

भारतीय मानक
औद्योगिक भवनों में आग से सुरक्षा की रीति संहिता
(मुद्रण एवं प्रकाशन उद्योग)

Indian Standard

**CODE OF PRACTICE FOR FIRE SAFETY IN
INDUSTRIAL BUILDINGS
(PRINTING AND PUBLISHING INDUSTRY)**

ICS 91.120; 13.220.20

© BIS 1999

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard has been adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Safety Sectional Committee had been approved by the Civil Engineering Division Council.

Printing and Publishing activities have established themselves as an important industry in India. The buildings housing these industries are prone to fire hazards due to the materials in these industries. Different materials used and operations involved pose fire risks due to different reasons. Thus electrically operated machines may cause fires due to sparking, overloading and short-circuiting, while letterpress operation produces ink mist which adheres to walls, ceilings and being a flammable substance, poses a risk of fire. Also, many volatile substances having low flash points are used in different operations such as offsetting, wetting, etc. All raw materials such as paper, ink, solvents and thinners are highly flammable materials.

Considering the high fire proneness of printing and publishing industries and their ubiquitous presence in all sorts of buildings alongside other activities makes it very important that utmost preventive as well as protective fire safety measures are provided for such buildings, housing these industries. This standard has been prepared with a view to give guidance for providing adequate safety against fire hazards in buildings, housing printing and publishing industries.

Provisions of this code are supplementary to the relevant statutory requirements applicable to a particular area and the general guidelines for fire safety covered in relevant Indian Standards on fire safety.

The composition of the technical committee responsible for the formulation of this standard is given at Annex B.

Indian Standard

CODE OF PRACTICE FOR FIRE SAFETY IN INDUSTRIAL BUILDINGS (PRINTING AND PUBLISHING INDUSTRY)

1 SCOPE

This standard lays down the essential requirements for the fire safety of the printing and publishing industry.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provision 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 as given in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 11097 (Part 1) shall apply.

4 APPLICABILITY

4.1 These fire safety requirements should be applicable to all types and sizes of printing industry engaged in either the total process of paper printing or part thereof.

4.2 In this standard only the fire safety requirements involved in printing industry are dealt. Other general safety requirements as given in IS 12619 shall apply.

5 CLASSIFICATION

For the purpose of this standard, the buildings housing these industries should be classified as Group G (moderate hazard occupancy) in accordance with IS 1641.

6 TYPE OF CONSTRUCTION

All buildings of permanent nature should be of Type I Construction having external shell and load bearing elements of 4 hour fire resistance rating; while internal/non-load bearing walls should have 2 hour fire resistance rating. Floors should have same fire resistance as that of external shells as laid down in IS 1642.

7 SOURCES OF FIRE HAZARDS

7.1 Building Housing the Industry

7.1.1 Most of the big printing establishments are housed in buildings having mixed occupancy, thereby posing plural fire risks. Thus, many buildings housing printing press are found to have business and mercantile activities carried on in the same building. Some buildings housing these industries are also partly used as residential, educational or institutional buildings. One building may, thus pose several hazards in addition to printing press hazards. Besides above, the printing and publishing industries themselves usually have a storage godown for storing raw materials, especially paper and ink.

7.1.2 Hence, in cases where fire risks cannot be segregated by fire resistant walls, the strictest fire protection measures for highest risk shall apply to the whole building.

7.2 Machinery

Electrically operated machines are fraught with hazards of sparking, overloading and short-circuiting which may cause major fires.

7.3 Operational Process

7.3.1 Letterpress Operation

This operation produces an ink mist which adheres to walls and ceilings and which, because of its oil content, present a fire hazard.

7.3.2 Offsetting Operation

This operation may require gas fired, oil fired or electric driers to obtain proper paper humidity. Isopropyl alcohol is generally used as wetting agent, which has a flash point of 12°C. Sheet based offset is usually dried by spraying with a cornstarch based powder which has an explosive potential greater than that of coal-dust.

7.3.3 Washing and Cleaning

Printing usually involves frequent washing and cleaning with highly volatile solvents which may include naphtha, toluene and gasoline, all of which are highly flammable.

7.4 Raw Materials

7.4.1 The raw materials used in printing, such as ink, solvents, thinner and paper are all highly flammable or combustible.

7.4.2 In motion through presses and other equipments, the paper may develop static electricity and provide an ignition source.

