BUILDING CONSTRUCTIONS IN HAZARD PRONE AREAS PROPOSED AMENDMENTS TO BUILDING BYE LAWS

Background Information of the Project:

The Government of India (GOI) and United Nations Development Programme (UNDP) are implementing a Disaster Risk Management programme in 169 districts and 17 states across India. Urban Earthquake Vulnerability Reduction Project is a sub component of the DRM programme which is implemented in the earthquake prone cities with a population of 0.5 million. 38 cities are covered in the project. Vijayawada is one of the city covered in the project which lies in Zone III of the earthquake vulnerability map of the country.

Under the UEVRP, the Techno Legal Regime is a core activity which leads to the hazard mitigation measures incorporated in the building codes and bye laws.

A Techno Legal Regime Sub Committee is constituted with the members from Municipal Corporation, Town Planning, Urban Development Authority (VGTM UDA), Builders Association and HOD of Civil Engineering Department of Local Engineering Colleges. The consultation meeting of the sub committee constituted by the Vijayawada Municipal Corporation (VMC) with the above members was held on 27th July 2007 to discuss the amendments in the building bye laws proposed by the Ministry of Home Affairs.

The following are the participants who attended the sub committee meeting

1. Sri Gulzar N., I.A.S., Commissioner, VMC.
2. Dr. Ved. Mittal, Consultant, UNDP, New Delhi
3. Sri S.V. Giridhara Rao, A.C. (P) & Nodal Officer for UEVRP
4. Sri . Yohan, Superintending Engineer,& Chief Engineer, VMC
5. Sri P.N.S. Sai Babu, Asst. City Planner and CP I/C, VMC
6. Sri P. Pradeep Kumar, Asst. City Planner, VMC
7. Sri.Satheesh Kumar K.S, Project Officer UEVRP, VMC
8. Sri Panduranga Rao, Professor, Siddhartha Engg. College,
9. Dr. Ramesh, Professor, KLCE,
10. Sri Bhaskara Rao, Dy. Superintending Engineer. (Irrigation)
11. Sri Rajling Gadde, Builders Association
12. Sri Ramana Rao, Builders Association.
13. Sri. Anne Raguram, Consulting Structural Engineer, VAJ.
14. Sri Ramakrishana, Promoter, VAJ.
15. Sri. B. Mohan Krishna, DE (Electrical) APTRANSCO, VAJ.

Participants discussed in elaborate about the proposed amendments and expressed their acceptance in the incorporation of the proposed amendments in the existing bye laws. Consultant from the UNDP appraised the proposed amendments and their significance.

The following are the incorporation in the building by laws.

Include the definitions along with the existing definitions in Section (2) of the existing bye laws.

I. "Natural Hazard" means the probability of occurrence, within a specific period of time in a given area, of a potentially damaging natural phenomenon.

II. "Natural Hazard Prone Areas" means the areas likely to have (i) moderate to very high damage risk zone of earth quakes, OR (ii) moderate to very high damage risk of cyclones OR (iii) significant flood flow or inundation, OR (iv) Tsunami proneness (v) landslide proneness or potential, OR (vi) one or more of these hazards.

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

IV. "Mitigation" means the measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and on environment including preparedness and prevention."

V. "Earthquake prone areas" mean the areas under seismic zones III, IV & V (as specified in IS: 1893) which are likely to have moderate to high damage risk due to earth quake. The whole of the Vijayawada City Corporation area falls in this earthquake prone area classification.

VI. "Compliance" means the verification of properties of construction materials based on test data and verification of the strength and structural adequacy for various components of buildings and structures

VII. "Contractor" means who has been licensed by the Municipal Corporation

VIII. "Cyclone prone areas" mean the areas close to the coast, where the cyclonic wind velocities exceed 39 m/sec. (specified in the wind velocity map given in I.S. 875) and prone to cyclonic storms.

IX. In these areas, the risk is due to i) cyclonic wind velocities combined with heavy storm, (ii) flooding by sea water due to high waves and (iii) flooding due to heavy storm.

X. "Flood prone areas" mean areas likely to have significant flood flow inundation notified by the Corporation of Vijayawada from time to time as flood prone areas which may be modified / added/ deleted when necessary by due notification.

XI. "Lifeline Buildings" means the buildings which are of post earthquake importance such as hospital building, power house building, telephone exchange building and the like.

XII. "Retrofitting" means upgrading the strength of an unsafe building by using suitable engineering techniques.

XIII. "Quality Control" relate to construction quality and to control of variation in the material properties and structural adequacy. In case of concrete, it is the control of accuracy of all operations, which affect the consistency, and strength of concrete, batching, mixing, transporting, placing, curing and testing.

XIV. "Quality Audit" is a requirement for an independent (third party) assessment of the quality and seismic or cyclone resistant features of all the multi-storeyed buildings in earthquake zone III and coastal areas of the State. The quality audit report shall consist of conformance or non-conformance of structures with the technical specifications for earthquake and cyclone resistance and to suggest remedies/rectification if any.

XV. "Quality Assurance"- All planned and systematic actions necessary to ensure that the final product i.e. structure or structural elements will perform satisfactorily in service life.

XVI. "Quality Auditor " means a Civil Engineer listed in the record of Corporation

XVII. "Compliance" refers to the verification of the properties of construction materials based on test data and verification of the strength and structural adequacy for various components of buildings and structures.

