मानकः पथप्रदर्शकः
Bureau of Indian Standards

COMPENDIUM OF INDIAN STANDARDS ON

SAFETY AND HAZARDS IN PROCESS INDUSTRIES




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Introduction

The process industries, encompassing chemical, petrochemical, and allied sectors, operate in environments involving hazardous substances and complex operations. Ensuring safety in such settings is vital to protect human life, assets, and the environment. The Bureau of Indian Standards (BIS) has formulated standards to address various hazards, safety norms associated with chemicals. These standards provide a structured approach to risk identification, operational control, and emergency preparedness. Adherence to them facilitates compliance and promotes a proactive safety culture.

This compendium brings together key Indian Standards relevant to safety in process industries. It includes standards on the classification of hazardous chemicals, safe transportation of dangerous goods, and codes of safety for handling chemicals. Additionally, it covers laboratory safety for chemical, radiochemical, and microbiological settings, as well as guidelines for preparing and using Material Safety Data Sheets (MSDS). Provisions related to permit-to-work systems for high-risk operations are also included to ensure comprehensive hazard control.

The compendium is intended to serve as a reference for industry professionals, regulatory bodies, and safety practitioners. It aims to support informed decision-making and the implementation of best practices. By following these standards, organisations can enhance safety performance, reduce accident risks, and demonstrate regulatory compliance. Ultimately, the compendium contributes to safe, responsible and sustainable industrial operations.

Bureau of Indian Standards
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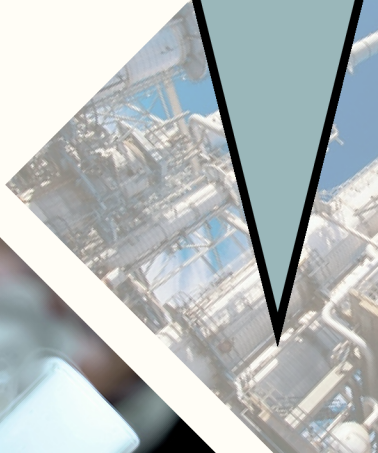

Indian Standards on Classification and Transportation of Hazardous Chemicals

IS 1446 : 2024 Classification of Dangerous Goods (Third Revision)

This standard classifies chemicals and dangerous goods by the type of hazards involved and lists the corresponding UN number to facilitate national and international transport. It has been aligned with the 22nd edition of the the UN recommendation for the transportation of dangerous goods.

Key Hazard Classes and Definitions

Hazards are classified into nine main classes, with subdivisions based on the nature and severity of the hazard:

1. Explosives (e.g., mass explosion, projection hazard)
2. Gases (flammable, non-flammable non-toxic, toxic)
3. Flammable Liquids
4. Flammable Solids and Substances Emitting Flammable Gases
5. Oxidizing Substances and Organic Peroxides
6. Toxic and Infectious Substances
7. Radioactive Material
8. Corrosive Substances
9. Miscellaneous Dangerous Goods

IS 18149:2023 "Transportation of Dangerous Goods — Guidelines."

Transportation of dangerous goods involves significant risks to human health, property, and the environment. To address these challenges and ensure safe practices across all modes of transport, the Bureau of Indian Standards has introduced IS 18149:2023, titled "Transportation of Dangerous Goods — Guidelines." This standard provides a comprehensive framework for the classification, packaging, labeling, documentation, and handling of hazardous materials during transit.

The guidelines are applicable to a wide range of substances, including explosives, flammable liquids and solids, gases, oxidising substances, organic peroxides, toxic and infectious substances, radioactive materials, and environmentally hazardous substances. The standard excludes goods explicitly forbidden by law for transportation.

Key provisions of the standard include:

- Classification and Packing
- Labelling and Marking
- Documentation
- Transport Operations
- Mode-Specific Provisions
- Training Requirements
- Security and Safety Provisions

Indian Standards on Code of Safety for Chemicals

A hazard is defined as anything that can be a potential source of harm or something that could have an adverse health effect on those who come into contact with it.

As per IS/ISO 45001:2018, "Hazards can include sources with the potential to cause harm or hazardous situations or circumstances with the potential for exposure leading to injury and ill health."

Indian standards on codes of safety for chemicals prescribe general properties of chemicals and the nature of hazards associated with them. These standards also cover other essential information, such as information on storage, handling, packing, labelling, disposal of waste, cleaning and repair of containers, selection and training of personnel, protective equipment and first-aid.

Key points covered in these standards are:

- **Physical and chemical properties, and fire and explosion hazard properties of Chemicals**

The standard on the code of safety for chemicals prescribes the physical and chemical properties of hazardous substances, including parameters such as flash point, autoignition temperature, boiling and melting points, vapour pressure, and flammability limits.

