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END OF PREAMBLE (NOT PART OF THE STANDARD)

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Indian Standard
**CODE OF PRACTICE FOR FIRE SAFETY OF
BUILDING (GENERAL): GENERAL
PRINCIPLES OF FIRE GRADING AND
CLASSIFICATION**

(First Revision)

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BUREAU OF INDIAN STANDARDS

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Indian Standard

**CODE OF PRACTICE FOR FIRE SAFETY OF BUILDING (GENERAL): GENERAL
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0. FOREWORD**0.1**

The Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 2 May 1988, after the draft finalized by the Fire Safety Sectional Committee had been approved by the Civil Engineering Division Council.

0.2

A series of Indian Standards covering fire safety of buildings in general principles of fire grading details of construction, exit requirements and exposure hazards have been formulated. This Indian Standard covers general principles of fire grading and

classification, which has been adopted in various Indian standards in respect to fire safety aspects. This standard was first issued in 1960. Based on considerable research done on field of fire protection in the past 25 years in advanced countries like USA, UK and Canada, the method of classification of building has been revised and covered in this revision. Further the calorific values and list of hazardous materials as existing have been deleted as the same are available in all standard text Books.

Note—The information relating to calorific values and hazardous, materials in detail is covered in Handbook on Fire Protection (*under preparation*).

0.3

For the purpose of deciding whether a particular requirements 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 - 1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1

This code covers the general principles of fire grading of buildings and classification.

2. FIRE LOAD

2.1

Classification—Fire load is the amount of heat in kilocalories which is liberated per square metre of floor area of a compartment by the combustion of the contents of the building and any combustible parts of the building itself. This amount of heat is used as the basis for classification of occupancies.

2.2

The fire load is determined by multiplying the weight of all combustible materials by their calorific values and dividing the figure by the floor area under consideration.

2.3

Different materials having the same weight and same calorific value may present different hazards on account of their other properties, such as ease of ignition, speed of burning, and liberation of heat and fumes. Thus, some materials are more readily ignited than others, again, some burn more rapidly than others, some materials when heated on fire liberate dangerous fumes, and some may readily cause ignition of other materials.

2.4

The content of a building are rarely distributed uniformly over the whole floor area. From the fire protection point, it would be undesirable to have all combustible material concentrated on a fraction of the floor area, as the average taken over the whole area would not give a true representation of the actual conditions, and the resulting effects on the structure immediately surrounding would be out of all proportion to these expected on the basis of average fire load.

3. CLASSIFICATION OF BUILDING BASED ON OCCUPANCY

3.1

General Classification—All buildings should be classified, according to the use or the character of occupancy in one of the following groups :

Group A Residential

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Group B Educational

Group C Institutional

Group D Assembly

Group E Business

Group F Mercantile

Group G Industrial

Group H Storage

Group J Hazardous

3.1.1

Minor occupancy incidental to operations in another type of occupancy should be considered as part of the main occupancy and should be classified under the relevant group for the main occupancy.

Examples of buildings in each group are given in **3.1.1.1** to **3.1.1.9**.

3.1.1.1

Group A residential buildings— These should include any building in which sleeping accommodation is provided for normal residential purposes, with or without cooking or dining or both facilities, except any building classified under Group C.

Buildings and structures under Group A should be further subdivided as follows:

- a. *Subdivision A-1 lodging for rooming houses*—These should include any building or group of buildings under the same management, in which separate sleeping accommodation for total of not more than 15 persons, on transient or permanent basis, with or without dining facilities, but without cooking facilities for individuals, is provided.

A lodging or rooming house should be classified as a dwelling in Subdivision A-2, if no room in any of its private dwelling units is rented to more than three persons.

- b. *Subdivision A-2 one- or two-family private dwelling*—These should include any private dwelling which is occupied by members of a single family and has a total sleeping accommodation for not more than 20 persons.

If rooms in a private dwelling are rented to outsiders, these should be for accommodating not more than three persons per room.

If sleeping accommodation for more than 20 persons is provided in any one residential building, it shall be classified as a building in Subdivision A-3 or A-4 as the case may be.