XVIII. "Non-Structural Component" refers to the components of buildings which do not contribute to the structural stability such as infill walls in r.c. frame buildings, glass panes, claddings, parapet walls, chimneys etc.

Terms and expressions which are not defined in these Rules shall have the same meaning as in the respective rules / regulations / by-laws of the respective local authorities and as defined in the National Building Code as the case may be, unless the context otherwise requires.

In the application procedure the following to be incorporated

(d) (i) The evidence of ownership,

(ii) Certificates in the prescribed -

Form 1 – by the Owner, Developer, Structural Engineer on Record and Architect on Record

Form 2 – by the Architect on Record/Engineer on Record,
Form 3 – by the Structural Engineer on Record,
Form 4 – by the construction Engineer on Record.

(iii) Any other documents, particulars, details, plans as may be decided by the Commissioner which may be required to process the application and the applicant may be called upon to furnish; the applicant shall furnish these within the time stipulated by the Commissioner."

PROTECTION AGAINST HAZARDS

1. PROTECTION FROM EARTHQUAKES

I. In those areas where there are no dangers of soil liquefaction or settlements or landslides, all building structures and infrastructures should be designed using the relevant Indian Standards as provided in the Building Regulations and the National Building Code.

II. Soils subjected to liquefaction potential under earthquake shaking can be improved by compaction to desired relative densities, so as to prevent the possibility of liquefaction.

III. Buildings and structures could be founded on deep bearing piles going to non-liquefiable dense layers.

IV. Steep slopes can be made more stable by terracing and construction of retaining walls and breast walls, and by ensuring good drainage of water so that the saturation of the hill-slope is avoided.

V. Any other appropriate engineering intervention to save the building structures or infrastructure from the fury of the earthquake.

2. PROTECTION FROM CYCLONIC WIND DAMAGE / FLOODING

Buildings, structures and infrastructures in the cyclone prone areas should be designed according to the Indian Standards and Guidelines as provided in the Regulations and the National Building Code.

I. Light utility structures used for electrical transmission and distribution and towers for communications, Chimney stacks of industrial structures require special design considerations against the cyclonic wind pressures, suctions and uplifts.

II. In case the buildings, structures and infrastructures are founded on marine clay deposits it will be advisable to adopt either under-reamed or long piles which should penetrate the marine clay layer and rest on dense sand stratum, or individual column footing with a reinforced concrete beam located at the level of the ground, or a continuous reinforced concrete strip footing, using a very low bearing pressure.

III. Wherever, the top soil could become slushy due to flooding, the top layer of 30 cm depth of soil should not be considered for providing lateral stability.

IV. In storm surge prone areas, it will be preferable to construct the community structures, like schools, cyclone shelters, etc. by raising the level of the ground protected by provision of retaining walls at sufficient distance away from the building, taken to such depth that no erosion takes place due to receding storm surge. Alternatively, construct the community structures on stilts with no masonry or bracing up to the probable maximum surge level.

V. Raising the site above the high flood level.

VI. Construction/improvement of drainage paths to effectively drain the water from the site area.

VII. Construction of buildings and structures on deep foundations going below the depth of scour or on stilts with deep enough foundations under water.

ADDITIONAL PROVISONS IN BUILDING REGULATIONS/ BYE-LAWS FOR STRUCTURAL SAFETY IN NATURAL HAZARD PRONE AREAS

STRUCTURAL DESIGN

For any building in the hazard prone area structural design/retrofitting shall only be carried out by 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 wherever applicable as provided in these rules. Generally, the structural design of foundations, 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 as given below:

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

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.

STRUCTURAL DESIGN BASIS REPORT

In compliance of the design with the above Indian Standard, the Structural Engineer on Record shall submit a structural design basis report in the Performa attached herewith covering the essential safety requirements specified in the Standard.

(i) The” Structural Design Basis Report (SDBR)”consists of four parts(FormNo.5)

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 Corporation Commissioner 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

SEISMIC STRENGTHENING/RETROFITTING

Prior to seismic strengthening/ retrofitting of any existing structure, evaluation of the existing structure as regards structural vulnerability in the specified wind/ seismic hazard zone shall be carried out by a SER/SDAR. If as per the evaluation of the SER/SDAR the seismic resistance is assessed to be less than the specified minimum seismic resistance as given in the 'note' below, action should 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.

REVIEW OF STRUCTURAL DESIGN

(i) The Corporation Commissioner shall create a Structural Design Review Panel (SDRP) consisting of senior SER's and SDAR's whose task will be to review and certify the design prepared by SER or SDAR when ever referred by the Corporation Commissioner.

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

(iii) Table-1 gives requirements of SDRP for earthquake prone areas.
If the Commissioner decides that for any other building which may not fall under the above type, require proof check in his opinion to be carried out, it shall be done.

TABLE – 1
PROOF CHECKING REQUIREMENTS FOR STRUCTURAL DESIGN

Sl. No.	Type of Structure	Submission from SER or SDAR	To be proof checked
01	Load bearing building up to 3 Storeys	SDBR* (Not required)	Not to be checked
02	Buildings up to seven storeys (RCC/ Steel framed structures)	SDBR Preliminary design Detailed structural design and structural drawings	To be checked To be checked To be checked
03	Buildings greater than seven storeys (RCC/ Steel framed structures)	SDBR Preliminary design Detailed structural design and structural drawings	To be checked To be checked To be checked
04	Public Buildings (a). Load bearing buildings upto 3 storeys (b) RCC/ Steel Structures	 SDBR SDBR Preliminary design Detailed structural design and structural drawings	 Not to be checked To be checked To be checked To be checked
04	Special structures	SDBR Preliminary design Detailed structural design and structural drawings.	To be checked To be checked To be checked

Note: Public building means assembly of large number of people including schools, hospitals, courts etc. Special structures means large span structures such as stadium, assembly hall, or tall structures such as water tanks , TV tower, chimney etc.

