भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
BUREAU OF INDIAN STANDARDS
(Ministry of Consumer Affairs, Food & Public Distribution, Govt. of India)

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व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 39 /टी - 8 **04 जून 2024**

तकनीकी समिति : भूकंप इंजीनियरिंग अनुभागीय समिति , सीईडी 39

प्राप्तकर्ता :

1. सिविल अभियांत्रिकी विभाग परिषद, सीईडीसी के सभी सदस्य
2. भूकंप इंजीनियरिंग अनुभागीय समिति, सीईडी 39 के सभी सदस्य
3. सीईडी 39 की उपसमितियों और अन्य कार्यदल के सभी सदस्य
4. रुचि रखने वाले अन्य निकाय।

महोदय/महोदया,

निम्नलिखित मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 39(25407)WC	**संरचनाओं का भूकंप प्रतिरोधी डिज़ाइन और विवरण — रीति संहिता भाग 1 सामान्य प्रावधान का भारतीय मानक मसौदा** (IS 13920 का *दूसरा पुनराभ्यास*) (आईसीएस 91.120.25)

कृपया इस मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजे कि यह मसौदा प्रकाशित हो तो इन पर अमल करने में आपको व्यवसाय अथवा कारोबार में क्या कठिनाइयां आ सकती हैं।

सम्मतियाँ भेजने की अंतिम तिथि: 03 अगस्त 2024

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को ई-मेल द्वारा ced39@bis.gov.in पर या उपरलिखित पते पर, संलग्न फोर्मेट में भेजें। सम्मतियाँ बीआईएस ई-गवर्नेंस पोर्टल, www.manakonline.in के माध्यम से ऑनलाइन भी भेजी जा सकती हैं।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा संबंधी त्रुटि हुई तो उपरोक्त प्रालेख को यथावत अंतिम रूप दे दिया जाएगा। यदि सम्मति तकनीकी प्रकृति की हुई तो विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रालेख को अंतिम रूप दे दिया जाएगा।

यह प्रालेख भारतीय मानक ब्यूरो की वेबसाइट www.bis.gov.in पर भी उपलब्ध हैं।

धन्यवाद।

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ह/-
(द्वैपायन भद्र)
वैज्ञानिक ई एवं प्रमुख
सिविल अभियांत्रिकी विभाग

संलग्न: उपरलिखित

भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
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WIDE CIRCULATION DRAFT

Our Reference: CED 39/T- 8 **04 June 2024**

TECHNICAL COMMITTEE: EARTHQUAKE ENGINEERING SECTIONAL COMMITTEE, CED 39

ADDRESSED TO:

1. All Members of Civil Engineering Division Council, CEDC
2. All Members of Earthquake Engineering Sectional Committee, CED 39
3. All Members of Subcommittees, Panels and Working Groups under CED 39
4. All others interested.

Dear Sir/Madam,

Please find enclosed the following draft:

Doc No.	Title
CED 39(25407)WC	**Draft Indian Standard** **Earthquake Resistant Design and Detailing of Structures — Code of Practice** Part 1 General Provisions (*Second Revision* of IS 13920) ICS 91.120.25

Kindly examine the attached draft and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as National Standard.

Last Date for comments: 03 August 2024

Comments if any, may please be made in the enclosed format and emailed at ced39@bis.gov.in or sent at the above address. Additionally, comments may be sent online through the BIS e-governance portal, www.manakonline.in.

In case no comments are received or comments received are editorial, kindly permit us to presume your approval for the above document as finalized. But, in case of comments, technical in nature are received, then they may be finalized either in consultation with the Chairperson, Sectional Committee, or referred to the Sectional Committee for further necessary action if so desired by the Chairperson, Sectional Committee.

The document is also hosted on the BIS website www.bis.gov.in.

Thanking you,

Yours faithfully,
Sd/-
Dwaipayan Bhadra
Scientist 'E' & Head
Civil Engineering Department

Encl: As above

FORMAT FOR SENDING COMMENTS ON THE DOCUMENT

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/ table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. **Comments through e-mail to ced39@bis.gov.in shall be appreciated**.]