- c. *Subdivision A-3 dormitories*—These should include any building in which group sleeping accommodation is provided, with or without dining facilities, for persons who are not members of the same family, in one room or a series of closely associated rooms under joint occupancy and single management, for example, school and college dormitories, students' and their hostels, and military barracks.
- d. *Subdivision A-4 apartment houses (flats)*—These should include any building or structure in which living quarters are provided for three or more families, living independently of each other and with independent cooking facilities, for example, apartment houses, mansions and *chawls*.
- e. *Subdivision A-5 hotels*—These should include any building or group of buildings under single management, in which sleeping accommodation with or without dining facilities, is provided for hire to more than 15 persons who are primarily transient, for example, hotels, inns, clubs and motels.

3.1.1.2

Group B educational buildings— These should include any buildings used for school, college or day-care purposes involving assembly for instruction, education or recreation and which is not covered by Group D.

3.1.1.3

Group C institutional buildings— These should include any building or part thereof, which is used for purposes, such as medical or other treatment or care of persons suffering from physical or mental illness, disease or infirmity; care of infants, convalescents or aged persons and for penal or correctional detention in which the liberty of the inmates is restricted. Institutional buildings ordinarily provide sleeping accommodation for the occupants.

Buildings and structures under Group C should be further subdivided as follows:

- a. *Subdivision C-1 hospitals and sanatoria*— This subdivision include any building or a group of buildings under single management, which is used for housing persons suffering from physical limitations because of health or age, for example, hospitals, infirmaries, sanatoria and nursing homes.
- b. *Subdivision C-2 custodial institutions*— This subdivision should include any building or a group of buildings under single management, which is used for the custody and care of persons, such as children convalescents and the aged, for example, homes for the aged and infirm, convalescent homes and orphanages.

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- c. *Subdivision C-3 penal and mental institutions*—This subdivision should include any building or a group of buildings under single management, which is used for housing persons under restraint, or who are detained for penal or corrective purposes, in which the liberty of the inmates is restricted, for example, jails, prisons, mental hospitals, mental sanatoria and reformatories.

3.1.1.4

Group D assembly buildings—These should include any building or part of a building, where groups of people congregate or gather for amusement, recreation, social, religious, patriotic, civil, travel and similar purposes, for example, theatres, motion picture houses, assembly halls, auditoria, exhibition halls, museums, skating rinks, gymnasiums, restaurants, places of worship, dance halls, club rooms, passenger stations and terminals of air, surface and marine public transportation services, recreation piers and stadia, etc.

Buildings under Group D should be further subdivided as follows:

- a. *Subdivision D-1*—This subdivision should include any building primarily meant for theatrical or operatic performance and exhibitions, and which has a raised stage, proscenium curtain, fixed or portable scenery or scenery loft, lights, motion picture booth, mechanical appliances or other theatrical accessories and equipment, and which is provided with fixed seats for over 1 000 persons.
- b. *Subdivision D-2*—This subdivision should include any building primarily meant for use as described for Subdivision D-1, but with fixed seats for less than 1 000 persons.
- c. *Subdivision D-3*—This subdivision should include any building, its lobbies, rooms and other spaces connected thereto, primarily intended for assembly of people, but which has no theatrical stage or theatrical and/or cinematographic accessories, and has accommodation for more than 300 persons, for example, dance halls, night clubs, halls for incidental picture shows, dramatic, theatrical or educational presentation, lectures or other similar purposes, having no theatrical stage except a raised platform and used without permanent seating arrangement; art galleries, museums, lecture halls, libraries, passenger terminals; and buildings used for educational purposes for less than 8 hours per week.
- d. *Subdivision D-4*—This subdivision should include any building primarily intended for use as described in Subdivision D-3; but with accommodation for less than 300 persons.
- e. *Subdivision D-5*—This subdivision should include any building meant for outdoor assembly of people not covered by Subdivisions D-1 to D-4, for example, grandstands, stadia, amusement park structures, reviewing stands and circus tents.

