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भारतीय मानक

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(पहला पुनरीक्षण)

Indian Standard

FIRE SAFETY OF INDUSTRIAL BUILDINGS: TEA FACTORIES—CODE OF PRACTICE

(First Revision)

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Price Group 4

FOREWORD

This Indian Standard was 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.

Fires may occur in buildings involving tea manufacturing operations particularly in withering houses, where preliminary drying of houses either by natural or artificial means is carried out. The fire in such houses becomes difficult to control because of combustible hessian spread on tiers of wooden racks and which results in complete gutting of the sheds. Chances of outbreaks of fire in tea factories will be greatly reduced if predetermined safety measures are adopted in the construction of building, installation of machinery, in storage godowns and by providing adequate fire fighting arrangements.

Furthermore, tea factories are located in such areas which may not receive ready support for fire extinguishing purposes from public fire service. Provision of adequate water supply and adequate private protection are important aspects that need consideration from fire safety point of view. This safety code has, therefore, been formulated with a view to give necessary guidance with regard to fire safety aspects of tea-factories which, if followed, would safeguard the factory from fire hazard to a large extent.

This standard was first published in 1968. This revision has been published to conform to the extent possible with the latest requirements of TAC besides general updating.

Provisions of this code are supplimentary to the relevant statutory requirements as laid down in *Indian Factories Act*, 1948, *Petroleum Rules*, 1976, *Gas Cylinder Rules*, 1940, etc.

Indian Standard

FIRE SAFETY OF INDUSTRIAL BUILDINGS: TEA FACTORIES—CODE OF PRACTICE

(First Revision)

1 SCOPE

1.1 This standard covers the requirements with regard to fire safety aspects of tea factories.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Factory Buildings

Buildings in which rolling, fermenting, sorting, packing and drying, and withering of tea are carried out.

3.2 Withering House

Buildings in which preliminary withering of tea leaves either by natural or artifical means is carried out.

3.3 Withering Troughs

Long troughs of noncombustible material in which withering is carried out by blowing warm air.

4 LOCATION

4.1 Tea factories should be located, as far as possible, in such areas where ample water supply is available for fire fighting purposes. Access to the factories shall be by way of all-weather roads which shall be not less than 3·6 m wide.

4.2 Storage and process buildings of the factories should preferably be not less than 30 m from any railway line used by coal-fired locomotives. Where this is not practicable, all external openings in the buildings should be protected by wire gauge having 20 mesh to a cm^2 and the area around each building should be kept free from all vegetation or combustible material up to a distance of not less than 15 m.

5 COMPOUND

5.1 The compound of the factory should be of such areas as to comply with the provisions under **8.1**.

5.2 The compound should be kept clear of all growing vegetation and where lawns are to be laid, these should be regularly mowed.

6 BUILDING CONSTRUCTION

6.1 The constructional features of all the buildings within the compound should comply with requirements of IS 1642 : 1989.

6.2 All process and utility buildings, other than withering houses, using timber racks or hessian spreads or both should be of Type 3 as specified in IS 1642 : 1989.

6.2.1 Withering houses of the aforesaid type should be of not less shan Type 3. The combustible materials like timber racks or hessian spreads should be avoided as far as possible. If however, these have to be used, they should be appropriately treated with suitable chemicals to reduce their flame spread factor, so as to conform to Class I of IS 12777 : 1989.

6.3 Godowns containing tea in chests only should be single storeyed and should be of not less than Type 3 as specified in IS 1642 : 1989, while construction of other godowns should comply with provisions laid down in IS 3594 : 1989.

6.4 Manufacturing and process buildings should not be more than two storeys in height and the highest point of the roof should not be more than 15 m above the surrounding ground level. In case of withering houses, however, the height of the highest point of the roof above ground level may be allowed up to 20 m.

6.5 The intermediate floor of a manufacturing or processing building should preferably be of concrete or masonry, but it may be covered on top by a timber flooring provided it is laid without any intervening space.

6.6 The floor area of any manufacturing or processing building, other than that of a withering house in which combustible racks or spreads are used should not normally exceed 5 000 m^2 unless otherwise separated by a separating wall extending not less than 1 m above the roof.