CERTIFICATION REGARDING STRUCTURAL SAFETY IN DESIGN

Structural Engineer on Record (SER) or Structural Design Agency on Record (SDAR) shall give a certificate of structural safety of design as per Performa given in Form-3 and Form 12 at the time of completion.

CONSTRUCTIONAL SAFETY

Supervision

All construction (except the small developments in rule shall be carried out under supervision of the Construction Engineer on Record (CER) or Construction Management Agency on Record (CMAR).

Certification of structural safety in construction

CER/ CMAR shall give a certificate of structural safety of construction as per proforma given in Form-11 at the time of completion.

QUALITY CONTROL AND INSPECTION

Inspection

All the construction for multi-storyed buildings higher than 4 storeys, or 15 metres in height 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)

Certification of safety in quality of construction

Quality Auditor on Record (QAR) or Quality Auditor Agency on Record (QAAR) shall give a certificate of quality control as per Performa given in Form-13. Quality Inspection Programme to be carried on the site shall be worked out by QAR/ QAAR in consultation with the owner, builder, CER/CMAR.

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

Following provisions shall apply for telecommunication infrastructure.

a) Location: The Telecommunication Infrastructure shall be either placed 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 fiber 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 Radio Frequency Allocation"(SACFA) issued by Ministry of Telecommunications.

(ii) Every applicant will have to produce the structural safety & stability certificate for the tower as well as the building from the Structural Engineer on Record (SER) which shall be the liability of both owner and SER.

(iii) Applicant has to produce / submit plans of structure to be erected.

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

INSPECTION

The general requirement for inspection of the development shall also include the following regulation.

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, Block No, Village Name, Door Number, Street Name, Locality, etc. name of owner and name of Architect on Record, Engineer on Record , Developer, Structural Engineer on Record, Construction Engineer on Record (except for small developments).

Record of Construction Progress

(a) Stages for recording progress certificate and checking:- (except for small developments Viz. G+2 Buildings)
i) Plinth
ii) Middle storey.
iii) 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. 6 to 8) This progress certificate shall be signed by the Construction Engineer on Record. The construction shall be continued only after the competent authority issues construction continuance certificate.

(c) Completion Report (except for small developments Viz. G+2 Buildings)

i) It shall be incumbent on every applicant whose plans have been approved, to submit a completion report in Form No.9.

ii) It shall also be incumbent on every person / agency who is engaged under these rules to supervise the erection or re-erection of the building, to submit the completion report in Form No.10 and 11 prescribed under these rules.

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

(d) 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.

Issue of Occupancy Certificate (except for small developments Viz. G+2 Buildings)
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 Fire Department for completion of fire requirements as applicable for multi-storyed and buildings of public assembly 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 approved plan (Such as Parking, Internal Roads, Height of the Building, Infrastructure facilities, lift and fire safety measures), the competent authority may issue occupancy certificate for such one detached or semi detached building / buildings in a building unit.

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.

MAINTENANCE OF BUILDINGS

In case of multi-storeyed buildings and buildings for public assembly older than fifty years, it shall be the duty of the owner of a building, 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.14) shall be produced by the Owner to the Competent Authority. If any action, for ensuring the structural safety and stability of the building is to be taken, as recommended by SER, it shall be completed within five years. For other buildings less than fifty years old, the owner shall get his building inspected after the age of building has crossed fifty years. The procedure shall be followed as per above rule.

PROTECTIVE MEASURES IN NATURAL HAZARD PRONE AREAS

In natural hazard prone areas identified under the land use zoning regulations, structures buildings and installations which cannot be avoided, protective measures for such construction/ development should be properly safeguarded based on the suggestion given in Appendix A.

REGISTRATION OF PROFESSIONALS

Registration, Qualifications and Duties of Professionals shall be as given in the appendix D

APPOINTMENT OF PROFESSIONALS

The Owner/Developer shall appoint Architect on Record (AR), Engineer on Record (ER), Structural Engineer on Record (SER),Structural Design Agency on Record (SDAR), Geo technical Engineer on Record(GER), Construction Engineer on Record (CER), (CMAR), and Quality Auditor on Record (QAR) and Quality Audit Agency on Record (QAAR) as required. A proper written agreement(s), in a standard format(s), should be entered upon with such professional(s) engaged.

CHANGE IN OWNER / DEVELOPER / PROFESSIONALS

If during the construction of the building the Owner / Developer / Architect on Record (AR) / Engineer on Record (ER) / Structural Engineer on Record (SER) / Structural Design Agency on Record (SDAR) / Geo technical Engineer on Record(GER) / Construction Engineer on Record (CER) / (CMAR) and Quality Auditor on Record (QAR) and Quality Audit Agency on Record (QAAR) is changed he shall intimate the competent authority by a registered letter that he was no longer responsible for the project and the construction shall have to be suspended until the new Owner / Developer / Architect on Record (AR) etc., undertakes the full responsibility for the project as prescribed in these rules and also in the forms.