Doc. No.: CED 39(25407)WC

BIS Letter Ref: CED 39/T-8

Title: Draft Indian Standard Earthquake Resistant Design and Detailing of Structures — Code of Practice
Part 1 General Provisions (Second Revision of IS 13920) ICS 91.120.25

Last date of comments: 03 August 2024

Name of the Commentator/ Organization: _____

Sl No.	Clause/ Para/ Table/ Figure No. commented	Type of Comment (General/ Technical/ Editorial)	Comments/ Modified Wordings	Justification of Proposed Change

NOTE- Kindly insert more rows as necessary for each clause/table, etc

BUREAU OF INDIAN STANDARDS

DRAFT STANDARD FOR COMMENTS ONLY

Draft Indian Standard

EARTHQUAKE RESISTANT DESIGN AND DETAILING OF STRUCTURES — CODE OF PRACTICE

PART 1 GENERAL PROVISIONS

(*Second Revision* of IS 13920)

Earthquake Engineering Sectional Committee, CED 39	Last Date for Comments: **03 August 2024**

FOREWORD

[*Formal Clauses will be added later*]

This standard should be read in conjunction with CED 39 (22343), which provides design earthquake hazard and general provisions for earthquake resistant design of all structures. Also, this standard provides clauses for earthquake-resistant design and detailing of Structural Elements (SEs), and Architectural Elements and Utilities (AEUs).

This standard was first published in 1993, and revised in 2016. Again, in 2023, the Committee decided to present the provisions for different types of structures in separate parts, to keep abreast with rapid developments and extensive research carried out in earthquake-resistant design of various structures. Thus, IS 13920 is split into 11 parts, namely:

Part 2: Buildings;
Part 3: Liquid Retaining Tanks (*to be formulated*);
Part 4: Bridges and Retaining Walls (*to be formulated*);
Part 5: Industrial Structures (*to be formulated*);
Part 6: Base Isolated Buildings (*to be formulated*);
Part 7: Pipelines (*to be formulated*);
Part 8: Dams and Embankments (*to be formulated*);
Part 9: Coastal Structures (*to be formulated*);
Part 10: Steel Towers (*to be formulated*); and
Part 11: Tunnels (*to be formulated*).

This standard contains general provisions on earthquake resistant design and detailing applicable to all structures. Additional specifications for earthquake resistant design and detailing applicable covered in Parts 2 to 11 of this standard. And, unless stated otherwise, the provisions in IS 1893 (Parts 2 to 11) shall be read necessarily in conjunction with the general provisions as laid down in CED 39 (22343).

In this second revision, the provisions for design of masonry, reinforced concrete and steel buildings are specified separately.

In this first edition, the following major changes have been included in IS 13920 (Part 2) [CED 39(25408)]:

Section 1: Additional Criteria for All Structures

1) Provisions on buildings have been harmonized from relevant provisions given in IS 4326, IS 1905, SP 7 and IS 16890.

Section 2: Additional Criteria for Masonry Structures

1) Provisions on buildings have been harmonized from IS4326, IS1905, SP 7 and IS16890; and
2) The admissibility of different structural systems in the earthquake zones is clarified.

Section 3: Additional Criteria for Concrete Structures

1) The admissibility of different structural systems in the earthquake zones is clarified; and
2) The structural plan density of the structural walls is varied with the earthquake zone and category of the building.

Section 4: Additional Criteria for Steel Structures

1) New provisions have been prepared for steel buildings; and
2) The structural plan density of the structural walls is varied with the earthquake zone and category of the building.

The units used with the items covered by the symbols shall be consistent throughout this standard, unless specifically noted otherwise.

In the formulation of this standard, effort has been made to coordinate with standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. Assistance has particularly been derived from the following publications:

a) IBC, (2021), *International Building Code*, International Code Council, USA, 2021;
b) ACI 318-19(22), (2022), *Building Code Requirements for Structural Concrete and Commentary*, American Concrete Institute, Chicago, IL, USA;
c) NZS 3101 (Part 1), (2006), *Concrete Structures Standard*, Standards New Zealand, Ministry of Business, Innovation & Employment, Wellington, NZ;
d) EN 1998, (2005), *Eurocode 8: Design of structures for earthquake resistance*, European Committee for Standardization, Brussels;
e) ANSI/AISC 360-16, ‘Specification for Structural Steel Buildings’, an American National Standard, American, Institute of Steel Construction, Chicago, IL, USA, 2016; and
f) ANSI/AISC 341-16, ‘Seismic Provisions for Structural Steel Buildings’, an American National Standard, American Institute of Steel Construction, Chicago, IL, USA, 2016

The composition of the Committee that formulated this standard is given in Annex B.

This standard contributes to the United Nations Sustainable Development Goal 9: ‘Industry, innovation and infrastructure’, particularly its target to develop quality, reliable, sustainable and resilient infrastructure, and also promote inclusive and sustainable industrialization.

