THE KERALA

MUNICIPALITY BUILDING RULES, 2012

CHAPTER XVII

STRUCTURAL DESIGN & SAFETY PROVISIONS FOR HIGH RISE BUILDINGS

CHAPTER XVII

Disaster Resiatant 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 various Acts, Bye-laws, Rules and Regulations enforced by Urban Local Bodies (ULBs) or local Urban Development Authorities - Corporations / Muncipalities / Panchayaths. However, experiences from recent natural disasters and man made disasters clearly illustrate that the provisions of the Techno-Legal Regime 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 made to the Local Authority to construct the 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 building bye-laws (KMBR). Assumptions are made regarding items appearing on the upper levels, 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 items in the upper levels, when those items 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. All these are lacunae of the construction practice that do not augur 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 such housing proposals is often missed by the Local Authorites, themselves as indicated by the devastating structural damage and economic losses in the past.
2.4 In view of above, Kerala Government has published Disaster Management Policy and has emphasized its desire to adhere to the National Building Code 2005 (NBC 2005) and Guide lines of National Desaster 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, enabling environment for stake holders to facilitate compliance of 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 client 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 loan-financed 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 processes are in place by the ULBs to ensure that disaster-resilience has indeed been incorporated in the assets *during the design process* at least *before construction begins*. This is a major lacuna 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 houses and infrastructure in both urban and rural areas is seen as an opportunity to ensure disaster resilience in the construction sector. Depending upon the nature of the assets and the vulnerability of the location to any or many 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 full or part of 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 modalities 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 verification wings of ULBs and/or their empanelled technical experts will be in a position to check that the safety-related 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 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 finishing and placement of its contents. For assessing safety of construction related to non-building structures, the technical professionals (e.g., 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 of carrying out peer review of housing 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. 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 multihazard 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* Buildings. 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 favorable 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 displacement type loading.

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 is responsible to carry the loads acting on the structure (including those due to its own weight, occupants, contents and finishes) and ensure safety to the occupants and function of the construction. It consists of the soil system underneath the construction, 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 securedfirmly 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 disasters. 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 nonstructural elements are of priority concerns. It is estimated that in 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 exposure 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 large. 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 honest construction of the building are decided in advance. But in existing buildings, many of these are fixed already, but their influence needs to be modified incrementally or significantly 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). The quantitative evidence needs to show how the retrofit scheme chosen improves one or more of
Retrofitting of buildings is a detailed technical and professional activity. 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 behavior 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 their nonlinear range of behavior. 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 behavior. 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*: 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 institutes 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 *equivalent 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 expected worst 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 path 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* check to ensure no collapse of the building structure and no toppling or sliding damage of building contents under strong shaking, and *displacement-based* check 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 shaking without collapse, as per Table 1.

Table 1:

Target Performance Levels of Building Structures for Seismic Retrofitting

	Performance Level Expected	
Building *Category*	***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	Immediate Occupancy (IO)
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 strengthening and retrofitting of existing constructions before and after impending natural disasters 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 in India modify or alter their buildings by adding extensions or additional floors either for own 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 the Techno-legal Regime of ULBs, ie, Kerala Muncipal 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 Muncipality* 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 / Muncipality* 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 Muncipality / Corporation* will undertake the technical peer review 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 Panael for carrying out peer review of these design documents.

(c) *The Muncipality / Corpration* 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 peer reviewers undertaking the assessment of the designs of the proposed constructions. The list of these forms is presented in Tables 3 and 4.

The forms to be prepared byArchitect on record / engineer on record and structural engineer on record for the use of peer reviewers depending up on the building height and the construction type (masonry, concrete or steel).
Architects / engineer on record will have to submit two forms, namely A1 and N1.
Structural Engineeron record will submitthe following form:
M1 (for masonry buildings),
C1 (for concrete buildings) or
C2 (for concrete buildings- when height is above 15m and below 45 m) or
C3 (for concrete buildings- when height is above 45 m)
S1 (for steel buildings) when the height of the building is below 15 meters, and
S2 (for steel buildings) when the height is above 15 meters.
Peer reviewers will check the design and record their commets.

Table 3:
Forms to assist Peer Reviewer Architects

Type of Buildings	Structural Configuration	Non-structural Components
All buildings	Form A1	Form N1
Note: Form M1, Form C1 or Form S1 of Table 4 also shall be filled by Architect / engineer on record as applicable for buildings on plots up to 500 m2 and of height up to 15 m.		

Table 4:

Forms to assist Peer Reviewer Structural Engineers

Building Height	Masonry	Concrete	Steel
<15m	Form M1	Form C1	Form S1
15-45m	Not Permitted		
>45m	Not Permitted	Form C2	Form S2

9.2.3 The architect on Record / Engineer on record and structural engineer on Record shall prepare their inputs in the above forms and the
(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.

17.1 High rise building.- High rise building means a building or an 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.]

17.2 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 competent authority as per Table-5 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.

17.3 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 Proforma Attached **(Form no. 6)** herewith covering the essential safety requirements specified in theStandard.

(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 as soon as design of foundation is completed, but not later than one month prior to commencement of construction.

Part-1 Completed
Part-2, Part-3 or Part-4 (if applicable) Completed

5.3 SEISMIC STRENGTHENING/RETROFITTING

Seismic Strengthening / retrofitting all existing life line buildings, special buildings, cinema theaters, 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.

5.4 REVIEW OF STRUCTURAL DESIGN / PROOF CHECKING

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

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

(iii) Table-5 gives requirements of SDRP for different seismic zones namely III, IV and V and for structures of different complexities

(iv) In seismic Zone II and above, buildings & structures greater than 40m or 7 stories in height will require proof checking by SDRP as per detail at sl. no.03 of Table 5.

TABLE – 5

PROOF CHECKING REQUIREMENTS FOR STRUCTURAL DESIGN

SR.NO	TYPE OF STRUCTURE	SUBMISSION FROM SER or SDAR	TO BE PROOF CHECKED
1	LOAD BEARING BUILDINGSUPTO 3 STOREYS	SDBR*	NOT TO BE CHECKED
2	BUILDINGS UPTO 7 STOREYS (R.C.C / STEELFRAMED STRUCURE)	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, metrorail, aquaducts, 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.

5.5 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 proforma given in **Form-3** and **Form 14** at the time of completion.

5.6 CONSTRUCTIONAL SAFETY

5.6.1 Supervision

All construction except load bearing buildings upto 3 storeys shall be carried out under supervision of the Construction Engineer on Record (CER) or Construction Management Agency on Record (CMAR) for various seismic zones. Construction safety certificate shall be issued by the Construction engineer on record in form -13

5.6.2 Certification of structural safety in construction

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

5.7 QUALITY CONTROL AND INSPECTION

5.7.1 Inspection

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.

5.7.2 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 proforma 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.

5.8 CONTROL OF SIGNS (HOARDINGS) AND OUTDOOR DISPLAY STRUCTURES AND PAGING / COMMUNICATION TOWER AND TELEPHONE TOWER AND OUTDOOR DISPLAY STRUCTURES

Following provisions shall apply for telecommunication infrastructure.

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. on the building roof top/terrace for equipment.
(iii) Masonry Structure/ Shelter on the ground for equipment.
(iv) D.G. Set 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.

5.10 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.

5.10.1 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 .

5.10.2 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) 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 upto maximum 15 sq mt. 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.

5.10.3 Issue of Occupancy Certificate

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

Notwithstanding 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.

5.11 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 srtrctural Inspection report is submitted to the secretary for issuing fresh occupancy certificate.

5.12 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 .

5.13 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, for other professions and professionals like engineers, developers/promoters for taking up the projects, there is no legislative frame available/applicable in the country. In the absence of such legislation, the appropriate qualifications, service conditions, professional fees and charges in the engineering profession etc. are varying and are not based on any uniform formula, therefore, the Committee, keeping in view that the responsibility of safety of development/projects, is that of the engineers, the Committee has worked out the detailed qualifications/responsibilities for different type of development which are given in Appendix 'L' under heading Registration, Qualifications and Duties of Professionals. The professional fees for the services rendered are listedbelow and in **Schedule III**.

5.14 PROFESSIONAL FEES FOR SER/ SDAR AND CER/ CMAR

Keeping in view that presently there is no Act regulating the services of engineers and to determine their scope of work and professional charges, the committee felt that :

(i) Considering the responsibility of structural safety of a building falls on the shoulders of the "Structural engineer on record (SER)" for its proper design and the "Construction Engineer on Record (CER)" for proper construction, it is imperative that selection and appointment of these professionals is made carefully after verification of their antecedents, past experience and registration/ grade etc to avoid unhealthy competition. More over, the clients can choose the best available engineer at the fees fixed by the government.

(ii) Council of Architects have fixed the fees to be paid to the Architects to avoid unhealthy compatiton. The fees to be paid to Structural Engineers on Record for structural design is also to be specified keeping in view the size and complexity of the project, which may vary based on the cost of the items of the structure enumerated below. "Excavation, diaphragm wall, piling, pile cap, base concrete, raft, Water proofing of basement and other under ground structures, all grades of concrete, reinforcement,bar bending schedule, pre-stressing, structural steel, load bearing masonry, structural glazing or curtain walls to be designed against earthquake and wind forces, clamps for stone cladding, framed structure, roof, lift well, shear wall design, gable structures, truss, gantry girders, bridge girders, pier, hammerhead". However, the minimum fees for structural design shall be fixed as 2% of the estimate cost.

(iii) Similarly, fees for construction management to Construction Engineer on Record may be specified keeping in view the size and complexity of the project and the duration for which construction management / project management services have to be provided on the basis of the total cost of the project. However, the minimum fees shall be fixed as 3% of the total cost of the project.

(ii) **Proof checking**: Similarly, fees for Proof checking, shall be 0.5% of the Estimate cost (refered in (ii) above) and may vary based on the cost of the structural items enumerated in (ii) above.
(iii) **Fee structure** to be followed while engaging professionals for construction of buildings is listed in appendix Q

CHAPTER XXI

REGISTRATION OF PROFESSIONAL – ARCHITECTS /ENGINEERS,

STRUCTURAL ENGINEERS , TOWN PLANNERS, ETC.

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

150. Application and procedure for registration.— (1) Any person having the requisite qualification may submit an application for registration in the form in Appendix-K.

(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 Appendix-M 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 Rs. 3000/ for all catagories. Period of registration is 3 years. The re registration fees shall be Rs. 1000/-.

151. Qualification for registration.- No person shall be eligible for registration unless he possesses the qualification as in Appendix-L.

152. 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.

153. 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 suo motu 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**5.15**

APPOINTMENT OF PROFESSIONALS

The Owner/Developer shall appoint Town Planner on Record (TPR), Architecton Record (AR)/ Engineer on R ecord (ER), Structural Engineer on Record (SER/, Structural Design Agency on Record (SDAR), Geotechnical Engineer on Record (GER), Construction Engineer on Record (CER)/ (CMAR), and Quality Auditor on Record (QAR) / Quality Audit Agency on Record (QAAR) as required. The detail of qualification and requirement of registration is given in **Appendix L**. A proper written agreement(s) showing the scope of work and fees, in the standard format(s), should be entered upon with such professional(s) engaged.

B2. APPOINTMENT OF PROFESSIONALS

B2.1 The Owner / Developer shall appoint the following professionals, out of the registered professionals described in B1.1 above, 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 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)

B2.2 **The Owner / Developer** shall submit a list of the professionals on Record appointed 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)

B2.3 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.

B3 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'
c) Once the building is completed and handed over, the builder / owner / occupyer will be responsible for the safety of the building. Periodical maintenece of the building is their collective responsibility. Structural changes / retrofitting of the building shall be done only under the supervision of a RSE.

B6 ARCHITECT ON RECORD / ENGINEER ON RECORD
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

B3.1 **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 (iii) above.
2. get required soil (geo-technical) investigation done from an approved laboratory and submit the report concerning the same in prescribed format to the Competent Authority.
3. get the Preliminary Design checked through third party verification by a member of Structural Design Review Panel and submit a certificate concerning the same to the Competent Authority. Provided that in case of high-rise buildings having seven or more structural floors and special structures, detailed design verification of major structural components will be required.

(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 prescribe 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.

B3.2 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.

B3.3` CONSTRUCTION MANAGEMENT AGENCY 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.

B3.4 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.

B3.5 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 testinglaboratory.

(B) During construction of a high rise building and special structures the QAAR shall carry out necessary testing of materials as well asnon-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.

B3.6 GEO –TECHNICAL ENGINEER ON RECORD (GER) / GEO-TECHNICAL AGENCY ON RECORD (GAR):
All buildings described in Table-1, for foundation work, shall engage the 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.

B 4 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 as site supervisor.
5. To obtain and adhere to the quality assurance procedure prepared by the registered CER.
6. To adequately enable the site supervisor to carry out his responsibilities.
7. To certify along with the site supervisor 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 and to appoint on his behalf appropriate persons to act as registered, clerk of works site supervisor, required for the proper execution of the project and to retain on behalf of the owner any other specialist or expert required on the work of the project.
13. 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.
14. When no registered construction contractor or site supervisor is required to be appointed and not appointed he shall be responsible for their duties and responsibilities under the Regulations .
15. 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.
16. He shall provide adequate safety measures 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
17. He shall exhibit the names of registered persons only, on site and no additional names will be exhibited/displayed.
18. He shall explain the construction design and its intended use as per approved plan only, to the prospective purchaser of the premises under construction.
19. He shall make available copies of titles for the land, approved plans and all certificates issued to the Competent Authority under these Regulations.

B 5 OWNER

"Owner",who holds the leagal 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
[See Rule 151)
QUALIFICATION AND FUNCTION OF ARCHITECT,
ENGINEER, ETC.