7.5 Storage of Paper

7.5.1 Indoor storage of roll paper present serious fire hazards. Fire grows rapidly in the flue like spaces formed due to stacking differing diameter rolls on ends in columns. Fire spread can quickly raise temperatures so high that exposed steel may fail structurally. Steel failure may rupture sprinkler piping and deprive roll paper of fire protection at a time of maximum need. Fire spreading up the side of a paper column quickly burns through the outer ply paper which then unwinds and peels away from rolls, thereby increasing the burning surface.

7.5.1.1 Initial fire development and intensity differ only slightly for different papers. Hard, thin and laminated papers burn somewhat faster than soft, thick and coated papers. Difference in types of papers are not important in regard to fire protection in on-end storage, because the extremely high temperatures developed are common to all types of papers.

7.5.1.2 Although rolls stored on side avoid dangerous peeling, a fire in this case, which is well shielded from fire fighting efforts, may involve a larger portion of the storage and become quite intense in the vertical columns created between rolls.

7.5.1.3 Paper is sometimes supported horizontally on racks by rods which run axially through the rolls. Such an arrangement because of the separation between rolls, has the same general fire characteristics as separated vertical stocks.

7.6 Negligence or Prohibited Activity by Workers

7.6.1 Errors in operation or maintenance of machines and improper handling or storage of materials may cause fire.

7.6.2 Surreptitious smoking and such other prohibited activities in risk areas may also cause fires.

7.7 Canteen

7.7.1 One or more staff canteens are very often operated in the printing press building. Hence, the risks generally associated with LPG cylinders constantly remain present in these buildings also.

7.8 Wastes

7.8.1 Every operation generates wastes and fire can flash across such deposits and spread. A large number

of sprinkler heads may open as a result and thus may cause unwarranted water damage.

7.8.2 Any movement of paper may generate static electricity and in such a situation, paper dust may provide an ignition source as well as explosive atmosphere.

8 FIRE SAFETY MEASURES

8.1 General

The usual causes of fires in printing and publishing industries include electrical equipment, static electricity, cutting and welding, lower humidity, surreptitious smoking and bad house keeping. These causes should be given particular attention while deciding about fire safety measures.

8.2 Fire Safety Measures in Buildings

8.2.1 The constructional details, electrical installations and fire protection installations as recommended in relevant Indian Standards shall be provided.

8.2.2 Internal decorations shall be of fire resisting materials, as specified in IS 1642.

8.2.3 The buildings 15 or more in height shall be provided with wet riser system as per IS 3844.

8.2.4 Refuge area, not less than 15 m², shall be provided on external walls as per IS 1642.

8.2.5 All electrical installations shall be done as recommended in IS 1646 and National Electrical code.

8.2.6 Service ducts shall be enclosed by walls and doors, if any, of 2 hours ratings. If the ducts are larger than 1 m² area at the floor then proper sealing should be done.

8.2.7 The airconditioning ducts where provided shall be as per the requirements given in IS 1642.

8.2.8 Flame proof electrical equipments, light fittings, etc, should be provided in the process areas where flammable vapours are present.

8.2.9 Adequate space shall be provided all round the building for fire brigade approach as required under the building byelaws applicable to that area.

8.2.10 Water supplies for fire fighting shall be arranged as per IS 9688. Sprinklers shall be provided in adequate numbers, keeping in view the fact that the sprinklers are best suited and most reliable fire protection measure for majority of fire risks.

8.2.11 All high rise buildings (compared to other surrounding buildings) shall have lighting protection as per IS 2309.

8.2.12 Portable fire extinguishers of appropriate types should be deployed throughout the premises

conforming to the requirements of IS 2190 and periodical inspection and maintenance should also be ensured.

8.2.13 The requirements of wet riser and down comer installations and capacity of water storage tanks and fire pumps should be as given below:

a) Less than 15 m in height

i) Plot area up to 250 m²

| <i>Installations</i> | <i>Minimum requirements</i> |
|--|---|
| Hose reel | To be provided |
| Wet riser | — |
| Down comer | To be provided (for more than one storey) |
| Yard hydrant | — |
| Automatic sprinkler system | — |
| Manually operated electric fire alarm system | To be provided |
| Automatic detection and alarm system | — |
| Underground static water storage tank | — |
| Terrace tank | 5 000 l (for hose reel) |
| Near underground static tank, fire pump with minimum pressure of 0.3 N/mm ² (3 kgf/cm ²) at terrace level | — |
| Pump at terrace level with minimum pressure of 0.3 N/mm ² (3 kgf/cm ²) | 450 l/min (for hose reel) |

ii) Plot area 251 m² to 500 m²

| <i>Installations</i> | <i>Minimum requirements</i> |
|--|--|
| Hose reel | To be provided |
| Wet riser | — |
| Down comer | To be provided (for more than one storey) |
| Yard hydrant | — |
| Automatic sprinkler system | To be provided (in case of basement area is 200 m ² and more) |
| Manually operated electric fire alarm system | To be provided |
| Automatic detection and alarm system | — |
| Underground static water storage tank | 25 000 l |
| Terrace tank | 5 000 l (for hose reel) 15 000 l in case the basement area is 200 m ² and more |