A new Owner / Developer / Architect on Record (AR) / Engineer on Record (ER) / Structural Engineer on Record (SER) / Structural Design Agency on Record (SDAR) / Geo technical Engineer on Record(GER) / Construction Engineer on Record (CER) / (CMAR) and Quality Auditor on Record (QAR) and Quality Audit Agency on Record (QAAR) shall inform the change to the competent authority and before taking responsibility as stated above, check the work already executed is in accordance with the permission granted by the competent authority. He / She may go ahead with the remaining works only after obtaining permission with competent authority.

SAVINGS:

The above provisions contained in this appendix shall not apply to the constructions in progress (as per the valid Local Body approved plan), on the date of coming into force of these amended rule provisions (i.e----- day,-----month----year) and the exemption is applicable till the expiry of the Building Permit/ renewal period for the above such constructions in progress. It shall also not apply in cases of buildings constructed already as per the approved plan and completion certificate /occupancy certificate is awaited from the Local Body.

REGISTRATION, QUALIFICATIONS AND DUTIES OF PROFESSIONALS

REGISTRATION OF PROFESSIONALS

The Commissioner shall register Architects (RA), Engineers (RE), Structural Engineers (RSE), Structural Design Agencies (RSDA), Construction Engineers (RCE), Construction Management Agency (RCMA), Quality Auditors (RQA) and Quality Audit Agencies (RQAA), Developers (RD).

Application for registration shall be submitted by these professionals to the competent authority.

Registration shall be valid for a period of three years and shall be renewable.

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.

This registration shall be renewed every three years.

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

Grade-I

Scope of work: To prepare structural design and structural drawings for any type of buildings including multi-storied buildings, Educational Institutes, Hospitals, Public buildings, Special structures, Lifeline Buildings and the likes.

Eligibility: (i) 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

OR

(ii) M. E. Structures/ 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 a structural designer

(iii) The experience as stated above shall be under a Structural Engineer on Record. (This requirement shall be waived for the first ten years of the promulgation of these Regulations)

Grade-II

Scope of work: To prepare structural design and structural drawings for non-multistoried buildings (i.e. upto 15 mts. in height)

Eligibility: (i) 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

OR

(ii) M. E. Structures/ 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 a structural designer

(iii) The experience as stated above shall be under a Structural Engineer on Record. (This requirement shall be waived for the first five years of the promulgation of these Regulations)

Grade-III

Scope of work: To prepare structural design and structural drawings for small developments (G+2), excluding the above mentioned structures for Grade-I and Grade-II.

Eligibility: i) Diploma in Civil Engineering with 5 years experience in structural design work.

OR

(ii) B. E. Civil or equivalent with minimum 3 years experience (after attaining the degree) in structural design work at a responsible position as a structural engineer

OR

(iii) M. E. Structures/ Earthquake Engineering or Ph.D. in Structural Engineering with minimum 1 years of experience (after attaining the degree) in structural design work at a responsible position as a structural engineer

(iv) The experience as stated above shall be under a Structural Engineer on Record. (This requirement shall be waived for the first three years of the promulgation of these Regulations)

REGISTERED CONSTRUCTION ENGINEER (RCE)

(A) The requirements for registration shall be:

(i) B.E. Civil or equivalent with five years experience in construction

OR

(ii) Diploma in Civil Engineering with seven years experience in construction

(iii) B.Arch or its equivalent with five years of experience in construction.

(iv) 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.

(B) The registration shall be renewed every three years

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

REGISTERED CONSTRUCTION MANAGEMENT AGENCY / FIRM (RCMA)

(A) The requirement for registration shall be
(i) Owner of a proprietary firm shall be an RCE
(ii) Fifty per cent partners of a partnership firm shall be RCE
(iii) A designated officer of a limited company shall be RCE

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

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

REGISTERED QUALITY AUDITOR (RQA)

(A) The requirements for registration shall be :

(i) B.E. Civil or equivalent with five years experience in testing of building materials including concrete and/or experience in quality control work with a reputed construction agency.

(ii) M.E. (Civil) or equivalent with two years experience as above.

(iii) B. Arch or equivalent with 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 in 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.

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

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

REGISTERED QUALITY AUDIT AGENCY (RQAA)

(A) The requirements for registration shall be:

(i) Owner of a proprietary firma 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.

REGISTERED GEO-TECHNICAL AGENCY (RGA)

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

(A) The requirements for registration shall be:

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

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

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

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

(v) The agency has a Registered Laboratory.

Any individual possessing qualifications as in (i) and hiring services of either GAR 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.

REGISTERED ARCHITECT (RA)

Qualification and Experience:-

The person/ firm/company acting as Architect shall be registered with Council of Architecture and shall be bind with the terms & conditions as prescribed under the professional rules by the Council of Architecture to render professional services.

APPOINTMENT OF PROFESSIONALS

The Owner / Developer shall appoint the following professionals, out of the registered professionals described in 1.1 RA above for every project as required.