6.6.1 The floor area of a withering house in which combustible racks are used should not exceed 2 000 m^2.

7 SEPARATING WALLS

7.1 Separating walls should be constructed in order to segregate the following sections of the factory from one another (*see* **6.2**).

a) Furnace of the directly fired driers,

b) Hazardous godowns, when forming part of the building, should be at the periphery of the building, with the entrydoor directly opening on outside road, etc;

c) Tea-chest fabricating rooms;

d) Boiler house and stores of directly heated driers;

e) Engine house;

f) Transformer should always be either away from the main building, or when forming part of the main building should be at the periphery with check door rolling shutter type fitted at entrance. The entrance opening to transformer room should have a raised sill of minimum 15 cm height to prevent rain water from getting inside, or leaking oil from transformer flowing outside.

The sub-station should be effectively separated from transformer by a 4 hour rating wall as per IS 1642 : 1989 without any opening door in between; and

g) Natural gas metering rooms.

8 DISTANCES

8.1 A minimum distance of 6 m should be maintained between godowns and factory buildings or withering houses (having non-combustible racks).

8.2 No withering house having combustible racks should be located within 10 m of any other building unless the facing wall of the buildings conforms to the provisions for a separating wall (*see* **6.2**).

8.3 Coal, wood or other fuels in excess of daily requirements should not be stored within 10 m of any building.

8.4 Hay, straw, grass or other fodders should not be deposited within 30 m of any building.

9 MACHINERY

9.1 Liquid Fuel Fired Tea Driers or Withering Stoves

9.1.1 The fuel should not have a flash point below 65·5°C (closed cup test).

9.1.2 All pipes should be of hard metal and be securely fixed, and cast iron pipes should not be used. A short metallic flexible pipe may be fitted direct to each burner.

9.1.3 Each drying machine should be fed from a service fuel tank situated outside the building. If the service tank has to be located inside the building it should be in an enclosed room having the entrance directly from outside, and no window/other openings on the inner face of the walls, if provided, should have rating not less than 2 hours fire resistance (*see* IS 1642 : 1989). The capacity of such service tanks should not exceed 1·1 kl.

The supply pipe should be fixed away from any exhaust or hot air from the driers and in such a manner that any burning fuel will not reach heated surface. As far as practicable, the fuel supply pipe should not be installed across the factory building. The supply pipe should have threaded connections. All pipes, tees, bends, elbows, sockets, etc, should conform to IS 1239 (Part 1) : 1979 and IS 1239 (Part 2) : 1982, as appropriate.

9.1.4 Where it is necessary to pre-heat the fuel, only one or more of the following systems should be permitted. The system(s) adopted should be so designed that the fuel should not be heated above a temperature which is 14°C below its flash point:

a) Electric oil fuel heater complete with thermostatic control and switch.

b) A steam heater jacket fitted to the fuel oil line.

c) By radiation from front of stove with all pipes securely fixed. The section of piping subject to heat should be of solid drawn seamless steel type having a shut off value or cock at each end of the section.

d) Thermostatically controlled direct heat or other processes free from combustibility hazard.

9.1.5 The fuel supply to burners should pass through an efficient filter on its passage to the burner. Adequate safety measures should be incorporated in the fuel system where it is necessary to pressurize the fuel lines.

9.1.6 Arrangements should be provided whereby supply of fuel to burners is automatically cut off when there is any stoppage of air flow to burners. Provision should also be made that the supply of fuel remains cut off even after air flow is resumed, until burners are re-lighted.

9.1.7 The air flow pipe to the burners should be so installed as to prevent any flow of fuel into the air pipe.

9.1.8 No tea drier should be fired after being shut down without the furnace having first been thoroughly purged with fresh air by means of a blowing or induced fan.

9.1.9 Fuel drip trays of adequate size containing sand should be fitted immediately below the burners outside the drying machine. These trays should be kept clean and the sand should be changed at frequent intervals. The oil soaked sand should be disposed off in a safe manner and should not be dumped within 30 m of the factory compound.

9.1.10 The drier should preferably be separated from the heater by enclosing walls of non-combustible material to ensure that the polluted dust from the drier exhaust should not again be drawn into air passages thereby causing an accumulation of calcined materials at the fan blades and at the base of the drier.

9.1.10.1 Where it is impracticable to separate the drier, arrangements should be made for exhausting the polluted air into the open.

9.1.11 An opening should be provided in a suitable position to enable the back of the furnace to be changed in an efficient manner.

9.1.12 If there are other flues in the building in connection with apparatus heated by other fuels, these should be independent of those connected with the liquid fuel apparatus.

9.2 Natural Gas Fired Tea Drying Machines and Withering Stoves

9.2.1 The supply of natural gas should be from a recognized gas undertaking operating under statutory regulations and guaranteeing at all times supply at a declared calorific value and not less than the pressure required for the burner fed by it.

9.2.2 The installation should be so designed as to provide a gas supply sufficient to meet maximum demand without undue loss of pressure between the point of supply and use.