Installations

Near underground static tank, fire pump with minimum pressure 0.3 N/mm² (3 kgf/cm²) at terrace level

Pump at terrace level with minimum pressure of 0.3 N/cm² (3 kgf/cm²)

iii) Plot area 501 m² to 1 000 m²

Installations

| <i>Installations</i> | <i>Minimum requirements</i> |
|--|---|
| Hose reel | To be provided |
| Wet riser | To be provided (for more than one storey) |
| Down comer | To be provided (for more than one storey) |
| Yard hydrant | — |
| Automatic sprinkler system | To be provided (in case of basement area is 200 m ² or more) |
| Manually operated electric fire alarm system | To be provided |
| Automatic detection and alarm system | — |
| Underground static water storage tank | 25 000 l |
| Terrace tank | 5 000 l for hose reel, 15 000 l in case basement area is 200 m ² or more |

Near underground static tank, fire pump with minimum pressure of 0.3 N/mm² (3 kgf/cm²) at terrace level

Pump at terrace level with minimum pressure of 0.3 N/cm² (3 kgf/cm²)

iv) Plot area 1 001 m² and above

Installations

| <i>Installations</i> | <i>Minimum requirements</i> |
|----------------------|---|
| Hose reel | To be provided |
| Wet riser | To be provided (for more than one storey) |
| Down comer | To be provided (for more than one storey) |
| Yard hydrant | To be provided |

Minimum requirements

One electric pump and one diesel pump of capacity

1 620 l/min and one electric pump of capacity 180 l/min

450 l/min (900 l/min in case the basement area is 200 m² and more)

Minimum requirements

To be provided

To be provided (for more than one storey)

To be provided (for more than one storey)

—

To be provided (in case of basement area is 200 m² or more)

To be provided

—

25 000 l

5 000 l for hose reel, 15 000 l in case basement area is 200 m² or more

One electric pump and one diesel pump of capacity

1 620 l/min and one pump of capacity 180 l/m

450 l/min (900 l/min in case the basement area is 200 m² and more)

| <i>Installations</i> | <i>Minimum requirements</i> |
|--|---|
| Automatic sprinkler system | To be provided (in case of basement area is 200 m ² or more) |
| Manually operated electric fire alarm system | To be provided |
| Automatic detection and alarm system | To be provided (depending upon the risk) |
| Underground static water storage tank | 35 000 l (50 000 l if ground floor covered area exceeds 1 000 m ²) |
| Terrace tank | 10 000 l (for hose reel, 30 000 l in case the basement area is 200 m ² or more) |
| Near underground static tank, fire pump with minimum pressure of 0.3 N/mm ² (3 kgf/cm ²) at terrace level | One electric pump and one diesel pump of capacity 1 620 l/min and one electric pump of capacity 180 l/min |
| Pump at terrace level with minimum pressure of 0.3 N/cm ² (3 kgf/cm ²) | 450 l/min (900 l/min in case the basement area is 200 m ² and more) |

b) 15 m and above but not exceeding 18 m

| <i>Installations</i> | <i>Minimum requirements</i> |
|--|--|
| Hose reel | To be provided |
| Wet riser | To be provided |
| Down comer | To be provided |
| Yard hydrant | To be provided |
| Automatic sprinkler system | To be provided |
| Manually operated electric fire alarm system | To be provided |
| Automatic detection and alarm system | To be provided |
| Underground static water storage tank | 100 000 l up to 500 m ² covered area per floor (150 000 l if covered area exceed 500 m ²) |
| Terrace tank | 20 000 l |
| Near underground static tank, fire pump with minimum pressure of 0.3 N/mm ² (3 kgf/cm ²) at terrace level | One electric pump and one diesel pump of capacity 2 850 l/min and one electric pump of capacity 180 l/min |
| Pump at terrace level with minimum pressure of 0.3 N/mm ² (3 kgf/cm ²) | 450 l/min (900 l/min in case the basement area is 200 m ² and more) |

NOTE — Buildings above 18 m in height not to be permitted.