For deciding whether a particular requirement of this standard is complied with, the final value observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (*Second*

Revision)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Draft Indian Standard

EARTHQUAKE RESISTANT DESIGN AND DETAILING OF STRUCTURES — CODE OF PRACTICE PART 1 GENERAL PROVISIONS

(*Second Revision* of IS 13920)

Earthquake Engineering Sectional Committee, CED 39	Last Date for Comments: **03 August 2024**

1 SCOPE

1.1 This standard provides requirements for designing and detailing of members, connections, and joints of structures, and of structures thereof, to resist effects of earthquake shaking, so as to impart in them adequate stiffness, strength, and in particular, ductility capacity, to resist severe earthquake shaking without collapse.

1.2 This standard provides specifications for designing and detailing of structural systems and structural members, which are made of different materials, like masonry, concrete and structural steel, to make them capable of resisting the effects of earthquake shaking. These provisions shall be applied over and above those specified in the respective standards for their basic design, namely IS 1905 for masonry structures, IS 456 for concrete structures and IS 800 for steel structures.

1.3 The provisions of this standard are applicable in general for all structures but, for select structures, especially Special Structures and Nuclear Power Plant Structures, additional requirements may be imposed by the associated statutory authorities in India. In such cases, the requirements specified by this standard may be taken preferably as at least the minimum that should be met with.

1.4 This standard provides guidance to:

a) enhance earthquake resistance of members and structures;
b) use of base-isolators and supplemental damping devices, when buildings are designed to sustain limited damage;
c) perform capacity design of structural members and connections, when buildings are designed to sustain damage; and
d) mitigate effects of liquefaction.

1.5 Provisions are included in this standard related to methods of design to protect AEUs. In particular, stringent requirements are imposed on the use of AEUs in Hospitals and other Critical Structures.

1.6 The values of Elastic Force Reduction Factor (*R)* of the building systems made of Masonry, Concrete and Structural Steel provided in Table 3 of CED 39 (22345) are a measure of the relative ductility in these buildings systems. The use of some of these building systems has been restricted in higher earthquake zones. Designers shall choose

the structural systems accordingly in keeping with the provisions of this standard and those in CED 39 (25408).

1.7 Masonry Structures

Section 2 of CED 39 (25408). deals with the selection of materials, special requirements related to design and construction of earthquake resistant masonry buildings, including masonry construction using rectangular masonry units, timber construction and buildings with pre-fabricated flooring/roofing elements.

1.8 Concrete Structures

Section 3 of CED 39 (25408) deals with the selection of materials and special aspects related to design and construction of earthquake resistant concrete buildings.

1.9 Steel Structures

Section 4 of IS CED 39 (25408) deals with the selection of materials and special aspects related to design and construction of earthquake resistant steel buildings.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this standard, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For structures referred to in this standard, the definitions given in CED 39 (22343) and CED 39 (22345) shall apply. In addition, the following additional definitions shall apply to the masonry structures.

3.1 Band — A reinforced concrete or reinforced brick runner provided in the walls to tie them together and to impart horizontal bending strength in them.

3.2 Box System — A bearing wall structure without a space frame, the horizontal forces being resisted by the walls that act as shear walls.

3.3 Grouted Masonry — A form of grouted masonry construction in which certain designated cells of hollow units are continuously filled with grout or a form a masonry in which the space between the wythes is solidly or periodically filled with grout.

3.4 Joint Reinforcement — A prefabricated reinforcement in the form of lattice truss which has been hot dip galvanized after fabrication and is to be laid in the mortar bed joint.

3.5 Structural Wall — A wall designed to resist lateral force in the own plane. Braced frames, subjected primarily to axial stresses, shall be considered as shear walls for the purpose of this definition.

4 SYMBOLS & ABBREVATIONS

The symbols and notations given below apply to the provisions of this standard:

R — *Elastic Force Reduction Factor* used in the design of the structure (as per Table 3 of CED 39 (22345)

Δ — Limiting lateral storey drift in the storey in which the glazing is placed (specified in Table 2), under design lateral earthquake force applied on the structure

Unless otherwise specified, all dimensions are in millimeter (mm*)*, loads in Newton (N), stresses in Mega-Pascal (MPa).

5 EARTHQUAKE RESISTANCE

Structures shall be designed to possess at least the virtues specified in the sub-sections hereunder to resist the effects of earthquake shaking.