- Architect on Record (AR) (for MSB and non-MSB excluding for small developments)
- Structural Engineer on Record (SER) (for MSB and non-MSB excluding for small developments)
- Structural Design Agency on Record (SDAR) (for MSB and non-MSB excluding for small developments)
- Geo-technical Engineer on Record (GER) (for MSB and non-MSB excluding for small developments)
- Construction Engineer on Record (CER) (for MSB and non-MSB excluding for small developments)
- Construction Management Agency on Record (CMAR) (for MSB and non-MSB excluding for small developments)
- Quality Auditor on Record (QAR) (for MSB developments)
- Quality Audit Agency on Record (QAAR) (for MSB developments)

The Owner / Developer shall submit a list of the appointed professionals on Record with the application for Development Permission to the competent authorities. (Consent/undertaking from these professionals needed in the required format at the time of seeking Development Permission)

In case the Owner / Developer change any of the professional on Record intimation to that effect shall be sent to the competent authorities, along with a no-objection certificate from the professional who is being changed.

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 and Architect on Record shall be responsible for adhering to the provisions of the relevant and prevailing 'Indian Standard Specifications'. They will not be held responsible for the severe damage or collapse that may occur under the natural forces going beyond the design forces provided in the above 'Indian Standard Specifications'

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

(i) the SER / SDAR is agreeable to accept the assignment to prepare designs, drawings and specifications.
(ii) the designs shall be carried out according to relevant national codes and specifications and good engineering practice.
(iii) 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 multistoreyed buildings and Special Structures, SER/ SDAR shall

(i) prepare Preliminary Design of the structure in addition to the Report indicated in A (iii) above.
(ii) 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.
(iii) 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.

(D) a) To prepare a report of the structural design.

b) 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.

c) 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.

d) To supply two copies of structural drawings to the supervisor.

e) To advise the Owner/Architect/Engineer for arranging for tests and their reports for soil, building material etc. for his evaluation and design consideration.

f) To prepare the revised calculations & drawings in case of any revision with reference to the earlier submission of drawings & design in a particular case.

g) 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.

CONSTRUCTION ENGINEER ON RECORD (CER)/ OR CONSTRUCTION MANAGEMENT AGENCY ON RECORD (CMAR)

All construction work shall be carried out under the supervision of a CER or CMAR.

Duties and Responsibilities (for non-MS Buildings):

a) To adhere strictly to the structural drawings, specifications and written instructions of the Structural Engineer on Record and Architect on Record / Engineer on Record

b) To follow the provisions of N.B.C. or I.S. specifications as regards materials, components, quality control and the process of construction.

c) To provide for safety of workers and others during excavation, construction and erection.

d) To provide safe and adequate temporary structure required for construction and erection.

e) 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.

f) 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.

g) He/she shall be in overall charge of the site and responsible for overall supervision of the work.

h) 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.

i) He/she shall take adequate measures to ensure that no damage is caused to the work under construction and adjoining properties.

j) He/she shall also ensure that no undue inconvenience is caused in the course of his/her work to the people in the neighborhood.

k) 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.

Duties and Responsibilities (for multi-storied buildings):

(A) i. 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.

(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.

QUALITY AUDITOR ON RECORD (QAR)/QUALITY AUDIT AGENCY ON RECORD (QAAR)

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

(A) At the time of seeking permission from competent authority for starting construction of a multi-storied building of special structures CER/CMAR shall submit an undertaking form QAR/QAAR that:

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

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

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

(C) Upon completion of the construction of multi-storied building or the special structure the QAR/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 CER/CMAR and the owner/developer for final submission to the competent authority.

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

GEO-TECHNICAL AGENCY ON RECORD (GAR):

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

Duties and Responsibilities:

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

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

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

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

DEVELOPER

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 registered CER as site supervisor.

5. To obtain and adhere to the quality assurance procedure prepared by the registered site supervisor.

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 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 /Site Supervisor 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 isrequired 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.

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.

Appendix

FORM NO 1
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/City

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.

3. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

Signature of Owner with date _____
Name in Block Letters _____
Address_____

Structural Engineer on Record with date

Name in Block Letters
_____
Address_____
_____

Signature of Developer with date _____

Name in Block Letters _____

Address_____
_____

Signature of the Architect on Record /Engineer on Record with date_____

Name in Block Letters
_____

Address_____
_____

FORM NO. 2

CERTIFICATE OF UNDERTAKING OF ARCHITECT ON RECORD/ ENGINEER ON RECORD

To

Ref : Proposal work of _____
(Title of the project)
C.S.No.R.S.No./F.P.No. _____ Inward No. _____at
Village _____ Taluka_____
Scheme No. _____ of _____
(Village/Town/City)
For_____
(Name of Owner /Developer/Builder)
Address: _____
Tel.No.:_____

1. I am a member of Council of Architects/Institution of Engineers (India) and I am possessing current registration to act as registered Architect/Engineer.

2. 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.

3. 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 contractor and electrical contractor shall be made at the appropriate stage by the owner before the relevant work commences.

4. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

Signature : _____

Reg. No. _____ Date :

Name : _____

Address : _____

Tel. No. : _____

FORM NO. 3

CERTIFICATE OF UNDERTAKING OF STRUCTURAL ENGINEER ON RECORD (SER)

To

Ref : Proposed work of _____
(Title of the project)
C.S.No./R.S.No./F.P.No. _____ Inward No. _____
at Village _____ Taluka _____
Scheme No. _____ of _____
(Village/Town/City)
Owner:_____
Address:_____
Tel. No.: _____

1. 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.

2. I have prepared and signed a structural design basis report (SDBR).

3. 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.