REGISTRATION, QUALIFICATIONS AND DUTIES OF PROFESSIONALS

B1. REGISTRATION OF PROFESSIONALS
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 reistered with Council of architects and corporate members of Institution of Engineer.

B1.2 REGISTERED ARCHITECT / REGISTERED ENGINEER

(a) Architect *(Ref: Appendix L - KMBR)*

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 *(equalant to Building designer A of KMBR 1999)*

(b) Engineer

1) B. E. in Civil engineering or membership in Institution of Engineer (Civil) or equalant with experience in planning and design of buildings OR
2) M.E. in Civil /Structural engineering with relevant experience
3) Diloma 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.
  -

REGISTERED ARCHITECT / REGISTERED ENGINEER Grade-I
(equalant 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. E. in 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 *(equalant to Engineer A of KMBR 1999)* OR
2) B.Arch or its equivalent with relevant experience of 5 years *(equalant to Architect of KMBR 1999)*
3) M.E. in 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 *(equalant 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 atleast one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced)

REGISTERED ARCHITECT / REGISTERED ENGINEER - Grade-II
(equalant 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. E. 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 *(equalant to Engineer A of KMBR 1999)* OR
2. B.Arch or its equivalent with relevant experience of 3 years*(equalant to Architect of KMBR 1999)*
3. M.E. in 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 *(equalant 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 Assistanceship / Deploma 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 atleast one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced)

REGISTERED ARCHITECT / REGISTERED ENGINEER- Grade-III
(equalant 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 structurtes for Grade –I and Grade – II, up to 2 stories or 7.5 m height, with Plinth area upto 300 m2.

Eligibility:
1. B. E. 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.E. in 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 *(equalant to Building designer A of KMBR 1999)*
6. Three years architectural Assistanceship / Deploma 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

B1.3 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.

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 and the likes.

Eligibility:

1. M. E. Structural/ Earthquake Engineering or Ph.D. in Structural Engineering with minimum 5 years of experience (after attaining the degree) in structural design work at a responsible position as structural designer or
2. B. E. Civil or equivalent with minimum 10 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 Registered Structural Engineer and should have designed atleast one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced).

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 upto750 m2.

Eligibility:

1. M. E. Structural engineering / Earthquake Engineering or Ph.D. in Structural Engineering 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. E. 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 Recor Engineer and should have designed atleast one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced).

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 upto 300 m2, excluding above mentioned structures for Grade-I and Grade-II .

Eligibility:

1. M. E. Structural/ Earthquake Engineering, with minimum 1 years of experience (after attaining the degree) in structural design work at a responsible position as a structural engineer
2. B.E. 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 atleast three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced) .

B1.4 REGISTERED CONSTRUCTION ENGINEER (RCE)

(A) The requirements for registration shall be:

a) B.E. Civil or equivalent with 5 years experience in construction or
b) M.E. in 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 *(equalant 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.

REGISTERED CONSTRUCTION ENGINEER (RCE) - Grade-I
(equalant 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. E. 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 *(equalant to Building designer A of KMBR 1999*)
4. The experience as stated above shall be under a Registered Construction Engineer and should have supervised atleast one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced

REGISTERED CONSTRUCTION ENGINEER (RCE)- Grade-II
(equalant 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. E. 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 *(equalant to Building designer A of KMBR 1999*)
4. Diploma in Civil Engineering with 5 years practice in construction management
5. Three years architectural Assistanceship / Deploma in Architecture with 5 years experience
6. The experience as stated above shall be under a Registered Construction Engineer and should have supervised atleast one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced

REGISTERED CONSTRUCTION ENGINEER (RCE) - Grade-III
(equalant to Supervisor B of KMBR 1999)

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

Eligibility:
1) (i) B. E. 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 *(equalant to Building designer A of KMBR 1999*)
4) Diploma in Civil Engineering with 3 years practice in construction management
5) Three years architectural Assistanceship / Deploma 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

B1.5 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.

B1.6 REGISTERED QUALITY AUDITOR (RQA)
(A) The requirements for registration shall be :
(i) B.E. 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.E. (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 control aspects of construction.
(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.

B1.7 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.

B1.8 REGISTERED GEO-TECHNICAL ENGINEER (RGE)
(C) The requirements for registration shall be:

(i) B.E. Civil or equivalent with 5 years experience in Geotechnical engineering /structural engineering or
(ii) M.E. 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.

REGISTERED GEO-TECHNICAL AGENCY (RGA)

For foundation works of , 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 /Structural 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 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.

B.1.10 TOWN PLANNER ON RECORD (TPR)

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.

B.1.11 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:

6) B. E. Civil / Mechanical engineering or equivalent with minimum 5 years experience in plumbing design & execution at a responsible position as plumbing engineer OR
7) B.Arch or its equivalent with a degree or diploma in Construction with relevant experience in plumbing design and excution of 5 years
8) The experience as stated above shall be under a Registered plumbing Engineer and should have designed & supervised atleast one 7 storied multistoried building or three 4 storied building during the last 3 years. (documentary evidence to the same is to be produced

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. E. Civil / mechanical engineering or equivalent with minimum 3 years experience in plumbing design & execution at a responsible position as plumbing engineer OR
2) B.Arch or its equivalent + with a degree or diploma in Construction with relevant experience plumbing design and excution of 3 years
3) Diploma in Civil Engineering with 5 years experience in plumbing design and excution
4) The experience as stated above shall be under a Registered Plumbing Engineer and should have designed & supervised atleast one 4 storied multistoried building or three 3 storied building during the last 3 years. (documentary evidence to the same is to be produced)

Registered Plumber

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

Appendix P

Procedure for Obtaining Building Permit

6.1 Notice – 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 (See Appendix ~~A~~) and such notice shall be accompanied by plans and statements in sufficient (~~See bye-law No.6.1.1~~) copies, as required under By-law ~~Nos. 6.2 and 6.3~~. The plans may be ordinary prints on white paper or ammonia paperor 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.

6.1.1 Copies of Plans and Statements – Normally 4 copies of plans and statements shall be made available along with the notice.

6.2 Information Accompanying Notice – The notice shall be accompanied by the site plan, building plans, services plans, specifications and certificate of supervision and ownership title and other documents as prescribed by the Authority.

6.2.1 Size of Drawing Sheets and Coluring of Plans

6.2.1.1 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
4	~~A3~~	~~297 X 420~~
5	~~A4~~	~~210 X 297~~
6	~~A5~~	~~148 X 210~~

6.2.1.2 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.

6.2.1.3 Dimensions – All dimensions shall be indicated in metric units .

TABLE 2

COLOURING OF PLANS

		Site Plan			Building Plan		
Sl .No	Item	White plan	Blue print	Amonia print	White plan	Blue print	Amonia print
1	Plot Lines	Thick black	Thick black	Thick black	Thick black	Thick black	Thick black
2	Existing Street	Green	Green	Green	...	...	...
3	Furure 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 demolised	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

6.2.2 **Key plan and Approved 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 neighborhood 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 lessor regarding lease conditions shall be obtained.

6.2.3 **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 neighboring 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 (if any) in front and of the street (if any) at the side or rear of building:

i) The direction of north point 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 are 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.

6.2.4. **Building Plan** - 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.mtrs. and plots measuring above 250 sq.mtrs. to a scale of 1: 100. The plan shall-

(a) include 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) show the use or occupancy of all parts of the buildings;

(c) show exact location of essential services, for example W.C., sink, bath and the like;

(d) include sectional drawings showing clearly the size of the footings, thickness of basement wall, wall construction, size and spacing of framing members, floor slabs and roof slabs and roof slabs with their materials. The section shall indicate the heights 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 , kitchen and toilet, bath and W.C;

(e) show all elevations;

(f) indicate details of service plan, if any;

(g) give dimensions of the projected portions beyond the permissible building line;

(h) include terrace plan indicating the drainage and the slope of the roof;

(i) give indications of the north point relative to the plan;

(j) details of parking space provided;

(k) give indication of all doors , windows and other openings including ventilators with sizes in proper schedule form; and

(l) such other particulars as may be required to explain the proposal clearly and as prescribed by the Authority.

(m) Relevant Form no. A1, N1, C1, C2, C3, S1, S2

(n) Undertakinf / certificate of professionals – Form No. 1, 2,3,4,6

6.2.4.1 Building Plans for Multistoried Special Buildings – For Multistoried buildings which are more than 15 m height and for special buildings like assembly, institutional, industrial, storage and hazardous occupancies, the following additional information shall be furnished / indicated in the Building Plans in addition to the items (a) to (l) -

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, CO_2 installations etc.; and

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

r) Structural design basis report and Structural design & drawings as per NBC

THE GUIDE LINES FOR THE CONSTRUCTION OF MULTISTOREYED BUILDINGS

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 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 upto 3 m from the boundary line.

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:

i. *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%.*
ii. *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.*

THE KERALA MUNICIPALITY BUILDING RULES, 2012

THE KERALA

MUNICIPALITY BUILDING RULES, 2012

CHAPTER XIX

Telecommunication Towers / Hoardings / Structural Glazing / Cladding

CHAPTER XIX
Telecommunication Towers / Hoardings / Structural Glazing / Cladding

130. 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.

[131. 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].

132. 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.l.

133 [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 ~~any~~ 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 ancillay 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.

134. ***Electrical line clearance.***— Every tower or ancillay 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.

135. 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.

136. ***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.

137. 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 colors alternatively each with 5 meter band, starting with international orange

at the top.

138. 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 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.

139. Building to be authorised — Erection of any telecommunication tower or pole structures or accessory rooms shall be permitted only over authorised **structurally safe** buildings.].

140. 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.

[140A. Site approval etc.— (1) ~~No~~ site approval ~~shall be~~ 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.].

141. Submission of application and its disposal.— (1) Application forbuilding permit shall be submitted to the Secretary in the form in Appendix A along with two copies of site plan, location, elevation, sections, structural design & Drawings, 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 Rs. one thousand 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 towere 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.

142. 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 as in ~~Form *E* and Form F~~ respectively, 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.

6.2.5 Service Plan – Plans, elevations **and sections of private water supply, sewage disposal** system and details of building services, where required by the Authority, shall be made available on a scale not less than 1: 100.

6.2.6 Specifications – General specifications of the proposed construction giving type and grade material of public use in the form given in Appendix 'A' duly signed by the licensed Architect/ Engineer/ Supervisor / Group may be shown accompanying the notice.

6.2.7. **Supervision** - Notice shall be further accompanied by a certificate of supervision in prescribed form given in Appendix 'B' by the registered Architects on record/Engineers on record, Structural engineer on record and Construction engineer on Record as the case may be .

6.2.8 **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 in Appendix '~~B~~' duly signed by licensed Plumbing Engineer on record / plumber.

6.2.9 **Document**s – 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 fom the competent Authority shall be

submitted;

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

c) Undertaking for non- stacking of building material on public property.

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

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

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

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

h) Indemnity Bond in case of proposal for the construction of basement as given in Appendix 'N' .

6.3 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, licence and enrollment number. However, plans in respect of plots up to 100 sq.metre and up to 2 storeys may be signed by a licenced supervisor (Engineer grade III), instead of Architect on record subject to its being approved by the Competent Authority.

7.5.1 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.

7.5.2 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 Architect or Engineer on record / Structural Engineer on record / Construction Engineer on record as the case may be who has supervised the construction, in the proforma given in Appendix 'G' accompanied by three copies of completion plan and the following documents and along with a fee of Rs.20.

1) Copy of lease deed

2) As built drawings of the services.

3) Clearance from Chief Fire Officer (if applicable)

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

5) Structural design & drawings, Structural Design Basis Report duly signed by the registered Structural Engineer on record.

6) Certificate from the Lift Manufacturer ,as required.

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

8) 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.

9) 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.

10) 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.

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

12) Form no. 7,8,9,10,11,12,13,14,15,A1, N1, C1, C2,C3, S1, S2 (relevant forms only)

7.6 Occupancy Certificate – The Authority, on receipt of the notice of completion, shall inspect the work and communicate the sanction or refusal or objections there to in the proforma given in Appendix 'H' 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.

Appendix Q

. SCOPE OF WORKS & FEES of professionals engaged by the builder / developer
)repared in line with the fee structure of Council of Architects)

'his appendix states the duties and responsibilities of the professionals engaged by the builder / wner. The professional engaged by the owner / builder shall make available all the relevant ocuments required for the construction. The scope services of different professionals engaged by ie clients are listed below. Professionals are responsible follow the relevant IS codes and NBC.

low ever, these guidelines will be binding on the professionals only if an equvlant fee is given to iem for the services rendered by them. Hence, an attempte is made to arrive at a reasonable fees iat can be charged by the professionals for different services offered by them. Its better for the rofessionals and the client to enter in to an aggrement before proceeding with the project.

he **Architect on Record / Engineer on Record** is required to provide the following services :

'art I - ARCHITECTURE :

.1 Taking Client's instructions and preparation of design brief.

.2 Site evaluation, analysis and impact of existing and / or proposed development on its immediate nvirons.

.3 Design and site development.

.4 Prepare the conceptual designs, plan and drawings, sketches, study model, etc., for the Client's pproval

'art II _ ALLIED FIELDS :

.5 Sanitary, plumbing, drainage, water supply and sewerage design.

.6 Electrical, electronic, communication systems and design.

.7 Heating, ventilation and air conditioning design (HVAC) and other mechanical systems.

.8 Elevators, escalators, etc.

.9 Fire detection, Fire protection and Security systems etc.

.10 Periodic inspection and evaluation of Construction works.