3.1.1.5

Group E business buildings—These should include any building or part of a building which is used for transaction of business (other than, that covered by Group F and parts of buildings covered by 3.1.1) for keeping of accounts and records and similar purposes, professional establishments, service facilities, etc. City halls, town halls, court houses and libraries should be classified in this group so far as the principal function of these is transaction of public business and keeping of books and records.

Business buildings should be further sub-classified as follows:

- a. *Subdivision E-1*—Offices, banks, professional establishments, like offices of architects, engineers, doctors, lawyers, etc.
- b. *Subdivision E-2*—Laboratories, research establishments and test houses.
- c. *Subdivision E-3*—Computer installations.

3.1.1.6

Group F mercantile buildings— These should include any building or part of a building, which is used as shops, stores, market, for display and sale of merchandise, either whole-sale or retail.

Mercantile buildings should be further sub-classified as follows :

- a. *Subdivision F-1*—Shops, stores, markets with area up to 500 m².
- b. *Subdivision F-2*—Underground shopping centres, departmental stores with area more than 500 m².

Storage and service facilities incidental to the sale of merchandise and located in the same building should be included under this group.

3.1.1.7

Group G industrial buildings—These should include any building or part of a building or structure, in which products or materials of all kinds and properties are fabricated, assembled, manufactured or processed, for example, assembly plants, laboratories, dry cleaning plants, power plants, pumping stations, smoke houses, laundries, gas plants, refineries, dairies and mills.

The hazard of occupancy, for the purpose of the Code should be the relative danger of the start and spread of fire, the danger of smoke or gases generated, the danger of explosion or other occurrence potentially endangering the lives and safety of the occupants of the buildings.

Hazard of occupancy should be determined by the authority on the basis of the character of the contents and the processes or operations

- 3 conducted in the building, provided, however, that the combustibility of the building, the flame spread rating of the interior finish or other features of the building or structure are such as to involve a greater than the occupancy hazard, the greater degree of hazard should govern the classification.

Where different degrees of hazard of occupancy exist in different parts of a building, the most hazardous of those should govern the classification for the purpose of this code, except in as far as hazardous areas are segregated or protected as specified in the code.

Buildings under Group G shall be further sub-divided as follows:

- a. *Subdivision G-1*—This subdivision should include any building in which the contents are of such low combustibility and the industrial processes or operations conducted therein are of such a nature that there are no possibilities for any self-propagating fire to occur and the only consequent danger to life and property may arise from panic, fumes or smoke, or fire from some external source.

- b. *Subdivision G-2*—This subdivision should include any building in which the contents or industrial processes of operations conducted therein are liable to give rise to a fire which will burn with extreme rapidity and give off a considerable volume of smoke, but from which neither toxic fumes nor explosions are to be feared in the event of a fire.
- c. *Subdivision G-3*—This subdivision should include any building in which the contents or industrial processes or operations conducted therein are liable to give rise to a fire which will burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of a fire.

3.1.1.8

Group H storage buildings—These should include any building or part of a building, used primarily for the storage or sheltering (including servicing, processing or repairs incidental to storage) of goods wares or merchandise (except) those that involve highly combustible or explosive products or materials), vehicles or animals, for example, warehouses, cold storage, freight depots, transit sheds, storehouses, truck and marine terminals garages, hangars (other than aircraft repair hangars) grain elevators, barns and stables.

Storage properties are characterized by the presence of relatively small number of persons in proportion to the area. Any new use which increases the number of occupants to a figure comparable with other classes of occupancy should change the classification of the building to that of the new use, example, hangars used for assembly purposes, warehouses used for office purposes, garage buildings used or manufacturing.