4. I undertake to supply the owner and the supervisor the detailed structural drawings.

5. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

Signature : _____

Reg. No. _____ Date : _____

Name : _____

Address : _____

_____

Tel. No. : _____

FORM NO.4

CERTIFICATE OF UNDERTAKING OF THE CONSTRUCTION ENGINEER ON RECORD

To

Ref : Proposed work of .....
(Title of the work)
C.S..NO. /R.S.NO. /F.P.NO.....in word..... at village..... Taluka.....
Scheme NO.....at.....
Owner :
Address :
Tele. No.....

1. I possess a current Registration to act as Registered Construction Engineer.

2. 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.

3. 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.

4. I undertake not to supervise more than ten works at a given time as provided in Building Rules.

5. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

Signature:

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

Name.....

Address.....

Tele.No.....

FORM NO. 5

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 1	General Data		
S.No.	Description	Information	Notes
1.	Address of the buiding • 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 stories above ground level (including stories 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 C1.6.3.5.2 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 to Fire Tender ♥ • 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 – approx.		IS:1893 C1.7.6
19	Design horizontal acceleration spectrum value (A_h)		IS: 1893 C1.6.4.2
20	♠ Expansion/Separation Joints		

♥ Enclose small scale plans of each floor on A_4 sheets
♦ In case terrace garden is provided, indicate additional fill load and live load
♠ Indicate on a small scale plan on A_4 sheets.

Part 2	Load bearing masonry buildings		
Sl.No.	Description	Information	Notes
1	Building category		IS: 4326 C1.7 Read with IS:1893 Zone / Bldg. | 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 C1.8.1.2
6	Re: size and position of openings (See note No.1) • Minimum distance (b5) • Ratio $(b_1+b_2+b_3)/l_1$ or $(b_6+b_7)/l_2$ • Minimum pier width between consequent opening (b_4) • Vertical distance (h_3) • Ratio of wall height to thickness4 • Ratio of wall length between cross wall to thickness		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	P IP NA □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	(see note No.2) IS:4326 C1 8.4.6 IS: 4326 C1 8.3 IS: 4326 C1 8.4.2 IS: 4326 C1 8.4.3

	• at top of gable walls • at top of ridge walls	□ □ □ □ □ □	IS: 4326 C1 8.4.3 IS: 4326 C1 8.4.4

8	Vertical reinforcing bar • at corners and T junction of walls • at jambs of doors and window openings	□ □ □ □ □ □	IS: 4326 C1 8.4.8. IS: 4326 C1 8.4.9
9	Integration of prefab roofing/flooring elements through reinforced concrete screed.	□ □ □	IS:4326 C1 9.1.4
10	Horizontal bracings in pitched truss • in horizontal plane at the level of ties • in the slopes of pitches roofs	□ □ □ □ □ □	

Notes

1. Information in Item 6 should be given on separate A4 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

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 C1 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 C1 7.12.1
8	Grades if concrete used in different parts of building		
9	Method of analysis used		
10	Computer software used		
11	Torsion included		IS: 1893 C1 7.9
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: 13920 Cl.7.1.2 IS: 456 Cl.26.5.1(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 Foundation

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

Part 4	Buildings in structural steel		
1	Adopted method of design	o Simple o Semi-rigid o Rigid	IS: 800 Cl 3.4.4 IS:800 Cl.3.4.5 IS: 800 Cl.3.5.6
2	Design based on	o Elastic analysis o Plastic analysis	IS: 800 Section-9 SP;6 (6)
3	Floor construction	o Composite o Non composite o Boarded	
4	Roof construction	o Composite o Non composite o Metal o Any other	
5	Horizontal force resisting system adopted	o Frames o Braced frames o Frames & shear walls	Note: Seismic force As per IS: 1893 Would depend on system
6	Slendemess ratios maintained	Members defined in Table 3.1, IS:800	IS 800; Cl.3.7
7	Member deflection limited to	Beams, Rafters Crane Griders Purlins Top of columns	IS:800 Cl.3.13
8	Structural members	o Encased in concrete o Not encased	IS: 800 Section-10
9	Proposed material	o General weld-able o High strength o Cold formed o Tubular	IS:2062 IS:8500 IS:801, 811 IS: 806
10.	Minimum metal thickness Specified for corrosion protection	o Hot rolled sections o Cold formed sections o 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 ○ CT Bolts ○ S H F G Bolts ○ Black Bolts ○ Welding field Shop (Specify welding type proposed) ○ Composite	IS:800, Section-8 IS:1929, 2155, 1149 IS 6639, 1367 IS 3757, 4000 IS: 1363, 1367 IS:816, 814,1395, 7280, 3613, 6419, 6560, 813, 9595
12	Minimum Fire rating proposed, with method	○ Rating……hours ○ Method proposed. -In tumescent painting -Spraying -Quilting -Fire retardant boarding	IS: 1641, 1642, 1643

FORM NO 6

PROGRESS CERTIFICATE

Plinth Stage/In case of basement casting of basement slab

Reference No.

Owner's Name: Location:

Submitted on: Received on:

The Executive 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: _____
letters_____

Name in block

Address:_____

_____
_____

Address _____
_____
_____

FORM NO. 7

PROGRESS CERTIFICATE - MIDDLE STOREY

Reference No.

Owner's Name: Location:
Submitted on: Received on:

The Executive Authority

Sir,

1. 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.

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

3. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

Yours faithfully,

Signature of the
Construction Engineer on Record

Date:_____
Name in block letters: _____
Address: _____

Signature of the
Owner/ Developer/ Builder

Date: _____
Name in block letters_____
Address_____

FORM NO. 8

PROGRESS CERTIFICATE - LAST STOREY

Reference No.