.11 Landscape Architecture

.12 Interior Architecture

.13 Architectural Conservation

.14 Structural design & Retrofitting

.15 Graphic Design and Signage

. SCHEDULE OF SERVICES :

he Architect/Engineer shall, after taking instructions from the Client, render the following services:

'ONCEPT DESIGN [STAGE 1] :

.01 Ascertain Client's requirements, examine site constraints & potential ; and prepare a design brief or Client's approval.

.02 Prepare report on site evaluation, state of existing buildings, if any ; and analysis and impact of xisting and/ or proposed development on its immediate environs.

.03 Prepare drawings and documents to enable the Client to get done the detailed survey and soil nvestigation at the site of the project.

.04 Furnish report on measures required to be taken to mitigate the adverse impact, if any, of the xisting and / or proposed development on its immediate environs.

.05 Prepare conceptual designs with reference to requirements given and prepare rough estimate of ost on area basis.

'RELIMINARY DESIGN AND DRAWINGS [STAGE 2] :

.06 Modify the conceptual designs incorporating required changes and prepare the preliminary rawings, sketches, study model, etc., for the Client's approval along with preliminary estimate of ost on area basis.

)RAWINGS FOR CLIENT'S/ STATUTORY APPROVALS [STAGE 3] :

.07 Prepare drawings necessary for Client's/ statutory approvals and ensure compliance with codes, tandards and legislation, as applicable and assist the Client in obtaining the statutory approvals ereof, if required.

'he Structural Design Basis Report will be prepared by a Structural Engineer on Record who shall repare structural design & drawings (at a later stage) as per the approved architectural plan ased on NBC 2005 & relevant IS codes, under the guidance of the Architect and shall be appointed nd paid by the Client.

VORKING DRAWINGS AND TENDER DOCUMENTS [STAGE 4] :

.08 Prepare working drawings, specifications and schedule of quantities sufficient to prepare stimate of cost and tender documents including code of practice covering aspects like mode of easurement, method of payments, quality control procedures on materials & works and other onditions of contract.

)etailed Structural Design and drawings shall be prepared by the Structural Engineer on record ppointed by the client. Proof checking, if required, shall be got done by a member of the Structural)esign Review Panel, by the client

APPOINTMENT OF CONTRACTORS [STAGE 5] :

2.09 Invite, receive and analyse tenders; advise Client on appointment of contractors.

CONSTRUCTION [STAGE 6] :

2.10 Prepare and issue working drawings and details for proper execution of works during construction.
2.11 Approve samples of various elements and components.
2.12 Check and approve shop drawings submitted by the contractor/ vendors.

2.13 Visit the site of work, at intervals mutually agreed upon, to inspect and evaluate the Construction Works and where necessary clarify any decision, offer interpretation of the drawings/specifications, attend conferences and meetings to ensure that the project proceeds generally in accordance with the conditions of contract and keep the Client informed and render advice on actions, if required.

2.14 In order to ensure that the work at site proceeds in accordance with the contract documents/ drawings/ structural drawings and to exercise time and quality controls. The day-to-day supervision will be carried out by a Construction Engineer on Record (Clerk of Works/ Site Supervisor or Construction Management Agency in case of a large and complex project), who shall work under the guidance of the Architect and shall be appointed and paid by the Client.

2.15 Issue Certificate of Virtual Completion of works.

COMPLETION [STAGE 7] :

2.16 Prepare and submit completion reports and drawings for the project as required and assist the Client in obtaining "Completion/ Occupancy Certificate" from statutory authorities, wherever required.

2.17 Issue two sets of **as built drawings** including services and structures.

3. PROFESSIONAL FEE :

3.01 In consideration of the professional services rendered by the Architect/Engineer, he shall be paid professional fee and other charges in accordance with the Scale of Charges ginen in **Schedule III.**

3.02 Any tax levied by law, such as Service tax, etc. contingent to professional services rendered by the Architect, shall be payable by the Client, over and above the gross fees charged by the Architect in relation to the services provided.

4. SCHEDULE OF PAYMENT : The **Architect on record / Engineer on record** shall be paid **professional fee** in the following stages consistent with the work done plus other charges and reimbursable expenses as agreed upon :

Retainer On appointment/ Signing of Agreement/ Acceptance of offer.	5% of the total fees payable, whichever is higher, adjustable at the last stage.
Stage 1 On submitting conceptual designs and rough estimate of cost.	10% of the total fees payable.
Stage 2 On submitting the required preliminary scheme for the Client's approval along with the preliminary estimate of cost.	20% of the total fees payable less payment already made at Stage 1.
Stage 3 a. On incorporating Client's suggestions and submitting drawings for approval from the Client/ statutory authorities.	30% of the total fees payable less payment already made at Stages 1 and 2.
b. Upon Client's / statutory approval necessary for commencement of construction.	35% of the total fees payable less payment already made at Stages1 to 3a.
Stage 4 Upon preparation of working drawings, specifications and schedule of quantities sufficient to prepare estimate of cost and preparation of tender documents.	45% of the total fees payable less payment already made at Stages1 to 3a.
Stage 5 On inviting, receiving and analysing tenders; advising Client on appointment of contractors & consultants.	55% of the total fees payable less payment already made at Stages 1 to 4.
Stage 6	
a. On submitting working drawings and details required for commencement of work at site.	65% of the total fees payable less payment already made at Stages 1 to 5.
b.	
i. On completion of 20% of the work	70% of the total fees payable less payment already made at Stages 1 to 6a.
ii. On completion of 40% of the work	75% of the total fees payable less payment already made at Stages 1 to 6b(i).
iii. On completion of 60% of the work	80% of the total fees payable less payment already made at Stages 1 to 6b(ii).
iv. On completion of 80% of the work	85% of the total fees payable less payment already made at Stages 1 to 6b(iii).
v. On Virtual Completion	90% of the total fees payable less payment already made at Stages 1 to 6b(iv).
Stage 7 On submitting Completion Report and drawings for issuance of completion/ occupancy certificate by statutory authorities, wherever required and on issue of as built drawings	100% of the fees payable less payment already made at various stages and retainer.

5. EFFECTING PAYMENT TO THE ARCHITECT / ENGINEER :

5.1 The fee payable to the Architect / Engineer on Record shall be computed on the actual cost of works on completion. The payment due to the Architect at different stages be computed on the following basis:

5.1.1 Retainer : On rough estimate of cost.

5.1.2 At Stage 1 : On rough estimate of cost.

5.1.3 At Stages 2 to 4 : On preliminary estimate of cost.

5.1.4 At Stages 5 to 6b : Accepted tender cost.

5.1.5 At Stage 7 : Actual total cost.

5.2 Progressive, on account, payments shall be made by the Client to the Architect /engineer against any of the above stages based on the quantum of work done during that stage, as may be mutually agreed to between the Client and the Architect / engineer.

5.3 No deductions shall be made from the fee of the Architect on account of penalty, liquidated damages, part rates or other sums withheld from payment or recovered from contractors/ suppliers.

5.4 When the work is executed wholly or in part with old materials or labour or carriage is provided by the Client, the percentage fees shall be calculated as if the work had been executed wholly by the contractor supplying all labour and new materials.

5.5 The actual cost of the completed works shall include cost of execution of assigned works, referred to in Scope of Work and also the cost of equipment & machinery such as Transformers, DG Sets, Sub-stations, Lifts, Air Conditioning Machines, Pumps & Motors, Water and Sewage Treatment Plant, etc., but excluding the cost of land.

6. DOCUMENTATION AND COMMUNICATION CHARGES :

Apart from the professional fee, the Client shall pay to the Architect / Engineer on record, Documentation and Communication charges, @ 10% of the professional fee payable at all stages.

7. REIMBURSABLE EXPENSES :

In addition to the amounts reimbursable against site visits by the Architect/engineer / Consultant, the Client will reimburse the Architect / Engineer / consultant the following expenses incurred by him for discharge of his obligations:

7.01. Actual cost of travel (to & fro), boarding & lodging and local transport for any visit made by his staff to the site or such other place as may be necessary in connection with the execution of work and in connection with the performance of duties referred to in this agreement.

7.02. Cost of presentation models, computer simulation, presentation drawings, etc., prepared at the instance of the Client for purposes other than the Design and execution of the project.

8. CLIENT'S ROLE AND RESPONSIBILITIES :

The Client shall discharge all his obligations connected with the project and engagement of the Architect as follows:

8.01 To provide detailed requirements of the project.

8.02 To provide property lease/ ownership documents.

8.03 To provide a site plan, to a suitable scale, showing boundaries, contours at suitable intervals, existing physical features including any existing roads, paths, trees, existing structures, existing service and utility lines and such lines to which the proposed service can be connected. In case such information is not readily available, the Client shall arrange for the survey/ collection of necessary information and pay for the same.

8.04 To furnish reports on soil conditions and test as required by the Architect / engineer or pay for the preparation of the same.

8.05 To furnish specific conditions/ Statutory stipulations/ Codes of Practice/Schedule of rates, etc., desired to be followed.

8.06 To pay all the fees, levies, security deposits and expenses in respect of statutory sanction.

8.07 To give effect to the professional advice of the Architect on record / engineer on record / Structural engineer on Record and cause no changes in the drawings and documents without their consent.

8.08 To honour bills produced by Architect on record / engineer on record / Structural engineer on Record within one month of its submission.

8.09 To appoint a Structural Engineer on Record and a Construction Engineer on record (Clerk of Works/ Site Supervisor or Construction Management Agency in case of a large and complex project)

9. EXECUTION OF THE ASSIGNMENT :

9.01 The Architect / Engineer shall keep the Client informed about the progress of work in his office.

9.02 The Architect/ Engineer shall appoint specialised consultants in consultation with the Client, if necessary.

9.03 The Architect/ Engineer shall be responsible for the direction and integration of the consultants work. The consultants, however, shall be fully responsible for the calculations, the detailed design and periodic inspection and evaluation of the work entrusted to them. The Architect shall, if requested, make available the design calculations.

9.04 The Architect/ Engineer will advise the Client on the Time Schedule (Bar Chart/PERT/ CPM Network) prepared by the contractors for the completion of work, if required.

9.05 The Architect/ Engineer shall supply to the Client, free of cost, up to six sets of drawings at different stages.

9.06 The Architect/ Engineer shall not make any deviations, alterations or omissions from the approved drawings, involving financial implications without prior consent of the Client.

9.07 Any professional services to be rendered by the Architect/ Engineer at the instance of the Client after the agreed project completion period shall be compensated for on mutually agreed terms.

9.08 The Architect/ Engineer shall exercise all reasonable skill, care and diligence in the discharge of his duties and shall exercise such general superintendence and inspection as may be necessary to ensure that works are being executed in accordance with the Conditions of Contract.

9.09 Any revision in the drawings, tenders and documents, once approved, required to be made by the Client shall be compensated as additional services rendered by the Architect / Engineer and paid for @ 50% of the fee prescribed for the relevant stage(s).

9.10 No change shall be made in the approved drawings and specifications at site without the consent of the Architect/ Engineer.

9.11 Any curtailment of the professional services, beyond Stage 2, shall make it obligatory for the client to pay at least 20% of the fee for the remaining Stage(s) of the curtailed work/ Services.

10. TIME SCHEDULE :

The Architect/ Engineer shall, in consultation with the Client, prepare a Time Schedule in respect of various services to be rendered and discharge of Client's obligations.

11. INDEMNIFICATION :

In the event that a claim or suit is brought against the Architect / Engineer or the Consultants by any third party for damages arising from personal injury or property damage caused wholly by the Client, or anyone employed by the Client, or anyone for whose acts the Client may be held responsible, then the Client shall indemnify the Architect / Engineer and fully reimburse any loss, damage or expenses, including the attorney's fees, which the Architect may incur in connection therewith.

12. OWNERSHIP OF COPYRIGHT :

Architectural/ Structural design and drawing are intellectual property of the Architect / Engineer. The drawings, specifications, documents and models as instruments of service are the property of the Architect / Engineer whether the project, for which they are made, is executed or not. The Client shall retain copies of the Architect's models, drawings, specifications and other documents for his information and use in connection with the project. These shall not be used for any other project by the Client or the Architect or any other person, except for the repetition as stipulated in the Scale of Charges.

13. TERMINATION OF AGREEMENT :

13.1 Agreement between the Architect / Engineer and the Client may be terminated by either one giving the other a written notice of not less than 30 (thirty) days, should either fail substantially to perform his part of responsibilities/duties, so long as the failure is not caused by the one initiating the termination.

13.2 When termination of this Agreement is not related or attributable, directly or indirectly to any act, omission, neglect or default on the part of the Architect / Engineer, the Architect / Engineer shall be entitled to professional fees as stipulated under Clause 4 and sub-clauses 9.09 and 9.11 of Clause 9.

13.3 In the event of Architect's firm closing its business or the Client having terminated the agreement, the Client shall have the right to employ another Architect to complete the work, after making payment to the previous architect's firm.

14. INTERPRETATION :

In case of any ambiguity or difficulty in the interpretation of the Conditions of Engagement and Scale of Charges, the interpretation of the Council of Architecture / Institution of Engineers shall be final and binding on the Architect / Engineer and the Client.

15. ARBITRATION :

All disputes or differences which may arise between the Client and the Architect/ Engineer under "Conditions of Engagement and Scale of Charges" with regard to the meaning or interpretation or matter or things done or to be done in pursuance hereof, such disputes and differences shall be referred for arbitration The arbitration shall be conducted as per the provisions of the Arbitration and Conciliation Act, 1996. The decision and award of the arbitrator shall be final and binding on the Architect / Engineer and the Client.