9.2.3 The piping installation should be of robust nature and be thoroughly gas tight. It should be rigidly supported and mounted to minimize changes of accidental mechanical damage. Provision should also be made for draining out condensed water, if necessary. The installation should be carried out to the requirements of the gas supply authority.

9.2.4 The piping should be made electrically continuous throughout its length and properly earthed. It should not, however, be used to earth any electrical equipment.

9.2.5 All piping should be constructed of iron, steel or copper and separated by at least 15 cm from any electrical conduit, cable or appliances. Use of cast iron pipes and fittings should not be permitted.

9.2.5.1 Flexible type of metal pipes should be permitted only in lengths not exceeding 1 m as direct connection to the burner(s).

9.2.6 All outdoor pipings whether under or above ground should be protected with corrosion-resisting paint. In particular, pipes subject to electrolytic action should be protected by hessian or bituminous wrappings covered with asphalt or by any other means approved by the supply undertaking.

9.2.7 Pipes should not be taken through inaccessible or concealed spaces where its condition may not be inspected and accumulation of gas due to undetected leakage may create a dangerous situation.

9.2.8 The piping should be thoroughly cleaned and tested to ensure its gas tightness, before being put into service. The test pressure should be not less than one and a half times the pressure required under **9.2.1**.

9.2.9 Pipes taken off the main gasline to feed the burners should be fitted with properly designed reducing valves so that gas flowing to the burners may not exceed the pressure required under **9.2.1**.

9.2.10 A manually operated emergency shut off valve should be provided in the pipe line to each burner. It should be so located that fires or explosions in the drier will not prevent access to this valve.

9.2.10.1 A safety relief vent pipe to outdoors should preferably be provided between burner and the shut-off valve.

9.2.11 The burner(s) along with the igniting devices, safety controls, ventilation arrangements, etc, should be of approved types.

9.2.12 A governor or pressure regulator should be inserted upstream of the drier to control the pressure of supply thereto, to the minimum prescribed in **9.2.1**.

9.2.12.1 The ignition device should be fully effective and operative before the main gas supply is turned on.

9.2.13 Wherever possible, means should be provided whereby supply of gas to burners is automatically cut off in the event of flame failure at a gas pilot or voltage drop below a prescribed minimum in case of electrical igniting devices. Provision should also be made to ensure that the supply of gas remains cut off till the gas pilot is re-lighted or correct voltage for operation of the electrical igniting device is available.

9.2.14 Wherever possible interlocking arrangements should be provided so that the gas supply is automatically turned off in the event of failure of power supply to the fan motor(s), and it should remain turned off until the fan(s) may be restarted.

9.2.15 The drier should preferably be of indirectly heated type with the burners installed externally to the drying chamber.

9.2.15.1 In case where the drier is not separated from the burners by non-combustible partition, arrangements should be made whereby polluted air from the drier is exhausted to the open.

9.2.16 The drier should be located in well ventilated surroundings.

9.2.17 If there are other flues in the building in connection with apparatus heated by other fuels, these should be independent of those used in connection with natural gas fired driers.

9.2.18 Notices should be exhibited near natural gas fired equipment indicating that in the event of a gas fire, the first action to be taken before attacking the fire should be to turn off gas supply.

9.2.18.1 In order to aid identification of the main gas valve, it should be painted a distinctive colour.

9.2.19 Once the installation has been commissioned, any leakage in gas piping or other fittings should be located by external application of soap and water solution. No naked flame should be used for this purpose under any circumstances.

9.2.20 Repairs to defective gas piping may be undertaken only after isolating gas supply and thorough purging. All defective fittings should be replaced by new fittings.

9.2.21 All electrical switches in buildings through which gas pipes pass and in which gas is used for heating should be of flame-proof type.

9.3 Withering Troughs

9.3.1 Barring the hessian spreads, the troughs should preferably be of completely non-cumbustible construction. The hessian spreads should be treated with fire resistant coating conforming to Class I (*see* IS 12777 : 1989).

9.3.2 Indirect heater exhaust fumes should be discharged into the open air away from the factory in such a manner that fumes should not re-enter that building or any other adjacent building; the point of discharge should, in any case, be not less than 60 cm from any part of the factory and not less than 3 m from any other building. The flue pipe should be carried through the roof or through an external wall to a clear height of not less than 1 m above the roof and should be at least 45 cm clear of combustible material.