8.2.14 Proper relative humidity should be maintained in all machine operation rooms.

8.3 Fire Safety in Machinery

8.3.1 All machines shall be adequately earthed to dissipate static electricity.

8.3.2 The machine which may produce spark shall have proper guards so as to minimize hazards from sparks.

8.3.3 All machines shall be well maintained, lubricated and regularly cleaned to avoid frictional fires.

8.3.4 Electrical connections to the machines shall be regularly checked, properly insulated and wherever necessary, replaced with new ones.

8.3.5 Cornstarch based powder used for drying sheet-fed offset being explosive, it shall be periodically removed by vacuum cleaning to avoid accumulation and dust collectors (cleaner bags) emptied immediately.

8.3.6 Static eliminators should be provided for the machines, where static electricity is generated.

8.4 Raw Materials and Their Handling

8.4.1 Proper rolls shall be handled carefully to prevent pieces of paper from being torn loose and left hanging. Such loose pieces should be trimmed off or taped tightly to rolls. Waste paper or broken rolls shall not be stored with roll paper.

8.4.2 Vehicles used for transporting the materials shall be kept properly maintained and all refuelling shall be done outside storage area. It will be desirable to provide spark arresters to these vehicles.

8.5 For transporting flammable liquids within the process area, jerry cans with self closing lids should be used.

8.6 Oily wastes should be kept in containers with closed lids.

8.7 Storage

8.7.1 Storage room shall be provided with a well designed automatic sprinkler system. The sprinkler heads, shall conform to IS 9972.

8.7.2 The top of the stored material shall be at least 1 m below sprinkler deflectors to ensure effective water distribution.

8.7.3 Fire access aisles with a width of at least 2.5 m shall be provided with distance between two aisles in one direction not exceeding 15 m.

8.7.4 Absorbent papers such as tissue stock and, to a lesser extent, newsprint, swell when they absorb moisture. There shall, therefore be at least 0.6 m expansion space between storage and building walls.

8.7.5 Paper dust or other combustible deposits shall not be allowed to accumulate on top of rolls or on ceilings, structural members or piping as a fire may flash across such deposits, thereby opening the sprinklers to the full extent depending upon the accumulations.

8.7.6 Good housekeeping shall be strictly observed throughout the storage premises. All drains shall be regularly cleaned to avoid clogging.

8.7.7 Store rooms for valuable baled waste shall be provided with sprinklers.

8.7.8 Good housekeeping shall also be strictly observed in boundries where wastes are frequent. Use of cyclone or suction systems are recommended for removal of wastes.

8.7.9 Location of stores/godowns for printing units, varnish, thinner, flammable liquids and paper/cardboards should be in detached buildings. If it is not

possible, these should be segregated from the adjoining blocks.

8.7.10 Paint mixing area using flammable solvents should be in a detached building. It is not possible, it should be segregated from the adjoining blocks.

8.8 Education of Workers on Fire Safety

Workers shall be educated regarding fire hazards and necessity of observing fire prevention measures. They should also be trained in operation of fire fighting equipments. They shall be given practice in fire drills at suitable intervals.

8.9 Proper fire order shall be framed and enforced. Smoking shall be strictly prohibited in hazardous places. If required, separate smoking booth may be provided for smokers.

8.10 Canteen

Canteen premises should also be provided with suitable fire fighting equipments. It will be preferable to keep the canteen outside the building.

9 PERMISSION OF FIRE AUTHORITY

No printing establishment shall start functioning without clearance from the local fire authority.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

| <i>IS No.</i> | <i>Title</i> | <i>IS No.</i> | <i>Title</i> |
|---------------|--|--------------------------|--|
| 1641 : 1988 | Code of practice for fire safety of buildings (general): General principles of fire grading and classification (<i>first revision</i>) | 3844 : 1989 | Code of practice for provision and maintenance of internal fire hydrants and hose-reel on premises (<i>first revision</i>) |
| 1642 : 1988 | Code of practice for fire safety of buildings (general): Details of construction (<i>first revision</i>) | 9688 : 1992 | Eye surgery instruments — Hooks, strabismus (<i>first revision</i>) |
| 1646 : 1997 | Code of practice for fire safety of buildings (general): Electrical installations (<i>second revision</i>) | 9972 : 1981 | Specification for automatic sprinkler heads |
| 2190 : 1992 | Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers | 11097 (Part 1) : 1984 | Glossary of terms for printing machinery: Part 1 Fundamental terms |
| 2309 : 1989 | Practice for the protection of buildings and allied structures against lightning — Code of practice (<i>second revision</i>) | 12619 : 1989 | Printing industry — Safety code |
| | | SP 30 : 1984 | National Electrical Code |