Schedule III

Scale Of Charges /fees (*Prepared based on the fee structure of Council of Architects)*

ype of Project/ Services	Scope of Work & Services	Minimum fees/Reimbursable expenses
nprehensive hitectural vices		
Housing	As described for Comprehensive Architectural Services in the Conditions of Engagement including Site Development(but excluding Structural Design, Landscape Architecture, Interior Architecture, Graphic Design and Signage).	i. Single Block Housing and sites upto 0.5 hectare : 5 Percent on the cost of works assigned. ii. For a site more than 0.5 hectare and upto 2.5 hectares: 3.5 Percent on the cost of works assigned. iii. For a site more than 2.5 hectares and upto 5 hectares : 2.5 Percent on the cost of works assigned. iv. For a site more than 5 hectares : 2 Percent on the cost of works assigned. v. Individual House : 7.5 Percent on the cost of works assigned. Note : The fees payable in marginal cases in respect of clauses (iii) to (v) shall not be less than the maximum fee payable in their respective preceding clauses.
All projects er n housing	As described for comprehensive Architectural Services in the Conditions of Engagement including site Development(but excluding structural design, Landscape Architecture, Interior architecture, Graphic Design and Signage).	5 Percent on the cost of works assigned.
.1 Repetition of building in the ıe campus	As described for Comprehensive Architectural Services in the Conditions of Engagement including Site Development (but excluding Structural design, Landscape Architecture, Interior Architecture, Graphic Design and Signage).	5 Percent on the cost of works assigned.
.2 Repetition of building in the ıe campus	As described for Comprehensive Architectural Services in the Conditions of Engagement(except Structural Design, Landscape Architecture, Interior Architecture, Graphic Design & Signage and Site Development).	2.5 percent on the cost of works assigned.
.3 Repetition of building at a erent site	As described for Comprehensive Architectural Services in the Conditions of Engagement except Structural design, Landscape Architecture, Interior Architecture, Graphic Design & Signage and Site Development.	3.5 percent on the cost of works assigned.
Site elopment cept 1.1 and 1.2]	As described for Comprehensive Architectural Services in the Conditions of Engagement except Landscape Architecture, Interior Architecture, Graphic Design and Signage [except 1.1 and 1.2].	2.5 Percent on the cost of works assigned.
Architectural ıservation/ Structural rofitting/ Additions l alterations	Earth quake vulnerability Analysing, design and supervision of retrofitting of lifeline structures & buildings	7.5 Percent on the cost of works assigned
ite visits	Visits by an Architect/ engineer / consultant. i. Outstation Visit a. Traveling, Boarding & Lodging Expenses	Actual expenses by Air/ AC First Class train Fare (to & fro) / AC Car,Boarding & Lodging

	b. For each day	Expenses and Local Transport as per actual
	ii. Local site visit/field visit	Rs. 3000/day
echnical isory	i. Outstation	All as above at 5 i) (a) plus Rs. 10,000/ day.
ısultancy	ii. Local	Rs. 5,000/ day.
echnical umentation l ınmunication arges	Applicable on all professional fee payable to the Architect / engineer.	1 percent of the professional fees.
erification and tification of ıtractor's Bills	Verification of Contractor's bills for payment, based on progress of works at site, measurements of works Certified by the Construction Engineer on Record and in accordance with Conditions of Contract, Drawings and instruction issued.	1 percent of the contractors bill amount.

Structural Design, awings, certification	As described in the structural services and form A1 / N1/ C1 / C2 /C3 / S1 / S2	2% of the estimated cost of structure / building, including framed structure, wall, tiling, flooring, roofing, cladding, false ceiling, A/c. ducting, water tanks, truss, retaining walls, etc
Proof checking of the uctural design		0.5 % of the estimate cost
SDBR / structural ety / stability tification for hazard ety	Form 1 / 6	Rs. 10,000/- or 0.25% of the cost of buildings whichever is higher + cost of test to be conducted to assess the strength of the building
Technical Audit report		Rs 10,000/- or 0.25% of the cost of building, which ever is higher.
Construction ınagement / Project ınagement and tification by nstruction Engineer on cord		3 to 5% of the actual cost of construction depending upon the complexity of the project
Quality audit & safety dit during construction		Rs. 10,000/- per each report, excluding cost of tests.
Earth quake lnerability assessment life line structures & ecial buildings	Rapid Visual Screening Priliminary Earth quake analysis Detailed earth quake analysis	Rs, 5,000/building Rs. 25,000/ building 1% of the cost of building

FORMS

FORM NO 1
(Para 4.3.1 and 4.3.2)

CERTIFICATE OF UNDERTAKING
FOR HAZARD SAFETY REQUIREMENT

TO,

REF : Proposed work of _____
(Title of project)

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

Village _____ Taluka (F.P. _____ Scheme No. _____

of _____ Village/Town/Ciy

1. Certified that the building plans submitted for approval will satisfy the safety requirements as stipulated under 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 _____ Structural Engineer on Record with date

Address_____ Name in Block Letters _____

_____ Address_____

_____ _____

Signature of Developer with date _____ Signature of the Architect on Record/ Engineer on Record with date _____

Name in Block Letters _____ Name in Block Letters _____

Address_____ Address_____

Note : The certificate of Undertaking shall be signed by person concerned as per the provisions of Paras 4.3.1 and 4.3.2. **83**

FORM NO 2

(Para 4.3.1 and 4.3.2)

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/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 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 fulfill 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 a 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

(Para 4.3.1 and 4.3.2)

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 fulfill 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
(Para 4.3.1 and 4.3.2)

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 fulfill 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:

Registration No.....Date.....

Name : _____
Address : _____
_____
Tel. No. _____

FORM NO. 5
(Para 4.5.1)

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
(PARA 5.2)

STRUCTURAL DESIGN BASIS REPORT

1. This report to accompany the application for Building Development Permission.
2. In case information on items 3, 10, 17, 18 and 19 can not be given at this time, it should be submitted at least one week before commencement of construction.

Part I	General Data		
Sl.No	Description	Information	Notes
1	Address of the building • Name of the building • Plot number • Subplot number • 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	Use of the building		
7	Number of storey's above ground level (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 • Design safe bearing capacity		IS: 1893 Cl. 6.3.5.2 IS : 1904
11	Dead loads (unit weight adopted) • Earth • Water • Brick masonry • Plain cement concrete • Reinforced cement concrete • Floor finish • Other fill materials • Piazza floor fill and landscape		IS: 875 Part 1

12	Imposed (live) loads • Piazza floor accessible to Fire Tender • Piazza 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		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		

♥ Enclose small scale plans of each floor on A4 sheets
♦ Incase terrace garden is provided, indicate additional fill load and live load
♠ Indicate on a small scale plan on A4 sheet

FORM NO. 6 (Continued)

Part 2	Load bearing masonry buildings			
Sl.No	Description	Information		Notes
1	Building category			IS:4326 Cl. 7 read with IS: 1893

Big/ Zone	II	III	IV	V
Ordinary	B	C	D	E
Important	C	D	E	E

2	Basement Provided		
3	Number of floors including Ground Floor (all floors including stepped floors in hill slopes)		

4	Type of wall masonry				
5	Type and mix of Mortar				IS:4326 Cl. 8.1.2
6	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 consequent opening (b4) • Vertical distance (h3) • Ratio of wall height to thickness 4 • Ratio of wall length between cross wall to				IS:4326 Table 4, Fig.7
7	Horizontal seismic band • at plinth level • at window sill level • at lintel level • at ceiling level • at eave level of sloping roof • at top of gable walls • at top of ridge walls	P	IP	NA	(see note no.2)
					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
					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
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				

Notes

1. Information in item 6 should be given on separate A4 sized sheets for all walls with large number of openings.
2. P indicated **"Information Provided"** TP indicates **"Information to be Provided"**

   NA indicates **"Not Applicable"**

   Tick mark one box

FORM NO. 6

(Continued)

Part 3	Reinforced concrete framed buildings		
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 load capacity of piles * Depth of water table * Chemical analysis of ground water * Chemical analysis of soil		IS: 1498

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 • 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: 456 Cl. 5.6 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

General Notes

1. 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.
2. In addition to the completed report following additional information shall be submitted, at the latest, one month before commencement of Construction.

2.1 Foundations

2.1.1 Incase raft foundation has been adopted indicate K value used for analysis of the raft

2.1.2 Incase pile foundations have been used give full particulars of the piles, type, dia, length, capacity

2.1.3 Incase of high water table indicate system of countering water pressure, and indicate the existing water table, and that assumed to design foundations.

2.2 Idealization for Earthquake analysis

2.2.1 Incase 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.

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

2.3 Submit framing plans of each floor

2.4 Incase of basements, indicate the system used to contain earth pressures

FORM NO. 6 (Continued			
Part 4			Buildings in Structural Steel
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	esign based on	Elastic analysis Plastic	IS: 800; Section-9 SP: 6 (6)

		analysis	
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: 1893Would depend on system
6	Slenderness ratios maintained	Members defined in Table 3.1, IS: 800	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: 800; Section-10
9	Proposed material	General weld-able High strength Cold formed Tubular	IS: 2062 IS: 8500 IS: 801, 811 IS: 806
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	Shop (Specify welding type proposed) 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

FORM NO 7
(Para 5.10.2 b)

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
Construction Engineer on Record

Signature of the
Owner/ Developer/ Builder

Date:_____

Date: _____

Name in block letters: _____

Name in block letters_____

Address:_____
_____
_____

Address _____
_____
_____

FORM NO. 8
(Para 5.10.2 b)

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.

We 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:_____

Date: _____

Name in block letters: _____

Name in block letters_____

Address: _____
_____
_____

Address_____
_____
_____

FORM NO. 9
(Para 5.10.2 b)

PROGRESS CERTIFICATE - MIDDLE STOREY IN CASE OF HIGH-RISE BUILDING

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 _____ 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
Construction Engineer on Record

Signature of the
Owner/ Developer/ Builder

Date:_____

Date: _____

Name in block letters: _____

Name in block letters_____

Address: _____
_____
_____

Address_____
_____
_____

FORM NO. 10
(Para 5.10.2 b)

PROGRESS CERTIFICATE - LAST STOREY

Reference No.

Owner's Name : Location :

Submitted on : Received on :

The Chief Executive Authority

Anjar 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
Construction Engineer on Record

Signature of the
Owner/ Developer/ Builder

Date:_____

Date: _____

Name in block letters: _____ Name in block letters_____

Address: _____ Address_____
_____ _____
_____ _____

FORM NO. 11
(Para 5.10.2 d)

COMPLETION REPORT

Reference No.

Owner's Name: Location :

Submitted on : Received on :

The
Chief Executive Authority / Municipal Commissioner,
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
(Para 5.10.2d)

BUILDING COMPLETION CERTIFICATE BY ARCHITECT ON RECORD/ ENGINEER ON RECORD

Reference No.

Owner's Name : Location :

Submitted on : Received on :

The Chief Executive Authority
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. Certifed 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
(Para 5.10.2.d)

BUILDING COMPLETION CERTIFICATE BY CONSTRUCTION ENGINEER ON RECORD

Reference No.

Owner's Name :

Location :

Submitted on :

Received on :

The Chief Executive Authority
Urban / Area Development Authority

Sir,

1. The building/s has/have been constructedunder 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 nonstructructeral elements attached to the building (Structrural glazing, cladding, false ceiling, canopy, hoardings, A/c ducts, pipe pilnes, fire fighting lines) were fixed firmly to the building as speceifed 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
(Para 5.10.2d)

BUILDING COMPLETION CERTIFICATE BY STRUCTURAL ENGINEER ON RECORD

Reference No.

Owner's Name :

Location :

Submitted on :

Received on :

The Chief Executive Authority
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 nonstructructeral elements attached to the building (Structrural glazing, cladding, false ceiling, canopy, hoardings, A/c ducts, pipe pilnes, fire fighting lines) were inspected by me and are found to be fixed to the building as speceifed in the relevant IS codes.

Signature of the Owner — Signature of Structural Engineer on Record

Date — Date

Name in block letters: — Name in block letters:

Address: _____ — 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 competentAuthority?	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. approvedagency/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 Verticle 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 reinforcementas per drawing : Yes/No
5.7.6 Suitable cover : Yes/No
5.7.7 Spacing of bars : Regular/Irregular
5.7.8 Overlaps as perspecifications : 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

atProvided	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 (*-42% for double storey)	: <50%/50*-60%/>60%	
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:

FORM A1

Structural Configuration of Buildings

Form to be submitted along with the application for building permit by 1) Architect on Record / Engineer on Record and 2) Structural Engineer on Record

A1.0 Basic Information

S.No.	Item	
A1.0.1	Name of building	
A1.0.2	Location of Building	
	Plot number /sy. No	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
A1.0.3	Occupancy class of building	

A1.0.4	Name of Owner	
	Address	
A1.0.5	Name of Builder/ Developer	
	Address	
A1.0.6	Name of Architect	
	Registration No.	
	Address	
A1.0.7	Name of Structural Engineer	
	Registration No.	
	Address	

Signature:
Date:

A1.1 Technical Information – Overall issues

S.No.	Question	Architect on Record / Engineer on Record	Structural Engineer on Record
Hazard Zones Applicable			
1	**Environment**		
(a)	What is the environment exposure condition: (IS:456 – 2000, Clause 8.2.2, IS:800 – 2007) • Mild? • Moderate? • Severe? • Very Severe? • Extreme?		
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in(IS: 1893 (Part 1) – 2002 Figure 1)	II / III / IV / V	
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken ?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in (IS: 875 (Part 3) – 1987 Figure 1)	Design wind speed (m/s)55 / 50 / 47 / 44 / 39	
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the building located in		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in		
(b)	Is any special attention required to address the above Landslide Zone? If yes, please mention if that action was taken?		
6	**Soil and Site Condition**		

(a)	What is the soil type?		