Owner's Name: Location:
Submitted on: Received on:

The Executive Authority

Sir,

1. 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.

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

3. I also undertake to comply with the rule No.14 in Appendix B regarding the change in Owner/Surveyor/Professionals.

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

COMPLETION REPORT

Reference No.

Owner's Name: Location:
Submitted on: Received on:

The Executive Authority,

Sir,

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

2. We declare that the work is executed as per the approved plan/permission granted 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.

3. We hereby declare that the plan as per the building erected has been submitted and approved.

4. We have transferred the area of parking space provided as per approved plan to an individual/association before for occupancy certificate.

5.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. 10

BUILDING COMPLETION CERTIFICATE BY ARCHITECT ON RECORD

Reference No.

Owner's Name : Location :
Submitted on : Received on :

The Executive 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.

3. Construction has been done under our supervision / guidance and adheres to the drawings submitted.

Signature of the Owner
Date

Signature of Architect on Record
Date

Name in block letter:

Address : _____

Name in block letters:

Address: _____

FORM NO. 11

BUILDING COMPLETION CERTIFICATE BY CONSTRUCTION ENGINEER ON RECORD

Reference No.

Owner's Name : Location :
Submitted on : Received on :

The Executive 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
   - the detailed structural drawings and structural specifications prepared by the Structural Engineer on Record
   - the detailed Architectural drawings and Architectural specifications prepared by the Architect on Record.
   - detailed drawings and specifications of all services

3. All materials used in the construction have been tested as provided in specifications and a record of test reports has been kept.

Signature of the Owner

Date

Name in block letter:
Address : _____

Signature of Construction Engineer on Record

Date

Name in block letters:
Address: _____

FORM NO. 12

BUILDING COMPLETION CERTIFICATE STRUCTURAL ENGINEER ON RECORD

Reference No.

Owner's Name : Location :
Submitted on : Received on :

The Executive Authority

Sir,

This is to certify that detailed structural drawings of the buildings/s 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.

Signature of the Owner

Date

Name in block letters:

Address: _____

Signature of Structural Engineer on Record

Date

Name in block letters:

Address: _____

FORM NO. 13

MODEL PROFORMA FOR TECHNICAL AUDIT REPORT

1. Design

		COMMENTS
1.1	Design/Drawings available?	Y/N
	Design category	Y/N
	Type design?	Design to be collected to refer to Design Consultant/H.O.
	Specific design ?	
	Drawings prepared/checked by competent Authority?	Y/N
	Design Drawings/details	
	Structural detailed included	Y/N
	Earthquake/cyclone resistant features included?	Y/N
	Design verified/vetted by Dept./Govt. approved agency/competent authority?	Y/N
	Design changes approved by dept./govt. approved agency/competent authority?	Y/N
2	Foundation	
2.1	Foundation used	Existing/New
2.2.1	If existing foundation used	
2.2.1	Depth of foundation below ground	: <50cm/50-70/>70cm
2.2.2	Type of masonry	: Stone/Bricks/PCC Blocks
2.2.3	Thickness of masonry (above ground)	: 23cm/35/>35
2.2.4	Mortar used	: Cement-Sand/Lime/Mud
2.2.5	Mix of cement mortar	: 1:4/1:6/Leaner
2.2.6	Height up to Plinth	: _____ cm
2.2.7	If stone masonry	
	2.2.7.1 Through Stones	: Yes/No, if Yes Adequate/Inadequate
	2.2.7.2 Corner Stones	: Yes/No, if Yes Adequate/Inadequate
2.3	If new foundation used	
2.3.1	Depth of foundation below ground	: _____ <50/50-70/>70cm
2.3.2	Type of masonry blocks	: stone/bricks/PCC
2.3.3	Thickness of Masonry above plinth	: 23 cm/35/>35cm
2.3.4	Mortar used	: Cement – sand/lime/mud
2.3.5	Mix of cement mortar (1:4)	: Yes/No
2.3.6	Height up to Plinth	: <60/>60cm
2.3.7	If stone masonry	
	2.3.7.1 Through Stones	: Yes/No, if Yes Adequate/Inadequate
	2.3.7.2 Corner Stones	: Yes/No, if Yes Adequate/Inadequate
2.4	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 reinforcement as per drawing	: Yes/No	
5.7.6	Suitable cover	: Yes/No	
5.7.7	Spacing of bars	: Regular/Irregular	
5.7.8	Overlaps as per specifications	: Yes/ No	
5.8	Form Work		
5.8.1	Type of Form Work	: Timber / Plyboard/ Steel	
5.8.2	Use of mould oil	: Yes/No	
5.8.3	Leakage of cement slurry	: Observed/Not observed	
5.9	Source		
5.9.1	Cement		
5.9.2	Sand		
5.9.3	Coarse Agg.		
5.9.4	Bricks		
5.9.5	PCC Blocks		
6	Seismic Resistance Features		
6.1	Masonry Structures		
6.1.1	Provision of bands at		
	Provided Adequate		
	6.1.1.1 Plinth level	Yes/No	Yes/No
	6.1.1.2 Sill level	Yes/No	Yes/No
	6.1.1.3 Lintel level	Yes/No	Yes/No
	6.1.1.4 Roof level (if applicable)	Yes/No	Yes/No
6.1.2	If sloped roof, whether seismic bands are provide at		
	6.1.2.1 Gable wall top	Yes/No	Yes/No
	6.1.2.2 Eaves level	Yes/No	Yes/No
6.1.3	Provision of vertical steel in masonry at		
	Provided Adequate		
	6.1.3.1 Each corner	Yes/No	Yes/No
	6.1.3.2 Each T-junction	Yes/No	Yes/No
	6.1.3.3 Each door joint	Yes/No	Yes/No
	6.1.3.4 Around each window	Yes/No	Yes/No
6.1.4	Openings		
	6.1.4.1 Total width of openings : <50%/50*-60%/>60% (*-42% for double storey)		
	6.1.4.2 Clearance from corner	OK/Not OK	
	6.1.4.3 Pier width between two openings	OK/Not OK	
6.2	Framed structures		
	6.2.1 Ductile detailing		
	6.2.1.1 Spacing of stirrup	OK/Not OK	
	6.2.1.2 Sizes of members	OK/Not OK	
	6.2.1.3 End anchorage	OK/Not OK	
	6.2.1.4 Lapping (length, location, etc.)	OK/Not OK	
	6.2.1.5 Angle of stirrup hook	90/135 degrees	