5.1 Member Capacity

To resist the expected earthquake shaking at the site of the structure, the members, the joints between members and the connections between members of the structural system shall be so designed that:

a) The stiffness of a member is such that it produces the pre-identified ductile actions within it, and
b) The members are proportioned such that their:
   i) Relative strengths of members meeting at joint ensure that designated members alone sustain inelastic effects;
   ii) Individual strengths associated with brittle actions of each member are such that these brittle modes of failure do not occur before the pre-identified ductile actions are fully realized; and
   iii) Individual strengths associated with pre-identified ductile actions are realized at least up to the levels of deformation ductility demand at the said predetermined locations; and
c) The joints between members and the connections between members remain elastic even when the adjoining members sustain inelastic actions.

5.2 Structure Capacity

The structure (composed of members, joints between members, and connections between members of the structural system, which are designed for the effects induced by the earthquake shaking expected at the site) shall possesses at least:

a) A minimum overall lateral stiffness, to ensure that the overall lateral drift demand on the AEUs appended to the SEs is not too large to damage the AEUs by the relative lateral deformation imposed on them;
b) A guaranteed overall lateral strength to ensure that the lateral displacement ductility demand on the structure is not unduly large; and
c) Sufficient overall lateral deformability to ensure that the lateral displacement demand on the structure is less than the overall lateral deformability.

6 EARTHQUAKE RESISTANT DESIGN

Structures can be designed to resist effects of earthquake shaking with:
a) Low damage in structural elements, or
b) Damage in structural elements.

6.1 Low Damage in Structural Elements

No member of the *lateral load resisting system* shall sustain damage under the effects of design earthquake shaking. Only, specially designed devices placed at select locations shall dissipate the earthquake shaking energy input to the structure.

6.1.1 *Energy Dissipation in Devices*

The following devices shall be permitted, namely::
a) Base Isolators, and
b) Supplemental Damping Devices.

6.1.1.1 *Base Isolators*

Base Isolators shall be designed as per requirements of IS 1893 (Part 6).

6.1.1.2 *Supplemental damping devices*

Specialist literature need to be referred.

6.2 Damage in Structural Elements

The members of the *lateral load resisting system* shall be designed to sustain damage at designed locations, under the effects of design earthquake shaking.

6.2.1 *Capacity Design*

The members identified to sustain damage shall dissipate the earthquake shaking energy input to the structure:

a) At pre-determined locations in them, and
b) Through ductile actions induced in them, without inflicting any damage in the joints and connections.

6.2.1.1 *Relative stiffness-strength between members*

The structural members of the lateral load resisting system meeting at a joint shall be proportioned such that the desired member sustains the inelastic actions. This shall be ensured through the following in members identified to sustain damage:

a) Higher Demand to Capacity Ratio (DCR) of the bending moment, and
b) Relatively lower bending strength.

6.2.1.2 *Relative strength within a member*

When a member is identified to sustain damage during earthquake shaking, the ductile actions in it shall be ensured by:

a) Precluding the brittle modes of failure to not occur before the ductile mode of failure, and

b) Ensuring the ductile mode of failure to be of tension-governing type.

6.2.1.3 *Ductility*

The ductility of a structure shall be enhanced by improving the ductility of materials, sections and members.

The ductility of structures can be improved in many ways, including:

a) *Masonry Structures*:

i) Providing vertical steel reinforcement bars in grouted cavities and horizontal steel reinforcement bars as joint reinforcement in walls and wall piers to resist tension actions, and
ii) Providing vertical and horizontal RC bands in masonry walls to confine the wall and reduce the masonry panel size,

b) *Concrete Structures*:

i) Confining the concrete through closely-spaced closed-loop transverse reinforcement embedded in concrete, and
ii) Choosing sections with larger cross-sectional area for columns,

c) *Steel Structures*:

i) Choosing structural sections with small *b/t* and *d/t* ratios, and
ii) Choosing sections with larger cross-sectional area to reduce axial stress, and small l_e/r ratios to prevent local and member buckling.

6.2.1.4 *Connections*

Connections shall be designed to remain elastic, when the designated members sustain ductile damage at the pre-determined locations.

The ductility can be enhanced by adopting one or more of the following actions:

a) *Masonry Structures*:

i) Providing vertical and horizontal steel reinforcement bars connected to each other in walls and piers to resist tension actions, and
ii) Providing continuous horizontal RC bands and vertical bands connected to the horizontal bands in masonry walls to confine the walls and reduce masonry panel size.

b) *Concrete Structures*:

i) Ensuring sufficient anchorage and development lengths of the longitudinal bars, and
ii) Using mechanical couplers to splice longitudinal bars (and not welding).

c) *Steel Structures*:

i) Reinforcing the connections and joint regions, and

ii) Using HSFG bolts when adopting bolting.