	Has it been considered in architectural design?		
	Is it a building on hill slopes?		
	If it is a building on hill slopes, are there any concerns to be addressed? If so, please list them.		
7	Blast Loading Condition		
(a)	Is blast-type loading expected in the building?		
(b)	Has it been considered in architectural design, through planning stand-off distances, choice of façade finishes and structural design of members?		

A1.2 Technical Information - Building Configuration

S.No.	Question	Architect on Record / Engineer on Record	Structural Engineer on Record
	Geometry		
8	**Overall shape**		
(a)	Does the building have a convex shape in plan or concave shape?		
(b)	Does the building have a convex shape in elevation or concave shape?		
(c)	What is the slenderness ratio of the building, i.e., ratio of its height to smallest base dimension?		
(d)	What is the plan aspect ratio of the building, i.e., ratio of its length to width in plan?		
(e)	Does the building have a central or off centered atrium? If yes, what is the area of the atrium in plan to the overall plan area of the building?		
(f)	Does the building have any expansion joint in plan? If yes, what is the width of the expansion joint?		
(g)	Does the building have any projected parts (e.g., cantilever overhangs, roof sheets) that are vulnerable to gusty winds?		

S.No.	Question	Architect on Record / Engineer on Record	Structural Engineer on Record
	Structural Configuration		
9	**Vertical Load Resisting System**		
	What is the vertical load resisting system: • Regular moment resisting frame (MRF)?		
	• Regular MRF with structural walls? • Irregular moment frame? • Irregular moment frame with structural walls? • Structural walls with beam-slab system? • Structural walls with flat-slab system?		
10	**Lateral Load Resisting System**		
(a)	What is the lateral load resisting system: • Regular moment resisting frame (MRF)? • Regular MRF with structural walls? • Irregular moment frame? • Irregular moment frame with structural walls? • Structural walls with beam-slab system? • Structural walls with flat-slab system?		
(b)	load resisting systems in each plan direction well-spaced in plan and of similar lateral stiffness to resist the inertia force generated in plan? If not, what are the problems: • Lack of frame grid? • Too many openings in walls making them of highly dissimilar stiffness and strength? • Others _____ (please state)?		
11	**Plan Irregularities**		
(a)	Does the building have Torsion Irregularity? Torsion irregularity shall be considered to exist when the maximum story drift, computed including accidental torsion, at one end of the structure transverse to an axis is more than 1.2		

	times the average of the story drifts at the two ends of the structure. (IS:1893 (Part 1) – 2002 Clause 7.1)		
	If Torsional Irregularity is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, are the structural elements designed for the consequent torsional effect? Torsional irregularity may arise from eccentric (IS:1893 (Part 1) – 2002 Clause 7.1)		

	location of mass (e.g., water tanks on roofs) or eccentric location of structural elements resisting lateral loads (e.g., columns, walls, lift cores, and staircases).		
(b)	**Does the building have any Re-entrant Corners?** Plan configurations of a structure and its lateral-force-resisting system contain reentrant corners where both projections of the structure beyond a re-entrant corner are greater than 15 percent of the plan dimension of the structure in the given direction. (IS:1893 (Part 1) – 2002 Clause 7.1)		
	If Re-entrant Corners are present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, does the building have enough structural elements in the re-entrant corner to allow the flow of forces through this corner? (IS:1893 (Part 1) – 2002 Clause 7.2)		
(c)	**Does the building have any Diaphragm Discontinuity?** Diaphragms with abrupt discontinuities or variations in stiffness including those having cutout or open areas greater than 50 percent of the gross enclosed diaphragm area or changes in effective diaphragm stiffness of more than 50 percent from one story to the next. (IS:1893 (Part 1) – 2002 Clause 7.3)		
	If Diaphragm Discontinuity are present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, does the building have enough in plane floor diaphragm action in plan to allow the flow of forces to the vertical elements without any in-plane deformation of the floor slab? (IS:1893 (Part 1) – 2002 Clause 7.4)		
(d)	Does the building have any **Out-of- Plane Offsets i**n Vertical Lateral- Force Resisting Elements? Discontinuities in a lateral force resistance path are out-of-plane offsets of the vertical elements resisting the lateral load. (IS:1893 (Part 1) – 2002 Clause 7.5)		
	If **Out-of-Plane Offsets** are present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, does the building have floating columns, off-set columns, floating walls, or offset walls that do not significantly alter the load path of the structure? (IS:1893 (Part 1) – 2002 Clause 7.6)		

(e)	Does the building have any **Nonparallel Systems?** The vertical lateral-force-resisting elements are not parallel to or symmetric about the major orthogonal axes of the lateral-force resisting system. (IS:1893 (Part 1) – 2002 Clause 7.6)		
	If Nonparallel Systems are present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give		

	details how to achieve it? If not, has design been done to account for 25/73 load combinations to account for all possible actions under 2D/3D ground shaking? (IS:1893 (Part 1) – 2002 Clause 7.7)		
12	**Vertical Irregularities**		
(a)	Does the building have **Stiffness Irregularity – Soft Story?** A soft story is one in which the lateral stiffness is less than 70 percent of that in the story above or less than 80 percent of the average stiffness of the three stories above (IS:1893 (Part 1) – 2002 Clause 7.7)		
	If Stiffness Irregularity – Soft Story is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, the same may be stated and the structure declared unsafe? (IS:1893 (Part 1) – 2002 Clause 7.7)		
(b)	Does the building h**ave** Mass Irregularity? Mass irregularity shall be considered to exist where the effective mass of any story is more than 150 percent of the effective mass of an adjacent story. A roof that is lighter than the floor below need not be considered. (IS:1893 (Part 1) – 2002 Clause 7.8)		
	If **Mass Irregularity** is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, the same may be stated? (IS:1893 (Part 1) – 2002 Clause 7.9)		
(c)	Does the building have **Vertical Geometric Irregularity?** Vertical geometric irregularity shall be considered to exist where the horizontal dimension of the lateral-force- resisting system in any story is more than 130 percent of that in an adjacent story. (IS:1893 (Part 1) – 2002 Clause 7.10)		
	If **Vertical Geometric Irregularity** is present in the building, it is possible to		
	eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it?If not, the same may be stated? (IS:1893 (Part 1) – 2002 Clause 7.11)		
(d)	Does the building have In-Plane Discontinuity in Vertical Lateral- Force Resisting Elements? An in-plane offset of the lateral-force resisting elements greater than the length of those elements or a reduction in stiffness of the resisting element in the story below. (IS:1893 (Part 1) – 2002 Clause 7.11)		
	If In-Plane Discontinuity is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, the same may be stated?		
(d)	Does the building have Discontinuity in Capacity – Weak Story? A weak story is one in which the story lateral strength is less than 80 percent of that in the story above. The story strength is the total strength of all seismic-resisting elements sharing the story shear for the direction under consideration. (IS:1893 (Part 1) – 2002 Clause 7.11)		
	If In-Plane Discontinuity is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it?		

	If not, the same may be stated? (IS:1893 (Part 1) – 2002 Clause 7.12)		
(e)	Does the building have Discontinuity in Capacity – Weak Story? A weak story is one in which the story lateral strength is less than 80 percent of that in the story above. The story strength is the total strength of all seismic-resisting elements sharing the story shear for the direction under consideration. (IS:1893 (Part 1) – 2002 Clause 7.13)		
	If Discontinuity in Capacity – Weak Story is present in the building, it is possible to eliminate the same with suitable alterations without jeopardizing the functions of the building? If yes, please give details how to achieve it? If not, the same may be stated and the structure declared unsafe? (IS:1893 (Part 1) – 2002 Clause 7.14)		
S.No.	Question		
Pounding			
13	**Adjacent Units of the same building**		
(a)	Has the seismic analysis been done to estimate the lateral displacement of the two units? If yes, has it been established that there is or there is no problem of pounding? (IS:1893 (Part 1) – 2002 Clause 7.11.3)		
(b)	If the problem of pounding exists, is it possible to eliminate the pounding by choosing another lateral load resisting system?		
(c)	If the problem of pounding does not exist and the gap is large between the wo units, is any detailing provided for the large gap between the two units?		
Vibrations			
14	**Floor vibrations in the building**		
(a)	Are the vibration levels at floors (especially at the upper elevations) due to wind such that they cause discomfort to building occupants?		
(b)	If yes, what measures are taken to reduce the same?		
Emergency Evacuation			
15	**Staircases in the building**		
(a)	Is there adequate number of emergency exit staircases in the building?		
(b)	If YES, are they located properly?		
Fire Safety			
16	**Water Sprinklers in the building**		
(a)	Does the building require water sprinklers to douse accidental fires?		
(b)	If YES, are they • Sufficient in number, AND • Located properly?		
High-rise Buildings			
17	**Accessible Roofs & Balconies in the building**		
(a)	In buildings of height in the range 15- 45m, are all roofs and balconies access controlled?		
(b)	In buildings of height more than 45m, are all roofs and balconies are secured against access by normal users of the building?		

FORM N1

Non-structural Aspects of Buildings of all heights
Form to be submitted along with the completion certificate by Architect on Record / Engineer on Record and Structural Engineer on Record

N1.0 Basic Information

S.No.	Item	Details to be filled by the Engineer on record
N1.0.1	**Name of building**	
N1.0.2	**Location of Building**	
	Plot number	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
N1.0.3	**Occupancy class of building**	
N1.0.4	**Name of Owner**	
	Address	
N1.0.5	**Name of Builder**	
	Address	
N1.0.6	**Name of Architect on Record / Engineer on Record**	
	Registration No.	
	Address	
N1.0.7	**Name of Structural Engineer on Record**	
	Registration No.	
	Address	

Signature:
Date:

N1.1 Technical Information – Non-structural elements present in the Building

S.No.	Question	Architect on Record / Engineer on Record	Structural Engineer on Record
Non-structural elements present			
1	**Contents of buildings**		
(a)	Which of the following items are present in the building:	Provide below the detailed list of items under each category	
	(i) furniture and items of usage 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, AHUs & Cooling towers		
	(iii) appurtenances e.g., door & window panels & frames, large-panel glass panes with frames (as windows or infill walling material), other partition walls		
	• Facilities for handicapped people e.g. , Handrails, ramp, bed lift, medical gases, etc		
2	**Appendages to buildings**		
(a)	Which of the following items are present in the building:	Provide below the detailed list	
	Items projecting out of the buildings, either horizontally or vertically, e.g., chimney		

	projecting out of building, glass or stone cladding/façades, parapets, small water tanks atop building, sunshades, advertisements hoardings affixed to the vertical face of the building or anchored atop buildings, and small communication antennas mounted atop buildings		
3	**Services and utilities**		
(a)	Which of the following items are present in the building:	Provide below the detailed list of items under each category	
	(i) from outside to inside the building to within the building e.g., water supply mains, electricity cables, gas pipelines, sewage pipelines and telecommunication wires		
	(ii) from one part of the building to another e.g., air-conditioning ducts, rainwater drain pipes, elevators, fire hydrant systems including water pipes through the building		

Signature:
Date:

4	**Critical Contents of the building**		
(a)	Which of the following items are massive, tall/flexible or expensive items in/affixed to the building, and whose loss will cause life threat, impair function or major economic setback:	Provide below the list of only the critical items under each category	
	(i) furniture and items of usage 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, AHUs & Cooling towers		
	(iii) appurtenances e.g., door & window panels & frames, large-panel glass panes with frames (as windows or infill walling material), other partition walls		
5	**Critical Appendages to the building**		
(a)	Which of the following items are massive, tall/flexible or expensive items in/affixed to the building, and whose loss will cause life threat, impair function or major economic setback:	Provide below the list of only the critical items	
	Items projecting out of the buildings, either horizontally or vertically e.g., chimney projecting out of building, glass or stone cladding used as façades, parapets, small water tanks rested atop buildings, sunshades, advertisement hoardings affixed to the vertical face of the building or anchored atop buildings, and small communication antennas mounted atop buildings		
6	**Services and utilities of the building**		
(a)	Which of the following items are massive, tall/flexible or expensive items in/affixed to the building, and whose loss will cause life threat, impair function or major economic setback:	Provide below the list of only the critical items under each category	
	(i) from outside to inside the building to within the building		

	e.g., water supply mains, electricity cables , gas pipelines, sewage pipelines and telecommunication wires		
	(ii) from one part of the building to another e.g., air-conditioning ducts, rainwater drain pipes, elevators, fire hydrant systems including water pipes through the building		

Signature:
Date:

N1.2 Technical Information - Non-structural elements design

S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
Design to protect against effects of earthquake shaking			
7	**Critical Contents of buildings**		
(a)	Are all the Critical Contents of the building secured against effects of earthquake shaking by formal design of their anchorages, supports and interfaces?	Provide below the list of only the critical items under each category, and state YES or NO in response to the question on left hand side.	State design provisions used, when answer to question on left hand side is YES
	(i) furniture and items of usage		
	(ii) facilities and equipment		
	(iii) appurtenances		
	If not, which are the items not secured?		
8	**Critical Appendages to buildings**		
(a)	Are all the Critical Appendages to the building secured against effects of earthquake shaking by formal design of their anchorages, supports and interfaces?	Provide below the list of only the critical items under each category, and state YES or NO in response to the question on the left hand side.	State design provisions used, when answer to question on left hand side is YES
	If not, which are the items not secured?		
9	**Services and utilities**		
(a)	Are all the Services and utilities of the building secured against effects of earthquake shaking by formal design of their anchorages, supports and interfaces?	Provide below list of only the critical items under each category, and state YES or NO in response to the question on left hand side.	State design provisions used, when answer to question on left hand side is YES
	If not, which are the items not secured?		

Signature:
Date:

Name:.....
Address: .....