6.3	Any testing carried out by owner/Engineering 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

FORM NO. 14

STRUCTURAL INSPECTION REPORT

(This form has to be completed by registered Structural Designer after his site Inspection and verification regarding compliance of all recommendation by the owner, which in the opinion of the registered structural designer are necessary for safety of the structure)

1. Description by title and location of the property including T.P.No., F.P.No. etc.:

II. Name of the present owner:

III. Description of the structure:
Class I or Class II (Briefly describe the property in general and the structure in particular)

(a) Function	(b) Framed construction							
	Residence (with or without shops	Apart-ments (with or without shops	Office Bldg.	Shopping Centre	School, College	Hostel	Auditoria	Factory
	1	2	3	4	S	6	7	8
A. Load bearing masonry wall construction								
B. Framed structure								
Construction and structural materials	Critical load bearing element	Brick	RCC	Stone	Timber	Steel		
	Roof Floor	RCC	Timber	RBC	Steel	Jack-arch		

IV. Year of construction
Year of subsequent additions or rectification's (Please describe briefly the nature of additions or rectification's).

V. Date of last inspection report filed: Last filed by whom (This does not apply to the first report).

VI. Soil on which building is founded
i) Any change subsequent to construction
ii) Nearby open excavation
iii) Nearby collection of water
iv) proximity of drain
v) underground water-tank
vi) RW. Pipes out-lets
vii) Settlements

VII. The Super-structure (R.C.C. Frame structure)
i) Crack in beam or column nature and extent of crack probable causes.
ii) Cover spell
iii) Exposure of reinforcement
iv) subsequent damage by user for taking pipes, : conduits, hanging, fans or any other fixtures, etc.
vi) Crack in slab

vii) Spalling of concrete or plaster of slab
viii) Corrosion of reinforcement
ix) Loads in excess of design loads

VIII The Super-Structure (Steel Structure)
i) Paintings
ii) Corrosion
iii) Joint, nuts, bolts, rivets, welds, gusset plates
iv) Bending or buckling of members
v) Base plate connections with columns or pedestals
vi) Loading

IX. The Super-Structure (Load bearing masonry structure) Cracks in masonary walls)
(Please describe some of the major cracks, their nature, extent and location, with a sketch, if necessary.

X. Recommendations if any

This is to certify that the above is a correct representation of facts as given to me by the owner and as determined by me after Site Inspection to the best of my ability and judgment.

The recommendations made by me to ensure adequate safety of the structure are compiled with by the owner to my entire satisfaction.

(Signature of the Registered Structural Engineer

Date:

Name of the registered structural Engineer:

Registration No. Address:

The following are the City Specific issues to be incorporated in the bye laws as suggested by the members

1. Retrofitting should be made optional for owner until if any extension and expansion of their building.
2. Any ITI or diploma holder in architecture may be allowed to draw and suprivise buildings up to 6 m height and site extent up to 300 Sq mts.
3. Any structural deviation, not only during the construction, post construction should be prevented by enacting a law by incorporating it in registered sale deed as prior permission should be obtained from the structural engineer who designed the structure and the building welfare society.
4. Basements for building with 1o meters above should be made mandatory with RCC shear walls connecting peripheral columns. Lift wall also should be constructed with RCC shear walls.
5. The building where stilt floors are provided, RCC shear walls should be provided as per IS 1983 2002 and IS 13290 -1990 codes.
6. At the time of submitting proposals for building permission get the approval of structural designs from local Engineering colleges.
7. Quality certificate of structures should be obtained at every stage from sub structures to superstructures
8. After completion of the structures, Builder/ Developer has to get stability certificate from the registered structural engineer.
9. Construction materials shall be tested from sub structures to super structures
10. Technical committee should be constituted with the following members
    a. VMC Engineering officials (not less than EE)
    b. Professionals with structural specialization
    c. Registered Structural Engineers

Shall check all ongoing high rise building construction at lease one a month.

11. Water tanks should be provided over the roof equally because the mass will be distributed equally
12. Column size should be uniform from sub structures to super structures
13. Shear walls should be provided at basement level and stilt floor level
14. Cantilever projections shall not be more than 5 f
15. No permission shall be given for construction in the flood prone areas identified by the authority.

City Planner,
Vijayawada Municipal Corporation