9.3.3 The heat exchanger should not be situated in the inner space between two troughs connected by same set of ducts.

9.3.4 If the heating units are installed within the factory or factory annexe, or in a separate building within 10 m of the factory, the following provisions should apply:

a) The air inlet of the heater should be covered with a detachable screen, made out of wire gauze having 20 mesh per sq-cm, to prevent foreign matter being drawn into the heat exchanger.

b) A door of adequate dimensions to provide easy access to the heat exchanger for cleaning purposes should be provided in the hot air discharge duct.

c) A detachable wire screen having 4 mesh per linear centimeter, made of 0·9 mm thick wire should preferably be fitted in each discharge duct.

d) A cleaning door should be provided either in the side or at the end of each trough to facilitate the removal of rubbish from the troughs with a brush.

e) Withering troughs and the cold air inlets thereto should be situated, as far as possible, in the locations where the air is not likely to be contaminated by tea fluff or dust.

f) The heat exchanger should not preferably be installed in any upper floor of a tea factory and should not be situated in the same room as a drier heater, unless the drier be of indirectly heated type.

10 STORAGE ARRANGEMENTS

10.1 General

Storage of material shall, as far as possible, comply with the provisions of IS 3594 : 1989.

10.2 Bulk and Service Tanks of Liquid Fuels

10.2.1 The bulk storage tank(s) unless fully or semi-embedded type, should be situated not less than 15 m from any insured property. For fully embedded or semi-embedded tanks, the clerance from other insured property should be not less than 6 m. The bulk storage tanks should also comply with the following :

a) The tank(s), including manhole or inspection cover(s), should be substantially constructed of wrought iron or ungalvanized mild steel. The tank(s) should be completely oiltight and tested hydraulically against an internal pressure of (2 kN/m^2). Any manhole or inspection cover(s) should be securely fixed by bolts or studs with nuts and made oiltight. Any reinforcing steel or iron ring or strap around the opening should be welded or riveted to the tank and

made oiltight. The strength of the material used in the construction of the cover and the reinforcing ring should be not less than the strength of the material used for the tank.

b) The fill pipe should be fitted with a screwed cap and should extend into the tank and be arranged so as to discharge the fuel horizontally along the side of the tank. It should be carried down not less than two-thirds of the depth of the tank.

c) The centre line of the outlet should not be within 75 mm of the tank bottom. A sludge cock or other means of removing sludge should be provided at the lowest point of the tank.

Only solid bottom gland packed plug cocks or gate or sluice type valves may be used.

d) Each tank should be fitted with a vent pipe. The vent pipe should extend to at least 1 m above the tank roof for above ground tanks and 3 m from ground level for square tanks. The upper end should form an invested 'U' bend and its opening should be fitted with a wire gauze of 20 mesh per square cm.

e) The outlet, suction or gravity pipe for filling the service tank(s) should be fitted with a stop valve, except in a case of a service tank being filled only by a hand pump and such pump not being gravity fed. The stop valve should be placed as close as possible to the tank.

f) An anti-syphon valve should be fitted near the tank on any supply pipe in which fuel cold continue to flow by syphonic action if the valve were absent.

g) Hydrostatic gauges should normally be used as fuel level indicators. Dip rods may be used only in case of tanks in the open. If a float gauge is used, the cord should pass through a small hole fitted with a close fitting gland. Gauge glasses should not be used.

h) The tank and all its fitting should be designed to ensure electrical continuity and the complete installation should be efficiently earthed.

j) Each surface/above ground tank should have a bund wall around it. The area enclosed in the BUND wall and its height should be adequate to ensure that the whole contents of the tank plus a margin of 10 percent should be contained by the wall in case of rupture of the tank.

NOTE — No bund wall is required for underground tanks, but the tank area including its fill point and vent pipes should be protected against accidental damage by moving vehicles, filling lorries, etc.

10.2.2 Daily service tank(s) should be installed which shall not be of greater capacity than is required to hold sufficient fuel to cover a full day's working of the drying machines installed and should also comply with the following:

a) The tank(s) should be outside the building. If the daily service tank is required to be inside the buildings, it/these should be at the periphery of the building in a separate enclosure with the access door from outside, and having no opening on the wall separating the tank storage room. The separating wall should be of at least 27 mm thickness. The door of the room should be raised, and the floor counter sunk so as to prevent oil flowing out in case of a rupture of the service tank.

b) For external tanks, each tank should have a bund wall around it. The area enclosed in the bund wall and its height should be adequate to ensure that the whole contents of the tank shall be contained by the wall in case of a rupture of the tank.

