of excavations to provide for the safety of the buildings located and constructed thereon in accordance with the provisions in the BIS Codes.

(n) Local ground conditions shall be taken into account in the determination of the appropriate precautionary measures and protection walls such as revetments, retaining walls, toe walls and breast walls as well as the specifications of the relevant codes of practice of the Bureau of Indian Standards including BIS 14243-Part I & 11 will be followed.

3. Microzonation of Cities and major Towns

To Assist the Structural Engineers, Town Planners and the Local Self Government Authorities in deciding the necessity of a detailed subsoil investigation incorporating the dynamic conditions, seismic microzonation of all Corporation areas in Kerala and other major Towns should be done. For this the NDMA guidelines may be followed.

Corporation areas like, Thiruvananthapuram, Kollam, Cochin, Thrissur and Kozhikode and Municipal areas like Kottayam, Idukki and Wayanad has to be incorporated in the first phase in the seismic microzonation.

4. FORMAT FOR STRUCTUREAL DESIGN BASIS REPORT (SDBR)

4.1 Form No. 6 (Part 1)

Sl. No. 10; Item 1.1.3 Soil Data should include the following additional information

- Type of soil
- Is the site geologically fit for the construction of the proposed structure?
- Any ground improvement is needed? If so what type of improvement is suggested?
- Type of foundation
- Design safe bearing capacity / pile capacity

Items 11, 12 and 13 can be avoided for buildings upto 4 storeys

Form No. 6 (Part 2) can be avoided, as load bearing masonry buildings are used for upto 2 to 3 storey buildings.

Form No.6 (Part 3) & (Part 4) as it is can be adopted.

-End-