FORM M1

Load Bearing Masonry Buildings of Height Less than 15m
Form to be submitted along with the completion certificate by Structural Engineer on Record

M1.0 Basic Information

S.No.	Item	Details to be filled by the Peer Reviewer
M1.0.1	**Name of building**	
M1.0.2	**Location of Building**	
	Plot number	

	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
M1.0.3	**Occupancy class of building**	
M1.0.4	**Name of Owner**	
	Address	
M1.0.5	**Name of Builder**	
	Address	
M1.0.6	**Name of Architect**	
	Registration No.	
	Address	
M1.0.7	**Name of Structural Engineer**	
	Registration No.	
	Address	

Signature:
Date:

M 1.1 Technical Information - Siting of the Buildings

S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
	Hazard Zones Applicable		
1	**Environment**		
(a)	What is the environment exposure condition: • Mild? • Moderate? • Severe? • Very Severe? • Extreme?		IS:456 – 2000 Clause 8.2.2 IS:800 – 2007 Clause _____
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in?	II / III / IV / V	IS: 1893 (Part 1) – 2002 Figure 1
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action wastaken?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in	Design wind speed (m/s) 55 / 50 / 47 / 44 / 39	IS: 875 (Part 3) – 1987Figure 1
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the		

	building located in?		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in?		
(b)	Is any special attention required to address the above landslide zone? If yes, please mention if that action was taken?		
6	**Soil Condition**		

Signature:
Date:

(a)	What is the Ground terrain like? Is thenatural ground slope more than 20%?		
(b)	What is the type of soil strata: • Hard? • Medium? • Soft?		IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(c)	Is soil liquefiable?	Yes / No	IS:1893 (Part 1)-2002 Table 4, Figure 7
(d)	If the soil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?		
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?		
(f)	What is the Design Safe Bearing Capacity (kN/m2)?		IS:1904 - _____ Clause _____
M1.2 Technical Information - Building Information			
S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
	Geometry		
7	**Number of Storeys**		
(a)	What is the number of storey's above ground level in the building (including those to be added later, also including all stepped floors, if applicable)?		
(b)	Is this total height of the building more than 15m? if YES, is the quality of design engineering undertaken sufficient to show that the building is safe?		
S.No	Question	Response to the Question to be filled by the Peer Reviewer	Reference
	Design		
8	**Seismic Actions**		
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5	IS: 1893 (Part 1) – 2002Table 6
(b)	What is the Response reduction Factor used in estimating the design base shear?		IS: 1893 (Part 1) – 2002 Table 7
(c)	What is the Design Base Shear, as a		IS: 1893 (Part 1) – 2002 Clause 7.5.3

	fraction of the weight of thebuilding, • Seismic Coefficient Method • Response Spectrum Method		

Signature:
Date:

(d)	What is the category of the building, A, B, C, D or E?		IS: 4326 – 1993 Clause 7, Table 2
9	Is the building provided with a basement? If yes, is it structurally weak or soft to resist lateral loads?		
10	What is the type of the masonry employed in the wall • Burnt clay brick? • Cement concrete blocks? • Stone?		
11	What is the type of mortar used?		IS: 1905
(a)	What is the mix employed? Is this consistent with the mortar type to be used?		
12	Are the opening sizes and locations consistent with the norms for the category of the building and number of storey's in it?		IS: 4326
13	Are the ratios of • Wall height to thickness ≤ 20, and • Wall length between cross wall to thickness ≤40?		IS:4326-1993 Table 4, Figure 7
14	Does the building have a pitched roof • At eave level of sloping roof? • At top of gable walls? • At top of ridge walls?		
(a)	Is a pitched roof acceptable? If not, has adequate engineering been done to show that the roof and building are safe?		IS: 4326 Figure 10, Clause 8.4.4
S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
Detailing			
15	Have the following bands been provided: • Roof band? • Eves band? • Gable band? • Lintel band? • Sill band? • Plinth band?		
(a)	Are these bands sufficient as per the norms?		IS: 4326 Clauses 8.4.2, 8,4,3,8,4,6 and 8.4.7
(b)	Are the band size, bar size and links as per the norms?		IS: 4326 Table 6

Signature:

Date:

16	Have vertical reinforcing bars been provided in the building • At corners and T junctions of walls,and • At jambs of doors ad windowopenings?		
(a)	Are these bands sufficient as per the norms?		IS: 4326 Clauses 8.4.8, 8,4,9
(b)	Are the band size, bar size, and links as per the norms?		IS: 4326 Table 7
17	Does the building adopt precast roofing planks for the slab system? If YES, are these planks integrated to each other and with the walls?		IS: 4326 Clauses 9.1.4
18	If pitched roof is employed, are horizontal bracings provided in • The pitched roof truss, and • The horizontal plane at the tie level of the roof truss?		IS: 4326 Clause 5.4.12

FORM C1

Concrete Buildings of Height less than 15m
Form to be submitted along with the completion certificate by Structural Engineer on Record

C1.0 Basic Information

S.No.	Item	Details to be filled by the Peer Reviewer
C1.0.1	**Name of building**	
C1.0.2	**Location of Building**	
	Plot number	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
C1.0.3	**Occupancy class of building**	
C1.0.4	**Name of Owner**	
	Address	
C1.0.5	**Name of Builder**	
	Address	
C1.0.6	**Name of Architect**	
	Registration No.	
	Address	
C1.0.7	**Name of Structural Engineer**	
	Registration No.	
	Address	

Signature:
Date:

C1.1 Technical Information - Sitting of the Building

S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
	Hazard Zones Applicable		
1	**Environment**		
(a)	What is the environment exposure condition: • Mild? • Moderate?		IS:456 – 2000 Clause 8.2.2 IS:800 – 2007 Clause _____

	• Severe? • Very Severe? • Extreme?		
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in?	II / III / IV / V	IS: 1893 (Part 1) – 2002 Figure 1
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in	Design wind speed (m/s) 55 / 50 / 47 / 44 / 39	IS: 875 (Part 3) – 1987Figure 1
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the building located in?		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in?		
(b)	Is any special attention required to address the above landslide zone? If yes, please mention if that action was taken?		
6	**Soil Condition**		

Signature:
Date:

(a)	What is the Ground terrain like? Is the natural ground slope more than 20%?		
(b)	What is the type of soil strata: • Hard? • Medium? • Soft?		IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(c)	Is soil liquefiable?	Yes / No	IS:1893 (Part 1)-2002 Table 4, Figure 7
(d)	If the soil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?		
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?		
(f)	What is the Design Safe Bearing Capacity (kN/m2)?		IS:1904 - _____ Clause _____
C1.2 Technical Information - Building Information			
		Response to the Question to be filled by the Peer	

S.No.	Question	Reviewer	Reference
	Geometry		
7	**Number of Storeys**		
(a)	What is the number of storey's aboveground level in the building (including those to be added later, also including all stepped floors, if applicable)?		
(b)	What is the number of basements below ground level?		
S.No	Question	Response to the Question to be filled by the Peer Reviewer	Reference
	Design		
8	***Structural System***		
(a)	What is the Structural System employed: • Regular frame, • Regular frame with shear wall, • Irregular frame, • Irregular frame with shear wall, • Shear wall building, • Soft storey building, or • Any other (please identify)?	1.0 / 1.5	IS: 1893 (Part 1) – 2002Table 6
(b)	What is the foundation system: • Independent footing		IS: 1893 (Part 1) – 2002 Table 7

	• Interconnected footing • Raft foundation • Pile foundation, or • Any other (please identify)?		
(c)	What is the depth of the foundation? Is this sufficient for the strata of soil at the site?		
(d)	If individual foundations are used, what is the system for interconnecting the foundation units: • Plinth beams, • Foundation beams, • Pile caps connected by tie beams, or • Not connected together?		
(e)	What is the horizontal floor system: • Beams and slabs • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Any other (please identify)?		
9	In buildings with basement, have the following been considered: • Uplift pressure considered, and • Lateral pressure considered?If NO, is the building safe?		
10	What are the grades of concrete and number employed in the building? List all grades used.		
11	What are the grades of steel Reinforcement used in the building? List all grades used.		IS: 456 – 2000 Clause 5.6
12	What are the load combinations employed in the analysis of the Structure?		
13	***Seismic Actions***		
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5	IS: 1893 (Part 1) – 2002 Table 6

(b)	What is the Response reduction Factor used in estimating the design base shear?		IS: 1893 (Part 1) – 2002 Table 7
(c)	What is the natural period of the building for shaking in translation mode along the two horizontal plan directions?		
(d)	What is the Design Base Shear, as a		IS: 1893 (Part 1) – 2002

Signature:
Date:

	fraction of the weight of the building, • Seismic Coefficient Method • Response Spectrum Method		Clause 7.5.3
(e)	If soft/flexible storeys exist in the building, were the columns in that storey specially designed for additionaleffects?		IS:1893 (Part 1) – 2002 Clause 7.10
(f)	Has the effect of unreinforced masonry infills been accounted for in thestructural stiffness and strength designof building?		
(g)	Has analysis of the structure performed to include effects of torsion?		IS: 1893 (Part 1) Clause 7.9
S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
Detailing			
14	Is ductile detailing provided in the building?		IS:13920 – 2003 Clause 1.1.1
15	What is the minimum dimension (in mm) of the beams used?		IS:13920 – 2003 Clause 6.1
16	What is the minimum percentage of tensile reinforcement used in beams at any cross-section?		IS:13920 – 2003 Clause 6.2.1
17	What is the maximum percentage of tensile reinforcement used in beams at any cross-section?		IS:13920 – 2003 Clause 6.2.2
18	What is the spacing (in mm) of transverse reinforcement in 2d length of beams near ends?		IS:13920 – 2003 Clause 6.3.5
19	What is the minimum ratio of capacity of beam in shear to its capacity in flexure at ends?		
20	What is the minimum dimension (in mm) of columns?		IS:13920 – 2003 Clause 7.1.2, 7.1.3
21	What is the minimum percentage of longitudinal reinforcement used in columns?		IS:456 – 2000 Clause 26.5.3
22	What are the • Smallest diameter (in mm) • Largest spacing (in mm) of transverse reinforcement bars in columns near ends?		IS:13920 – 2003 Clause 7.4

Signature:

Date:

Name:.....
Address: .....
.....
.....
Tel. No..... .....

FORM C2

Concrete Buildings of Height more than 15m and less than 45 m
Form to be submitted along with the completion certificate by Structural Engineer on Record

C2.0 Basic Information

S.No.	Item	Details to be filled by the Structural Engineer on record
C2.0.1	**Name of building**	
C2.0.2	**Location of Building**	
	Plot number	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
C2.0.3	**Occupancy class of building**	
C2.0.4	**Name of Owner**	
	Address	
C2.0.5	**Name of Builder**	
	Address	
C1.0.6	**Name of Architect on Record / Engineer on Record**	
	Registration No.	
	Address	
C2.0.7	**Name of Structural Engineer on record**	
	Registration No.	
	Address	

Signature:
Date:

S.No.	Question	Response to the Question to be filled by the Structural Engineer on record	Reference
	Hazard Zones Applicable		
1	**Environment**		
(a)	What is the environment exposure condition: • Mild? • Moderate? • Severe? • Very Severe? • Extreme?		IS:456 – 2000 Clause 8.2.2 IS:800 – 2007 Clause _____
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in?	II / III / IV / V	IS: 1893 (Part 1) – 2002 Figure 1
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in	Design wind speed (m/s) 55 / 50 / 47 / 44 / 39	IS: 875 (Part 3) – 1987Figure 1
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if		

	that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the building located in?		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in?		
(b)	Is any special attention required to address the above landslide zone? If yes, please mention if that action was taken?		
6	**Soil Condition**		
(a)	What is the Ground terrain like? Is the natural ground slope more than 20%?		

Signature:
Date:

(b)	What is the type of soil strata: • Hard? • Medium? • Soft?		IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(c)	Is soil liquefiable?	Yes / No	IS:1893 (Part 1) – 2002Table 4, Figure 7
(d)	If tsoil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?		
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?		
(f)	What is the Design Safe Bearing Capacity (kN/m2)?		IS:1904 - _____ Clause _____
C2.2 Technical Information - Building Information			
S.No.	Question	Response to the question to be filled by the Structural engineer on Record	Reference
	Geometry		
7	**Number of Storeys**		
(a)	What is the number of storeys above ground level in the building (including those to be added later, also including all stepped floors, if applicable)?		
(b)	What is the number of basements below ground level?		
S.No.	Question	Response to the Question to be filled by the Structural engineer on Record	Reference
	Design		
8	**Structural System**		
(a)	What is the Structural System employed: • Regular frame, • Regular frame with shear wall, • Irregular frame, • Irregular frame with shear wall, • Shear wall building, • Soft storey building, or • Any other (please identify)?	1.0 / 1.5	
(b)	What is the foundation system: • Independent footing • Interconnected footing		

Signature:

Date:

	• Raft foundation • Pile foundation, or • Any other (please identify)?		
(c)	What is the depth of the foundation? Is this sufficient for the strata of soil at the site?		
(d)	If individual foundations are used, what is the system for interconnecting the foundation units: • Plinth beams, • Foundation beams, • Pile caps connected by tie beams, or • Not connected together?		
(e)	What is the horizontal floor system: • Beams and slabs • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Any other (please identify)?		IS: 1905
9	In buildings with basement, have the following been considered: • Uplift pressure considered, and • Lateral pressure considered? If NO, is the building safe?		
10	What are the grades of concrete employed in the building? List all grades used.		
11	What are the grades of steel reinforcement used in the building? List all grades used.		IS: 456 – 2000 Clause 5.6
12	What are the load combinations employed in the analysis of the structure?		
13	Is it ensured that all un-reinforced masonry infills (made of burnt clay brick, cement blocks or stone units in any mortar) are eliminated in the exterior bays of moment frames?		
14	Is it ensured that torsional modes of vibrations of the building are either eliminated or their mode participation factor is small?		
15	Has construction stage-wise structural analysis been performed with each storey added?		