ANNEX B

(Foreword)

COMMITTEE COMPOSITION

Fire Safety Sectional Committee, CED 36

| <i>Chairman</i> | <i>Representing</i> |
|---|--|
| SHRI J. N. VAKIL | Tariff Advisory Committee, Ahmadabad |
| <i>Members</i> | |
| ASSISTANT SECURITY COMMISSIONER DR A. K. BHALLA DR K. S. UPPAL (<i>Alternate</i>) | Ministry of Railways, New Delhi Ministry of Defence (CEESO), New Delhi |
| CHIEF FIRE OFFICER CHIEF FIRE OFFICER SHRI R. N. CHACHRA SHRI SUNIL DAS (<i>Alternate</i>) | Bhabha Atomic Research Centre, Mumbai Municipal Corporation of Mumbai (Mumbai Fire Brigade) Metallurgical and Engineering Consultants (India) Ltd, Ranchi |
| SHRI S. K. DHERI SHRI R. C. SHARMA (<i>Alternate</i>) SHRI S. M. DESAI | Delhi Fire Service, Government of Delhi, New Delhi In personal capacity (B-4/5 A.G. Khan Road Municipal Officers Society, Worli, Mumbai) Ministry of Home Affairs, New Delhi |
| FIRE ADVISORY DEPUTY FIRE ADVISOR (<i>Alternate</i>) | |
| FIRE OFFICER SHRI P. N. GHOSH SHRI J. S. GAHLAUT SHRI S. C. GUPTA SHRI SANJEEV ANGRA (<i>Alternate</i>) | Central Public Works Department, New Delhi In personal capacity (J-1916, Chittranjan Park, New Delhi-19) State Bank of India, Mumbai Lloyd Insulation (India) Pvt Ltd, New Delhi |
| SHRI M. M. KAPOOR SHRI P. C. SINGHAL (<i>Alternate</i>) SHRI T. R. A. KRISHNAN SHRI P. K. MAJUMDAR (<i>Alternate</i>) | Engineers India Ltd, New Delhi Tariff Advisory Committee, Delhi/Ahmadabad |
| COL KULDEEP SINGH SHRI A. J. PAWAR (<i>Alternate</i>) | Controllerate of Quality Assurance, Pune |
| SHRI A. R. KHAN SHRI NATRAJAN (<i>Alternate</i>) | Bharat Heavy Electricals Ltd, Bhopal/Trichy |
| SHRI G. B. MENON MEMBER (HYDRO-CONSTRUCTION MONITORING) MANAGING DIRECTOR SHRI D. K. SARKAR (<i>Alternate</i>) SHRI V. B. NIKAM | In personal capacity (16, Aniket Society Manjalpur, Vadodara) Central Electricity Authority, New Delhi Loss Prevention Association of India Ltd, Mumbai In personal capacity (4/34, Haji Ali Municipal Officers Cooperative Housing Society, Mumbai) In personal capacity (46, Block E-1, Pocket II, Sector 15, Rohini, Delhi) |
| SHRI P. N. PANCHAL PRESIDENT SECRETARY SHRI D. PADAMHABHA SHRI B. S. VENKATESH (<i>Alternate</i>) | Institution of Fire Engineers (India), New Delhi Tata Consulting Engineers, Mumbai |
| SHRI V. M. RANIKAR SHRI P. MADHUSUNDAVA RAO SHRI D. R. KRISHNA (<i>Alternate</i>) | Ministry of Petroleum and Natural Gas, New Delhi Directorate General Factory Advice Service and Labour Institute, Mumbai |
| DR T. P. SHARMA DR GOPAL KRISHNAN (<i>Alternate</i>) | Central Building Research Institute, Roorkee |
| SHRI R. SUNDARAJAN SHRI S. K. CHATTOPADHYAY (<i>Alternate</i>) | National Thermal Power Corporation Ltd, New Delhi |
| SHRI S. K. SHANGARI LT-COL A. T. PARNAIK | Engineer-in-Chief's Branch, New Delhi |
| SHRI P. K. SUNKARIA SHRI K. C. MATHUR (<i>Alternate</i>) SHRI VINOD KUMAR, Director (Civ Engg) | Department of Industrial Policy & Promotion, Ministry of Industry, New Delhi Director General, BIS (<i>Ex-officio Member</i>) |

Member-Secretary

SHRI S. CHATURVEDI
Joint Director (Civ Engg), BIS