3.1.1.9

Group J hazardous buildings—These should include any building or part of a building which is used for the storage, handling, manufacture or processing of highly combustible or explosive materials or products are liable to burn with extreme rapidity and/or which may produce poisonous fumes or explosions for storage, handling, manufacturing or processing which involve highly corrosive, toxic or noxious alkalis, acids or other liquids or chemicals producing flame, fumes and explosive poisonous, irritant or corrosive gases; and for the storage, handling or processing of any material corrosive gases; and for the storage, handling or processing of any material producing explosive mixtures of dust which result in the division of matter into fine particles subject to spontaneous ignition. Examples of buildings in this class are those buildings which are used for:

- a. Storage, under pressure of more than 0.1 N/mm² and in quantities exceeding 70 m³ of acetylene, hydrogen, illuminating and natural gases, ammonia, chlorine, phosgene, sulphur dioxide, carbon dioxide, methyloxide and all gases subject to explosion, fume or toxic hazard, cryogenic gases, etc;
- b. Storage and handling of hazardous and highly flammable liquids, rocket propellants, etc;
- c. Storage and handling of hazardous and highly flammable or explosive materials, other than liquids; and
- d. Manufacture of artificial flowers, synthetic leather, ammunition, explosives and fireworks.

3.2

Any building not covered by the above should be classified in the group which most nearly resembles its existing or proposed use,

3.3

Where change in the occupancy of any building places it in a different group or in a different subdivision of the same group, such building should be made to comply with the requirements of the code the new group or its subdivision.

3.4

Where the new occupancy of any building is less hazardous, based on life and fire risk than its existing occupancy, it should not be necessary to conform to the requirements of the code for the new group or its subdivision.

4. FIRE ZONES

4.1

Demarcation—The city or area should, for the purpose of the code, be demarcated into distinct zones, based on fire hazard inherent in

- 4 the buildings and structures according to occupancy (*see 3*), which should be called the 'Fire Zones'.

4.2 Number and Designation of Fire Zones

4.2.1

The number of fire zones in a city or area under the jurisdiction of the authority depends upon the existing layout, types of building construction classification of existing buildings based on occupancy (*see 2*) and the expected future development of the city or area. In large cities or areas, three fire zones may be necessary, while in smaller ones, one or two may be adequate.

4.2.2

The fire zones should be made use of in land use development plan and should be designated as follows:

4.2.2.1

Fire Zone No. 1—This should comprise areas having residential (Group A), educational (Group B), institutional (Group C), assembly (Group D), small business (Subdivision E-1) and retail mercantile (Group F) buildings, or areas which are under development for such occupancies.

4.2.2.2

Fire Zone No. 2— This should comprise business (Subdivisions E-2 and E-3) and industrial buildings (Subdivisions G-1 and G-2) except high hazard industrial buildings (Subdivision G-3) or areas which are under development for such occupancies.

4.2.2.3

Fire Zone No. 3— This should comprise areas having high hazard industrial buildings (Sub-division G-3), storage buildings (Group H) and buildings for hazardous uses (Group J) or areas which are under development for such occupancies.

4.3

Change in the Fire Zone Boundaries— When the boundaries of any fire zone are changed, or when it is intended to include other areas or types of occupancies in any fire zone, it should be done by following the same procedure as far promulgating new rules.

4.4 Overlapping Fire Zones

4.4.1

When any building is so situated that it extends to more than one fire zone, it should be deemed to be in the fire zone in which the major portion of the building or structure is situated.

4.4.2

When any building is so situated that it extends equally to more than one fire zone, it should be deemed to be in the fire zone having more hazardous occupancy buildings.

4.4 Temporary Buildings

4.5.1

Temporary buildings should be permitted only in Fire Zones No. 1 and 2 as the case may be, according to the purpose for which these are to be used, by special permit from the authority for a limited period and subject to such conditions as may be imposed in the permit.

4.5.2

Such buildings should be completely removed on the expiry of the period specified in the permit.

4.6 Restrictions on Type of Construction for New Buildings (see IS : 1642-1988*)

4.6.1

Buildings erected in Fire Zone No. 1 should conform to construction of Type 1, 2, 3 or 4.

4.6.2

Buildings erected in Fire Zone No. 2 should conform to construction of Type 1, 2, or 3.

4.6.3

Buildings erected in Fire Zone No. 3 should conform to construction of Type 1 or 2.

*Code of practice for fire safety of buildings (general): details of construction.