Signature:
Date:

(a)	If YES, is a pre-camber required to be provided in the floor levels at the construction stage?		
16	Have the effects of creep and shrinkage been estimated through formal calculations, and shown to be within acceptable limits?		
17	**Wind Actions**		
(a)	In buildings taller than 45m, have wind tunnel tests and/or CFD studies been performed to show that there are no detrimental drag effects of wind on the building, either locally or globally?		
18	**Seismic Actions**		
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5	IS: 1893 (Part 1) – 2002 Table 6
(b)	What is the Response reduction Factor used in estimating the design base shear?		IS: 1893 (Part 1) – 2002 Table 7

(c)	What is the natural period of the building for shaking in translation mode along the two horizontal plan directions?		
(d)	What is the Design Base Shear, as a fraction of the weight of the building, • Seismic Coefficient Method • Response Spectrum Method		IS: 1893 (Part 1) – 2002 Clause 7.5.3
(e)	If soft/flexible storeys exist in the building, were the columns in that storey specially designed for additional effects?		IS:1893 (Part 1) – 2002 Clause 7.10
(f)	Has analysis of the structure performed to include effects of torsion?		IS: 1893 (Part 1) Clause 7.9
19	**Fire Safety**		
(a)	What is the fire-rating for which the structural system is intended to be designed? Have all flammable material accounted for in ensuring fire-safety?	_____ hours	IS: 456
(b)	Do the member sizes chosen meet the expected fire-rating?		IS: 456
20	**Blast Actions**		
(a)	Is there a need to consider the effect of blast loading on the building?		
(b)	If YES, does the design of the structural system account for the expected blast load?		

Signature:

Date:

S.No.	Question	Response to the Question to be filled by the Structural engineer on Record	Reference
	Detailing		
21	Is ductile detailing provided in the building?		IS:13920 – 2003 Clause 1.1.1
22	What is the minimum dimension (in mm) of the beams used?		IS:13920 – 2003 Clause 6.1
23	What is the minimum percentage of tensile reinforcement used in beams at any cross-section?		IS:13920 – 2003 Clause 6.2.1
24	What is the maximum percentage of tensile reinforcement used in beams at any cross-section?		IS:13920 – 2003 Clause 6.2.2
25	What is the spacing (in mm) of transverse reinforcement in 2d length of beams near ends?		IS:13920 – 2003 Clause 6.3.5
26	What is the minimum ratio of capacity of beam in shear to its capacity in flexure at ends?		
27	What is the minimum dimension (in mm) of columns?		IS:13920 – 2003 Clause 7.1.2, 7.1.3
28	What is the minimum percentage of longitudinal reinforcement used in columns?		IS:456 – 2000 Clause 26.5.3
29	What are the • Smallest diameter (in mm) • Largest spacing (in mm) of transverse reinforcement bars in columns near ends?		IS:13920 – 2003 Clause 7.4

Signature:

Date:

Name:.....

Address: .....

.....

Tel. No..... .....

FORM C3

Concrete Buildings of Height more than 45m and/ or 7 stories
Form to be submitted along with the completion certificate by Structural Engineer on Record and vetted by a member of Structural Design Review Panel

C2.0 Basic Information

S.No.	Item	Details to be filled by the Structural Engineer on record
C2.0.1	**Name of building**	
C2.0.2	**Location of Building**	
	Plot number / Sy. No.	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
C2.0.3	**Occupancy class of building**	
C2.0.4	**Name of Owner**	
	Address	
C2.0.5	**Name of Builder**	
	Address	
C1.0.6	**Name of Architect on Record / Engineer on Record**	
	Registration No.	
	Address	
C2.0.7	**Name of Structural Engineer on Record**	
	Registration No.	
	Address	

Signature:
Date:

S.No.	Question	to be filled by the Structural Engineer on record	Remarks of member of SDRP	Reference
	Hazard Zones Applicable			
1	**Environment**			
(a)	What is the environment exposure condition: • Mild? • Moderate? • Severe? • Very Severe? • Extreme?			IS:456 – 2000 Clause 8.2.2 IS:800 – 2007 Clause _____
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.			
2	**Seismic Zone**			
(a)	Which Seismic Zone is the building located in?	II / III / IV / V		IS: 1893 (Part 1) – 2002 Figure 1
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken?			
3	**Cyclone Zone**			
(a)	Which Cyclone Area is the	Design wind		IS: 875 (Part

	building located in	speed (m/s) 55 / 50 / 47 / 44 / 39		3) – 1987Figure 1
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?			
4	**Flood Zone**			
(a)	Which Flood Area is the building located in?			
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?			
5	**Landslide Zone**			
(a)	Which Landslide Zone is the building located in?			
(b)	Is any special attention required to address the above landslide zone? If yes, please mention if that action was taken?			
6	**Soil Condition**			
(a)	What is the Ground terrain like? Is the natural ground slope more than 20%?			

(b)	What is the type of soil strata: (attach soil investigation report) • Hard? • Medium? • Soft?			IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(c)	Is soil liquefiable?	Yes / No		IS:1893 (Part 1) – 2002Table 4, Figure 7
(d)	If the soil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?			
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?			
(f)	What is the Design Safe Bearing Capacity (kN/m2)?			IS:1904 - _____ Clause _____
C2.2 Technical Information - Building Information				
S.No.	Question	to be filled by the Structural engineer on Record	Remarks of member SDRP	Reference
Geometry				
7	**Number of Storeys**			
(a)	What is the number of storeys above ground level in the building (including those to be added later, also including all stepped floors, if applicable)?			
(b)	What is the number of basements below ground level?			
S.No.	Question	Response to the Question to be filled by the Structural engineer on Record	Remarks of member SDRP	Reference
Design				
8	**Structural System**			
(a)	What is the Structural System employed: • Regular frame, • Regular frame with shear wall, • Irregular frame, • Irregular frame with shear wall, • Shear wall building, • Soft storey building, or	1.0 / 1.5		

	• Any other (please identify)?			
(b)	What is the foundation system: • Independent footing • Interconnected footing			
	• Raft foundation • Pile foundation, or • Any other (please identify)?			
(c)	What is the depth of the foundation? Is this sufficient for the strata of soil at the site?			
(d)	If individual foundations are used, what is the system for interconnecting the foundation units: • Plinth beams, • Foundation beams, • Pile caps connected by tie beams, • Not connected together?			
(e)	What is the horizontal floor system: • Beams and slabs • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Any other (please identify)?			IS: 1905
9	In buildings with basement, have the following been considered: • Uplift pressure considered, and • Lateral pressure considered? If NO, is the building safe?			
10	What are the grades of concrete employed in the building? List all grades used.			
11	What are the grades of steel reinforcement used in the building? List all grades used.			IS: 456 – 2000 Clause 5.6
12	What are the load combinations employed in the analysis of the structure?			
13	Is it ensured that all un-reinforced masonry infills (made of burnt clay brick, cement blocks or stone units in any mortar) are eliminated in the exterior bays of moment frames?			
14	Is it ensured that torsional modes of vibrations of the building are either eliminated or their mode participation factor is small?			
15	Has construction stage-wise structural analysis been performed with each storey added?			
(a)	If YES, is a pre-camber required to be provided in the floor levels at the construction stage?			
16	Have the effects of creep and shrinkage been estimated through formal calculations, and shown to be within acceptable limits?			
17	**Wind Actions**			
(a)	In buildings taller than 45m, have wind tunnel tests and/or CFD studies been performed to show that there are no detrimental drag effects of wind on the building, either locally or globally?			
18	**Seismic Actions**			
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5		IS: 1893 (Part 1) – 2002

				Table 6
(b)	What is the Response reduction Factor used in estimating the design base shear?			IS: 1893 (Part 1) – 2002 Table 7
(c)	What is the natural period of the building for shaking in translation mode along the two horizontal plan directions?			
(d)	What is the Design Base Shear, as a fraction of the weight of the building, • Seismic Coefficient Method • Response Spectrum Method			IS: 1893 (Part 1) – 2002 Clause 7.5.3
(e)	If soft/flexible storeys exist in the building, were the columns in that storey specially designed for additional effects?			IS:1893 (Part 1) – 2002 Clause 7.10
(f)	Has analysis of the structure performed to include effects of torsion?			IS: 1893 (Part 1) Clause 7.9
19	**Fire Safety**			
(a)	What is the fire-rating for which the structural system is intended to be designed? Have all flammable material accounted for in ensuring fire-safety?	_____ hours		IS: 456
(b)	Do the member sizes chosen meet the expected fire-rating?			IS: 456
20	**Blast Actions**			
(a)	Is there a need to consider the effect of blast loading on the building?			
(b)	If YES, does the design of the structural system account for the expected blast load?			

S.No.	Question	to be filled by the Structural engineer on Record	Remarks of member SDRP	Reference
Detailing				
21	Is ductile detailing provided in the building?			IS:13920 – 2003 Clause 1.1.1
22	What is the minimum dimension (in mm) of the beams used?			IS:13920 – 2003 Clause 6.1
23	What is the minimum percentage of tensile reinforcement used in beams at any cross-section?			IS:13920 – 2003 Clause 6.2.1
24	What is the maximum percentage of tensile reinforcement used in beams at any cross-section?			IS:13920 – 2003 Clause 6.2.2
25	What is the spacing (in mm) of transverse reinforcement in 2d length of beams near ends?			IS:13920 – 2003 Clause 6.3.5
26	What is the minimum ratio of capacity of beam in shear to its capacity in flexure at ends?			
27	What is the minimum dimension (in mm) of columns?			IS:13920 – 2003 Clause 7.1.2, 7.1.3
28	What is the minimum percentage of longitudinal reinforcement used in columns?			IS:456 – 2000 Clause 26.5.3
29	What are the • Smallest diameter (in mm) • Largest spacing (in mm) of transverse reinforcement bars in			IS:13920 – 2003 Clause

	columns near ends?			7.4

Signature:
Date:

Name:.....
Address: .....
.....
Tel. No..... .....

FORM S1

Steel Buildings of Height Less than 15m
Form to be submitted along with the completion certificate by Structural Engineer on Record

S1.0 Basic Information

S.No.	Item	Details to be filled by the Structural Engineer on Record
S1.0.1	**Name of building**	
S1.0.2	**Location of Building**	
	Plot number	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
S1.0.3	**Occupancy class of building**	
S1.0.4	**Name of Owner**	
	Address	
S1.0.5	**Name of Builder**	
	Address	
S1.0.6	**Name of Architect**	
	Registration No.	
	Address	
S1.0.7	**Name of Structural Engineer**	
	Registration No.	
	Address	

Signature:
Date:

S1.1 Technical Information - Sitting of the Building

S.No.	Question	Response to the question to be filled by the Structural Engineer on Record	Reference
	Hazard Zones Applicable		
1	**Environment**		
(a)	What is the environment exposure condition:		IS:456 – 2000 Clause 8.2.2 IS:800 – 2007

	• Mild? • Moderate? • Severe? • Very Severe? • Extreme?		Clause _____
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in?	II / III / IV / V	IS: 1893 (Part 1) – 2002 Figure 1
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in	Design wind speed (m/s) 55 / 50 / 47 / 44 / 39	IS: 875 (Part 3) – 1987Figure 1
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the building located in?		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in?		
(b)	Is any special attention required toaddress the above landslide zone? Ifyes, please mention if that action was taken?		
6	**Soil Condition**		

Signature:
Date:

(a)	*What is the Ground terrain like? Is the* natural ground slope more than 20%?		IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(b)	What is the type of soil strata: • Hard? • Medium? • Soft?		IS:1893 (Part 1) – 2002 Clause 6.3.5.2
(c)	Is soil liquefiable?	Yes / No	IS:1893 (Part 1) – 2002 Table 4, Figure 7
(d)	If the soil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?		
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?		
(f)	What is the Design Safe Bearing Capacity (kN/m2)?		IS:1904
S1.2 Technical Information - Building Information			
S.No.	Question	Response to the Question to be filled by the Peer Reviewer	Reference
Geometry			
7	**Number of Storeys**		
(a)	What is the number of storeys above ground level in the building (including		

	those to be added later, also including all stepped floors, if applicable)?		
(b)	What is the number of basements below ground level?		
S.No.	Question	Response to the Question to be filled by the Structural Engineer on record	Reference
Design			
8	**Structural System**		
(a)	What is the Structural System employed: • Regular frame, • Regular frame with shear wall, • Irregular frame, • Irregular frame with shear wall, • Shear wall building, • Soft storey building, or Cold formed steel frame, • Braced frame for vertical loads,	1.0 / 1.5	

Signature:
Date:

	• Braced frame for horizontal loads, or • Any other (please identify)?		
(b)	What is the foundation system: • Independent footing • Interconnected footing • Raft foundation • Pile foundation, or • Any other (please identify)?		
(c)	What is the depth of the foundation? Is this sufficient for the strata of soil at the site?		
(d)	If individual foundations are used, what is the system for interconnecting the foundation units: • Plinth beams, • Foundation beams, • Pile caps connected by tie beams,or • Not connected together?		
(e)	What is the horizontal floor system: • Beams and slabs • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Composite slab, • Boarded slab system, or • Any other (please identify)?		
(f)	What is the horizontal floor system: • Steel truss system, • Composite roof system, • Beams and slabs, • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Composite slab, • Boarded slab system, or • Any other (please identify)?		
	What is the angle of pitch, in roofs that are pitched?		
9	In buildings with basement, have the		

Signature:
Date:

	Following been considered: • Uplift pressure considered, and • Lateral pressure considered? If NO, is the building safe?		
10	What are the grades of concrete employed in the building? List all grades used.		