c) The tank(s) should only be filled by a fixed pipe(s) from storage tank and if filled by gravity without a hand pump a stop valve should be fitted as close as possible to the tank(s) within easy reach of ground level.

d) Each tank should have a vent pipe complying with the requirements of **10.2.1**(d) and its upper end should not be within one metre of any window or doorway, nor within three metres of any chimney opening.

e) An overflow pipe of cross sectional area not less than 50 percent greater than that of the inflow pipe should be fitted and be capable of returning all surplus fuel to a sump or other suitable container. No stop valve should be fitted on overflow pipe (*see* Note).

f) The outlet pipe should comply with the provisions in **10.2.1**(c) and be fitted, with a stop valve placed as close to the tank as possible, but in a readily accessible position.

g) The fuel level indicator should comply with the provisions in **10.2.1**(e).

h) An anti-syphon valve should be fitted complying with the provision in **10.2.1**(f).

j) The tank and all its fittings should be designed to ensure electrical continuity and the complete installation shall be efficiently earthed.

NOTE — In case where the storage tank is situated a considerable distance from the service tank the overflow piping may be led to a closed oil drum, situated at a safe distance outside the building, or not less than 180 litres capacity.

11 ELECTRICAL INSTALLATION

11.1 The electrical installation should be in accordance with IS 1646 : 1978.

11.2 Where practicable all equipment should be of totally enclosed type, metal clad construction, liberally proportioned and of adequate capacity.

11.3 The electrical wiring for both power and lighting in process and storage buildings should be enclosed in screwed steel conduits or be of mineral insulated copper or aluminium sheathed type.

11.4 Fan motors of driers and withering troughs should be dustproof type and so should be all switches, starters, fuse or cut-out boxes, joint boxes, etc, used in this connection.

11.5 Fan casing of electrically driven blowers should be fitted with thermostate so that the fan motor of driers may be cut-off in the event of temperature within the fan casing exceeding the normal working temperature by 10°C.

11.6 All lamp fittings of withering houses and those within 6 m of a tea drier and withering troughs should be of dust tight type.

12 FIRE FIGHTING ARRANGEMENTS

12.1 Fire fighting arrangements should be in accordance with the following guidelines:

a) *Water for Fire Fighting*

All factories along with their withering houses should have adequate quantity of water for fire fighting purposes. (*see* IS 9668 : 1980)

b) *Portable Fire Extinguishers*

All factories along with their withering houses should be protected with fire extinguishers and should comply with IS 2190 : 1979. The extinguishers should be mainly of the following types:

i) Water gas pressure type — 9 1 (*see* IS 940 : 1989)

ii) BCF 1·2 kg and 5 kg (*see* IS 11108 : 1984)

iii) Mechanical foam extinguisher 9 1 (*see* IS 10204 : 1982)

c) Internal hydrant system should be provided according to IS 3844 : 1989 and external hydrant system should be made according to IS 13039 : 1991.

13 GENERAL SAFETY PROVISIONS

13.1 Smoking should not be permitted anywhere in the factory premises.

13.2 In case of all godown and storage areas, including tea godowns, provisions laid down in IS 3594 : 1989 should be followed as far as possible.

13.3 Ashes from coal or firewood, fired boilers or stoves, should be disposed off in a safe manner.

13.4 Drying chambers and withering troughs should be cleaned at regular intervals to prevent accumulation of dust therein.

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
940 : 1989	Portable chemical fire extinguisher, water type (gas pressure) (*third revision*)
1239 (Part 1) : 1979	Mild steel tubes, tubulars and other wrought steel fittings : Part 1 Mild steel tubes (*fourth revision*)
(Part 2) : 1982	Part 2 Mild steel tubulars and other wrought steel pipe fittings (*third revision*)
1642 : 1989	Code of practice for fire safety of buildings (general): Materials and details of construction (*first revision*)
1646 : 1978	Code of practice for fire safety of buildings (general) : Electrical installations (*first revision*)

IS No.	*Title*
2190 : 1979	Code of practice for selection, installation and maintenance of portable first-aid fire extinguisher (*second revision*)
3594 : 1989	Code of practice for fire safety of industrial buildings: General storage and warehousing including cold storages (*first revision*)
3884 : 1989	Canned tomato paste (*first revision*)
9668 : 1980	Code of practice for provision and maintenance of water supplies for fire fighting
10204 : 1982	Portable fire extinguisher mechanical foam type
11108 : 1984	Portable fire extinguisher — Halon 1211 type
12777 : 1989	Fire safety — Flame spread of products — Method for Classification
13039 : 1991	Code of practice for provision and maintenance of external fire hydrant system

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

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