7 GEOTECHNICAL ASPECTS

The ground on which earthquake resistant structures are to be rested shall necessarily be competent to resist the effects of liquefaction and safe from landslides.

7.1 Liquefaction

It shall be ensured that the site has a *Factor of Safety* against earthquake-induced *Liquefaction* of at least 1.4 as per **7.8.4** of CED 39 (22343).

7.1.1 *Measures to Mitigate Effects of Liquefaction at a Site*

The effects of liquefaction at a site shall be mitigated by either:

a) Reducing the demand on vulnerable soil layers, or
b) Increasing the capacity of vulnerable soil layers.

Measures to reduce the demand on soil layers vulnerable to liquefaction include the use of:

a) Stone columns, and
b) Piles.

And, measures to increase the capacity of soil layers vulnerable to liquefaction include the use of:

a) Vibro-compaction,
b) Vibro-replacement, and
c) Surcharge.

7.2 Susceptibility to Landslides

It shall be ensured that the site has a *Factor of Safety* against earthquake-induced *Landslides* as per **7.7(1)(c)** of CED 39 (22343).

7.2.1 *Measures to Mitigate Effects of Landslides at a Site*

A natural hill slope at a certain elevation, which is likely to sustain earthquake-induced landslide, shall preferably not be considered as potential sites for Critical & Lifeline Structures as defined in CED 39 (22343).

For structures sited on hill slopes with earthquake-induced landslide potential, mitigation measures shall be adopted. These measures to mitigate earthquake-induced landslides depend on the type, condition, orientation and strengths of the *geological* and *geotechnical* layers, the angle of the slope of the top stratum, and history of landslides at the site. Competent geotechnical engineers shall be consulted to identify the measures most suitable for the context.

The measures to increase the capacity of soil strata vulnerable to earthquake-induced landslides include the use of:

a) Soil nailing,

b) Retaining Walls,
c) Ground Anchor Walls,
d) Horizontal Drains, and
e) Strengthening with geotextiles.

8 MISCELLANEOUS ITEMS

8.1 Architectural Elements and Utilities (AEUs)

The AEUs shall be protected by the strategies given hereunder.

8.1.1 *Earthquake Protection Strategy*

All AEUs [as classified in **8.1** of CED 39 (22343)] in new or existing structures shall be protected against the effects mentioned in **8.2** of CED 39 (22343). Connection systems shall be adopted to anchor AEUs, such that:

a) The acceleration-sensitive AEUs are held against overturning, sliding or both, and
b) The displacement-sensitive AEUs are released at one of their two ends to offer no restraint to likely relative deformation.

AEUs shall not be secured to infill masonry walls provided in Concrete or Steel Buildings, independent of the protection strategy adopted to secure the AEUs (as specified in **8.1.1.1**, **8.1.1.2** and **8.1.1.3**).

8.1.1.1 *Non-engineered protection*

To secure small, light and loose objects *(*like books, groceries, crockery & cutlery, bottles and items on shelves*)*, which cannot be held individually and connected to the Structural Elements (namely RC slabs, beams, columns and structural walls), the AEUs shall be contained within an enclosure, which is:

a) Latched,
b) Tied back to stay within an enclosure, or
c) Held in a cabinet or a shelf, which itself is protected by securing it to the SEs as per the requirements of this standard.

8.1.1.2 *Pre-engineered protection*

To secure factory manufactured objects (like cup boards rested against walls or completely kept away from them, small bookshelves, refrigerators, wall-mounted objects, table top TVs, computers & laptops on table tops, shelves, outdoor & indoor AC units, filing cabinets, side boards, and electrical wires & plumbing pipes running between floors of structures or across a construction joint in a structure), whose geometry and mass are standardized, the AEUs shall be secured to the SEs for expected earthquake effects by pre-design (including determining the location of the connection on the AEU *side*). The manufacturer shall provide the pre-designed anchors along with the shipment of the AEU; and instructions to fix the anchors at predetermined locations of AEUs. The manufacturers shall foresee all possible on-site conditions before setting prescriptive standards for securing AEUs.

8.1.1.3 *Engineered design protection*

To secure site-assembled one-of-its-kind massive and/or long objects (like cable trays and turbo-generators), whose geometry and mass are not standardized, the AEUs shall be secured with custom-made connection systems to the SEs for earthquake effects *estimated* as per this standard. The anchors required for securing the AEUs at the site of the structure shall be designed and provided at designed locations.