11	What are the grades of steel used in the building? List all grades used (including the grade of steel, as well general weldable/high-strength/Cold formed/Tubular)		IS: 456 – 2000 Clause 5.6
12	What are the load combinations employed in the analysis of the structure?		
13	What is the method of design employed: • Limit State Method, or • Working Stress Method?		IS: 800 Clause 3.1.2 IS: 801 Clause 5.3
14	What was assumed in the structural analysis: • Rigid construction, • Semi-rigid construction, or • Simple construction?		IS: 800Clause 4.2 IS: 801Clause 7.1
15	What is the method of analysis employed: • Elastic analysis o First-order analysis, o Second-order analysis, • Plastic analysis, or • Frame buckling analysis?		IS: 800 Clauses 4.4, 4.5, 4.6
16	Are slenderness limits satisfied by all steel members?		IS: 800 Clause 3.8
17	Are erection loads considered?		IS: 800 Clause 3.3
18	Are temperature stresses considered?		IS: 800 Clause 3.4
19	Are deflection limits satisfied?		IS: 800 Table 6
20	**Seismic Actions**		
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5	IS: 1893 (Part 1) – 2002 Table 6
(b)	What is the Response reduction Factor used in estimating the design base shear?		

(c)	What is the natural period of the building for shaking in translation mode along the two horizontal plan directions?		
(d)	What is the Design Base Shear, as a fraction of the weight of the building, • Seismic Coefficient Method • Response Spectrum Method		IS: 1893 (Part 1) – 2002 Clause 7.5.3
(e)	If soft/flexible storeys exist in the building, were the columns in that storey specially designed for additional effects?		IS:1893 (Part 1) – 2002 Clause 7.10
(f)	Has analysis of the structure performed to include effects of torsion?		IS: 1893 (Part 1) Clause 7.9
S.No.	Question	Response to the Question to be filled by the Structural Engineer on Record	Reference
Detailing			
21	Is ductile detailing provided in the building?		IS:13920 – 2003 Clause 1.1.1
22	What is the minimum dimension (in mm) of columns?		IS:13920 – 2003 Clause 7.1.2, 7.1.3
	What are the types of connections used: • Rivets, • CT Bolts, • SHFG Bolts, • Black Bolts, • Welding – Field Shop, or • Composite?		
23	What is the corrosion protection method employed: • Controlling electrode potential, • Inhibitor, • Inorganic/metal coating, or • Organic/paint coating?		IS: 800 Clause 15.2.4

24	What is the minimum fire resistance level provided for in the design?	_____ Hours	IS: 800 Clause 16
25	What is the fire resistance method employed: • In-tumescent painting, • Spraying, • Quilting, • Fire-resistant boarding, or • Concrete encasing?		IS: 800 Clause 16 IS: 1641 IS: 1642 IS: 1643

Signature:

Date:

Name:.....

Address: .....

.....

Tel. No..... .....

FORM S2

Steel Buildings of Height more than 15m, span more than 10m or area more than 500 m2
Form to be submitted along with the completion certificate Structural Engineer on Record and vetted by a member of Structural Design Review Panel

S1.0 Basic Information

S.No.	Item	Details to be filled by the Structural Engineer on Record
S2.0.1	**Name of building**	
S2.0.2	**Location of Building**	
	Plot number	
	Town Planning Scheme (If any)	
	Address	
	City/Town/Block/Panchayat/Village	
	District	
	State	
S2.0.3	**Occupancy class of building**	
S2.0.4	**Name of Owner**	
	Address	
S2.0.5	**Name of Builder**	
	Address	
S2.0.6	**Name of Architect**	
	Registration No.	
	Address	
S2.0.7	**Name of Structural Engineer**	
	Registration No.	

	Address	

Signature:
Date:

S2.1 Technical Information - Sitting of the Building

S.No.	Question	Structural engineer on Record	Structural design Review Panel
	Hazard Zones Applicable		
1	**Environment**		
(a)	What is the environment exposure condition:(IS:456 – 2000 clause 8.2.2 IS:800 – 2007, Clause _____) • Mild? • Moderate? • Severe? • Very Severe? • Extreme?		
(b)	Is any special attention required to address the above environment exposure condition? If yes, please mention if that action was taken.		
2	**Seismic Zone**		
(a)	Which Seismic Zone is the building located in? (IS: 1893 (Part 1) – 2002 Figure 1)	II / III / IV / V	
(b)	Is any special attention required to address the above seismic zone? If yes, please mention if that action was taken?		
3	**Cyclone Zone**		
(a)	Which Cyclone Area is the building located in (IS: 875 (Part 3) – 1987 Figure)	Design wind speed (m/s) 55 / 50 / 47 / 44 / 39	
(b)	Is any special attention required to address the above cyclone zone? If yes, please mention if that action was taken?		
4	**Flood Zone**		
(a)	Which Flood Area is the building located in?		
(b)	Is any special attention required to address the above flood zone? If yes, please mention if that action was taken?		
5	**Landslide Zone**		
(a)	Which Landslide Zone is the building located in?		
(b)	Is any special attention required to address the above landslide zone? Ifyes, please mention if that action was taken?		
6	**Soil Condition**		

Signature:
Date:

(a)	*What is the Ground terrain like? Is the* natural ground slope more than 20%?		
(b)	What is the type of soil strata: (IS:1893 (Part 1) – 2002 Clause 6.3.5.2) • Hard? • Medium? • Soft?		
(c)	Is soil liquefiable? (IS:1893 (Part 1) – 2002 Table 4, Figure 7)	Yes / No	
(d)	If the soil is liquefiable, does the proposed design consider the same and eliminate the negative effects of liquefaction on the proposed structure? If yes, how? If not, why?		
(e)	Is soil slope vulnerable to landslides? If yes, was a detailed analysis done to assess the safety of the slope?		
(f)	What is the Design Safe Bearing Capacity (kN/m2)? (IS:1904)		
S2.2 Technical Information - Building Information			
S.No.	Question		
	Geometry		
7	**Number of Storey's**		
(a)	What is the number of stories above ground level in the building (including those to be added later, also including all stepped floors, if applicable)?		
(b)	What is the number of basements below ground level?		
S.No.	Question		
	Design		
8	**Structural System**		
(a)	What is the Structural System employed: • Regular frame, • Regular frame with shear wall, • Irregular frame, • Irregular frame with shear wall, • Shear wall building, • Soft storey building, or Cold formed steel frame, • Braced frame for vertical loads,	1.0 / 1.5	

Signature:
Date:

	• Braced frame for horizontal loads, or • Any other (please identify)?		
(b)	What is the foundation system: • Independent footing • Interconnected footing • Raft foundation • Pile foundation, or • Any other (please identify)?		
(c)	What is the depth of the foundation? Is this sufficient for the strata of soil at the site?		
(d)	If individual foundations are used, what is the system for interconnecting the foundation units: • Plinth beams, • Foundation beams, • Pile caps connected by tie beams,or • Not connected together?		
(e)	What is the horizontal floor system: • Beams and slabs • Waffles, • Ribbed floors,		

	• Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Composite slab, • Boarded slab system, or • Any other (please identify)?		
(f)	What is the horizontal floor system: • Steel truss system, • Composite roof system, • Beams and slabs, • Waffles, • Ribbed floors, • Flat slab with drops, • Flat plate with drops, • Flat slab or plate without drops, • Composite slab, • Boarded slab system, or • Any other (please identify)?		
	What is the angle of pitch, in roofs that are pitched?		
9	In buildings with basement, have the		

Signature:
Date:

	Following been considered: • Uplift pressure considered, and • Lateral pressure considered? If NO, is the building safe?		
10	What are the grades of concrete employed in the building? List all grades used.		
11	What are the grades of steel used in the building? List all grades used (including the grade of steel, as well general weldable/high-strength/Cold formed/Tubular) (IS: 456 – 2000 Clause 5.6)		
12	What are the load combinations employed in the analysis of the structure?		
13	What is the method of design employed: (IS: 800 Clause 3.1.2 IS: 801 Clause 5.3) • Limit State Method, or • Working Stress Method?		
14	What was assumed in the structural analysis: (IS: 800Clause 4.2 IS: 801Clause 7.1) • Rigid construction, • Semi-rigid construction, or • Simple construction?		
15	What is the method of analysis employed: (IS: 800 Clauses 4.4, 4.5, 4.6) • Elastic analysis o First-order analysis, o Second-order analysis, • Plastic analysis, or • Frame buckling analysis?		
16	Are slenderness limits satisfied by all steel members? (IS: 800 Clause 3.8)		
17	Are erection loads considered? (IS: 800 Clause 3.3)		
18	Are temperature stresses considered? (IS: 800 Clause 3.4)		
19	Are deflection limits satisfied? (IS: 800 Table 6)		
20	Is it ensured that all un-reinforced masonry infills (made of burnt clay brick, cement blocks or stone units in any mortar) are eliminated in the exterior bays of moment frames?		
21	Is it ensured that torsional modes of vibrations of the building are either eliminated or their mode participationactor is small?		

22	Has construction stage-wise structural analysis been performed with each storey added?		

Signature:

Date:

(a)	If YES, is a pre-camber required to be provided in the floor levels at the construction stage?		
23.	Have the effects of creep and shrinkage been estimated through formal calculations, and shown to be		
24	Wind Actions		
(a)	In buildings taller than 45m, have wind tunnel tests and/or CFD studies been performed to show that there are no detrimental drag effects of wind on the building, either locally or globally?		
25	**Seismic Actions**		
(a)	What is the Importance Factor used in estimating the design base shear?	1.0 / 1.5	
(b)	What is the Response reduction Factor used in estimating the design base shear? (IS: 1893 (Part 1) – 2002 Table 7)		
(c)	What is the natural period of the building for shaking in translation mode along the two horizontal plan directions?		
(d)	What is the Design Base Shear, as a fraction of the weight of the building, (IS: 1893 (Part 1) – 2002 Clause 7.5.3) • Seismic Coefficient Method • Response Spectrum Method		
(e)	If soft/flexible stories exist in the building, were the columns in that (IS:1893 (Part 1) – 2002 Clause 7.10) storey specially designed for additional effects?		
(f)	Has analysis of the structure performed to include effects of torsion? (IS: 1893 (Part 1) Clause 7.9)		
26	**Fire Safety**		
(a)	What is the fire-rating for which the structural system is intended to be designed? Have all flammable material accounted for in ensuring fire-safety? IS: 456	_____ hours	
(b)	Do the member sizes chosen meet the expected fire-rating?		
27	**Blast Actions** IS: 456		
	Is there a need to consider the effect of blast loading on the building?		
	If YES, does the design of the structural system account for the expected blast load?		

Signature:
Date:

S.No.	Question		
	Detailing		
28	Is ductile detailing provided in the building? (IS:13920 – 2003 Clause 1.1.1)		
29	What is the minimum dimension (in mm) of columns? (IS:13920 – 2003 Clause 7.1.2, 7.1.3)		
	What are the types of connections		

	used: • Rivets, • CT Bolts, • SHFG Bolts, • Black Bolts, • Welding – Field Shop, or • Composite?		
30	What is the corrosion protection method employed: (IS: 800 Clause 15.2.3) • Controlling electrode potential, • Inhibitor, • Inorganic/metal coating, or • Organic/paint coating?		
31	What is the minimum fire resistance level provided for in the design? (IS: 800 Clause 16)	_____ Hours	
32	What is the fire resistance method employed: • In-tumescent painting, • Spraying, • Quilting, • Fire-resistant boarding, or • Concrete encasing?		

Signature:
Date:
Name:.....

Address: .....

Tel. No..... .....

Reference IS codes

For General Structural Safety

1. IS: 456:2000 “Code of Practice for Plain and Reinforced Concrete
2. IS: 800-1984 “Code of Practice for General Construction in Steel
3. IS: 801-1975 “Code of Practice for Use of Cold Formal Light Gauge Steel Structural Members in General Building Construction
4. IS 875 (Part 2):1987Design loads (other than earthquake) for buildings and structures Part2 Imposed Loads
5. IS 875 (Part 3):1987Design loads (other than earthquake) for buildings and structures Part 3 Wind Loads
6. IS 875 (Part 4):1987Design loads (other than earthquake) for buildings and structures Part 4 Snow Loads
7. IS 875 (Part 5):1987Design loads (other than earthquake) for buildings and structures Part 5 special loads and load combination
8. IS: 883:1966 “Code of Practice for Design of Structural Timber in Building
9. IS: 1904:1987 “Code of Practice for Structural Safety of Buildings: Foundation”
10. IS1905:1987 “Code of Practice for Structural Safety of Buildings: Masonry Walls
11. 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 Cyclone/Wind Storm Protection

12. IS 875 (3)-1987 "Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, Part 3, Wind Loads"
13 Guidelines *(Based on IS 875 (3)-1987)* for improving the Cyclonic Resistance of Low rise houses and other building

For Earthquake Protection

14 IS: 1893-2002 "Criteria for Earthquake Resistant Design of Structures (Fifth Revision)"
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 Protection of Landslide Hazard

20 IS 14458 (Part 1): 1998 Guidelines for retaining wall for hill area: Part 1 Selection of type of wall.
21 IS 14458 (Part 2): 1997 Guidelines for retaining wall for hill area: Part 2 Design of retaining/breast walls
22 IS 14458 (Part 3): 1998 Guidelines for retaining wall for hill area: Part 3 Construction of dry stone walls
23 IS 14496 (Part 2): 1998 Guidelines for preparation of landslide – Hazard zonation maps in mountainous terrains: Part 2 Macro-zonation
24 National Building Code 2005

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.