8.1.2 *Design to Protect AEUs*

The earthquake demands on AEUs identified for Pre-Engineered Protection and Engineered Design Protection shall be estimated as per **8.4** of CED 39 (22343).

8.1.3 *Considerations for AEUs in Critical & Lifelines Structures*

AEUs shall be given special attention, if they are part of Critical & Lifelines Structures (especially Hospitals and related structures), which are required to be functional and operational immediately after the earthquake. The following *AEUs* shall be prohibited in such structures:

a) False ceilings hung from soffit of RC roof or floor slabs with anchor fasteners embedded in concrete portion of RC slabs; when false ceilings are required from medical safety point of view, exceptions shall be allowed provided they meet requirements of **8.1.3.1**;
b) Tiles pasted on floors, unreinforced load-bearing masonry walls, unreinforced masonry infill walls, or RC walls. Medically acceptable painting should be employed to meet the functional requirement that the tiles are expected to;
c) Façade made of stone, ceramic, glass, etc.; when glass facades are required from medical safety point of view, exceptions shall be allowed subject to requirements of **8.1.3.2**;
d) Any *AEU* nailed to or supported by the Unreinforced Masonry Infill walls made of any material; and
e) Any duct and piping system part of air-conditioning system shall not be anchored directly to the floor slabs, but shall be held on a secondary framing system, using the provisions of this standard.

8.1.3.1 *False Ceilings*

False ceilings shall be used only sparingly in hospital and critical buildings. When the administration of such structures requires false ceiling to be provided in specific rooms from the point of view of medical safety and functionality, the following shall be ensured:

a) They shall be attached to a secondary system that is not connected to the slab above, but is connected to the beams at those levels, vertical Reinforced Concrete Structural Walls on the side, or a combination of these SEs;
b) No false ceiling shall be anchored to or supported by unreinforced masonry walls; and
c) When false ceilings cannot be supported by the roof (above) or the vertical elements of the structural system (on the side), they shall be supported by an independent system that is supported on the floor slab, but not interfering with the lateral load resisting system.

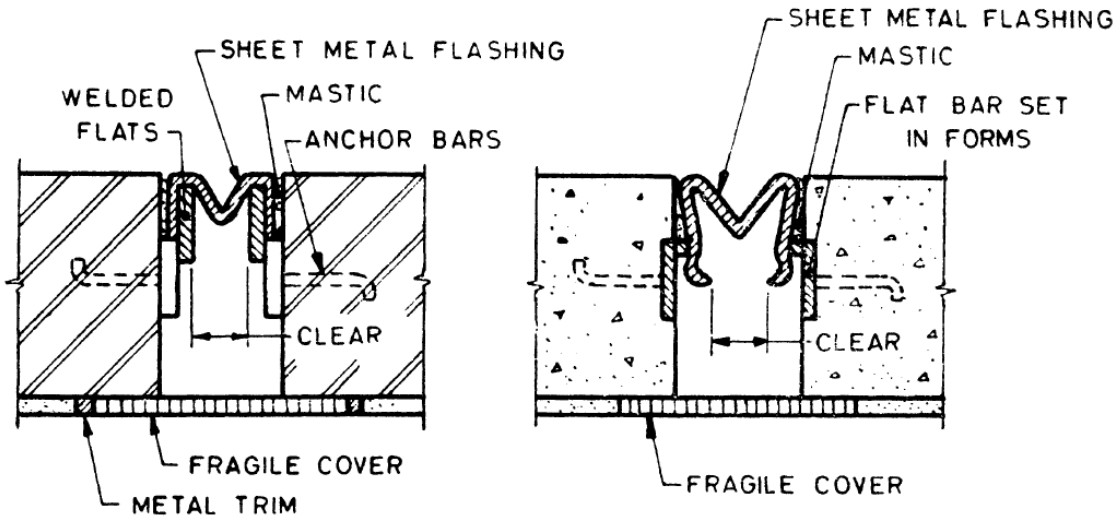
8.1.3.2 *Structural Glazing*

Structural Glazing shall be avoided in hospital buildings. When the hospital administration requires Structural Glazing to be provided at specific locations from the point of view of medical safety and functionality, they shall meet the following requirements:

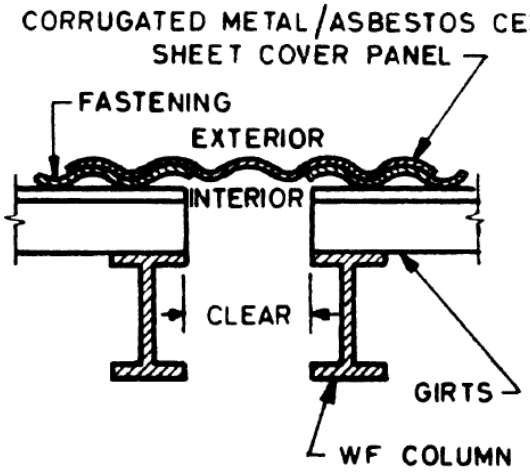
a) The mechanism holding the glazing in place shall have the capacity to sustain in-plane lateral drift $R\Delta$, between the top and bottom edges and between the left and right edges, without damaging the glazing. Here, R is the Elastic Force Reduction Factor used in the design of the structure (as per Table 3 of CED 39 (22345) and Δ is the limiting lateral storey drift in the storey in which the glazing is placed (specified in Table 2), under design lateral earthquake force applied on the structure.
b) The mechanism holding the glazing in place shall have the capacity to sustain out-of-plane vibrations between the top and bottom edges, without damaging the glazing.
c) The mechanism holding in place the structural glazing components, sub-assemblages and systems shall be qualified through Full-scale Experimental Testing under effects of expected strong earthquake shaking.

8.1.4 *Separation of Adjoining Buildings*

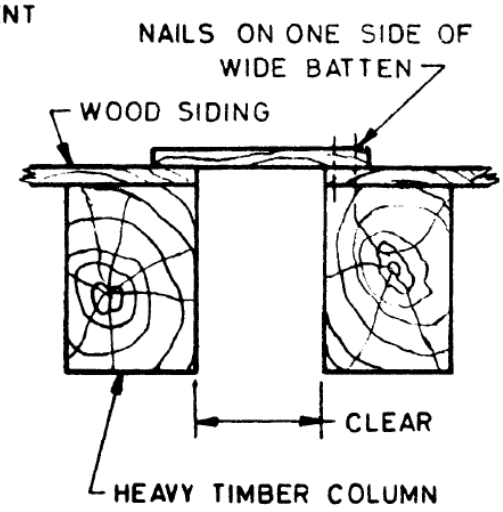
Two parts of a building or two separate buildings shall be separated and shall have devices with typical details of separation and crumple sections as shown in Fig. 1.



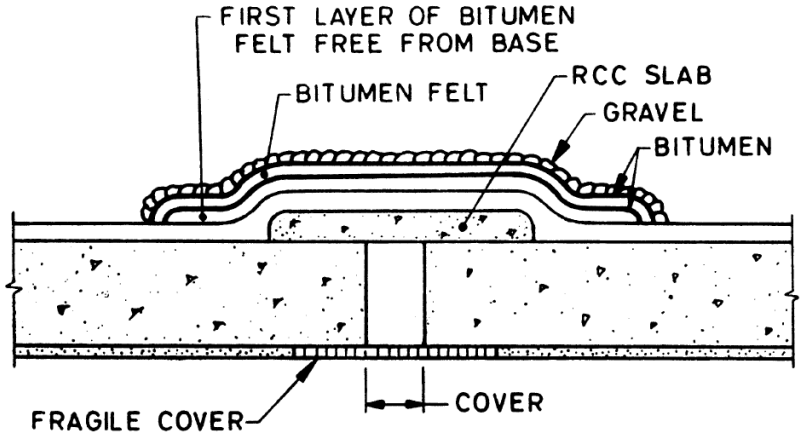
a) BRICK WALLS b) CONCRETE WALLS



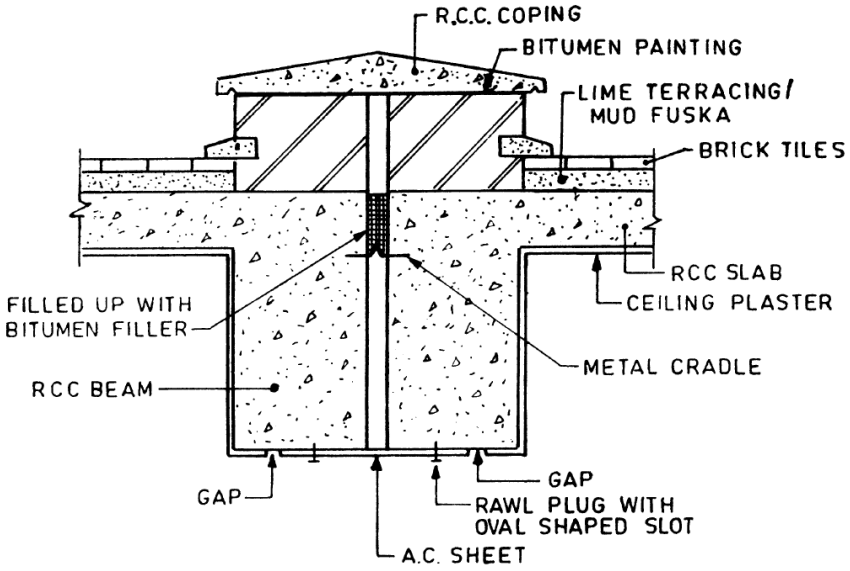
c) METAL SIDING INDUSTRIAL ROOF



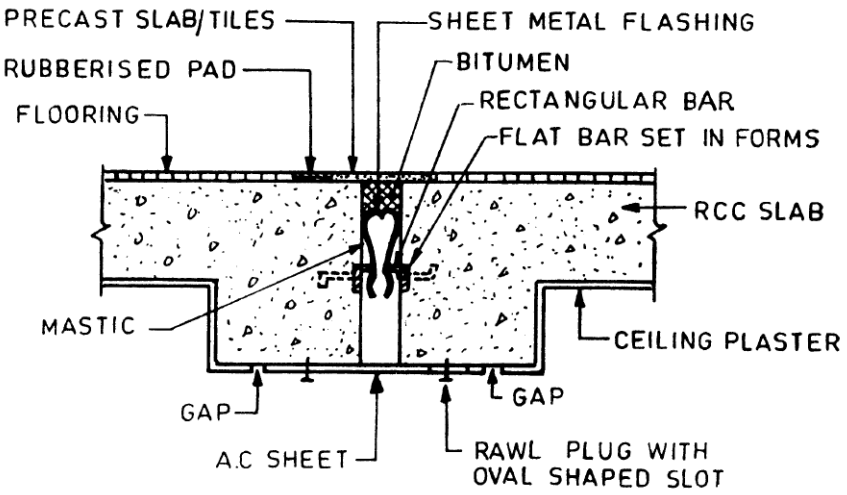
d) WOOD SHETHING INDUSTRIAL ROOF



e) RC SLAB ON ROOF



f) RC SLAB AT ROOF



g) RC SLAB AT FLOOR LEVEL

FIG.1 TYPICAL DETAILS OF SEPARATION DEVICES IN JOINTS

ANNEX A
(*Clause* 2)

LIST OF CROSS REFERRED INDIAN STANDARDS

IS No.	*Title*
IS 456 : 2000	Plain and reinforced concrete — code of practice (*fourth revision*)
IS 800 : 2007	General construction in steel — code of practice (*third revision*)
IS 875	Design loads (other than earthquake) for buildings and structures — code of practice
(Part 1 : 1987)	Dead loads – unit weights of building material and stored materials (*second revision*)
(Part 2 : 1987)	Imposed loads (*second revision*)
(Part 3 : 2015)	Wind loads (*third revision)*
(Part 4 : 2021)	Snow loads (*third revision)*
(Part 5 : 1987)	Special loads and load combinations (*second revision*)
IS 1343 : 2012	Prestressed concrete — code of practice (*second revision*)
IS 1786 : 2008	High strength deformed steel bars and wires for concrete reinforcement — specification (*fourth revision*)
IS 1893 (Part 6) : 2022	Criteria for earthquake resistant design of structures part 6 base isolated buildings
IS 1905 : 1987	Code of practice for structural use of unreinforced masonry (*third revision*)
IS 13827 : 1993	Improving earthquake resistance of earthen buildings — guidelines
IS 13828 : 1993	Improving earthquake resistance of low strength masonry buildings — guidelines
IS 16172 : 2014	Reinforcement couplers for mechanical splices of bars in concrete – specification
CED 39 (25408)	Draft Indian Standard Earthquake-resistant design and detailing of structures (Part 2) Buildings (*second revision of* IS 13920)
CED 39 (22343)	Draft Indian Standard Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions [Seventh Revision of IS 1893 (Part 1)]
CED 39 (22345)	Draft Indian Standard Criteria for earthquake resistant design of structures Part 2 Buildings [Seventh revision of IS 1893 (Part 1)]

ANNEX B
(*Foreword*)

(Committee Composition will be added after finalization)