- **Hazards and Toxicity information related to chemicals**

These standards provide information on acute and chronic health effects resulting from inhalation, dermal contact, ingestion, or eye exposure. Parameters such as LD_{50}, LC_{50}, Threshold Limit Values (TLVs), and Occupational Exposure Limits (OELs) are specified to support occupational health risk assessments.

- **Personal protective equipment (PPEs) for handling chemicals**

These standards prescribe the selection, performance characteristics, use, and maintenance of personal protective equipment necessary for safe handling of hazardous chemicals.

- **Storage, handling, labelling, and transport of hazardous chemicals**

These standards prescribe technical requirements for the safe storage and handling of hazardous chemicals, including criteria for segregation of incompatible substances, design of ventilation systems, spill containment, and safe transfer operations. Labelling and transportation guidelines are aligned with the Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules, 1989, and the Central Motor Vehicles Rules, 1989.

- **Handling spillage, leakage, and waste disposal**

Indian standards provide structured procedures for responding to chemical spills and leaks, including containment, neutralisation, and recovery techniques tailored to specific chemical hazards.

- **Fire prevention and firefighting measures**

Indian standards provide information on fire risk reduction, the installation and maintenance of fire detection and suppression systems, and the appropriate selection and deployment of fire extinguishing media tailored to specific chemical classes.

- **Training of personnels handling these chemicals**

Indian standards recommend structured training programmes that cover hazard identification, safe handling practices, emergency procedures, proper use of PPE, and familiarity with Safety Data Sheets (SDS).

- **Health management, first aid, and medical treatment**

Indian Standards prescribes pre-placement and periodic medical examinations, first aid measures for exposure to corrosives, toxins, and asphyxiants, and the availability of emergency medical resources such as antidotes and eyewash stations

List of standards on Code of Safety for Chemicals

SI.No	IS Number	IS Tittle
1	IS 10870 :1984 (Reaffirmed in 2021)	Code of safety of Hexane
2	IS 10871 : 1984 (Reaffirmed in 2021)	Code of safety for Hydrzine and Hydrazine hydrate
3	IS 10872 : 2023	Malathion code of safety (first revision)
4	IS 10920 : 1984 (Reaffirmed in 2021)	Code of safety for Phosphorus Trichloride
5	IS 11141 : 1984 (Reaffirmed in 2021)	Code of safety for Acrylonitrile
6	IS 12033 : 1986 (Reaffirmed in 2021)	Code of safety for Dinitrotoluene (dnt)
7	IS 12034 : 1986 (Reaffirmed in 2021)	Code of safety for methyl bromide
8	IS 12141 : 1987 (Reaffirmed in 2021)	Code of safety for methyl ethyl ketone
9	IS 12142 : 1987 (Reaffirmed in 2021)	Code of safety for 1,1,1 - trichloro ethane
10	IS 12143 : 1987 (Reaffirmed in 2021)	Code of safety for tetrachloroethane
11	IS 13440 : 1992 (Reaffirmed in 2023)	Methyl chloride - code of safety
12	IS 13441 : 1992 (Reaffirmed in 2023)	Ethyl ether - code of safety
13	IS 13442 : 1992 (Reaffirmed in 2023)	Trichloro ethylene - code of safety
14	IS 13447 : 1992 (Reaffirmed in 2023)	P - nitro aniline - code of safety
15	IS 13910 : 1993 (Reaffirmed in 2023)	Sulphur dioxide - code of safety
16	IS 13911 : 1993 (Reaffirmed in 2023)	Sulphur - code of safety
17	IS 13914 : 1993 (Reaffirmed in 2023)	Perchlorates of ammonium, potassium and sodium - code of safety
18	IS 14165 : 1995 (Reaffirmed in 2023)	Handling Carcinogenic substances - code of safety
19	IS 14200 : 1994 (Reaffirmed in 2022)	Hydrogen peroxide - code of safety
20	IS 14518 : 2023	Acetaldehyde - code of safety (first revision)

21	IS 14572 : 2022	Chloroform code of safety (first revision)
22	IS 14631 : 1999 (Reaffirmed in 2021)	Styrene - code of safety
23	IS 14814 : 2023	Acetylene - code of safety (first revision)
24	IS 14983 : 2022	Phosphorous (white or yellow) - code of safety (first revision)
25	IS 14984 : 2001	1,3 - butadiene - code of safety
26	IS 14985 : 2001	Methyl acrylate and ethyl acrylate - code of safety
27	IS 15200 : 2024	Hydrogen sulphide code of safety (first revision)
28	IS 15201 : 2022	Hydrogen- code of safety (first revision)
29	IS 15548 : 2005	Hydrofluorocarbon - code of safety
30	IS 18099 : 2022	Sodium hypochlorite - code of safety
31	IS 19083 : 2025	Nitrous oxide-code of safety
32	IS 5184 : 1969 (Reaffirmed in 2021)	Code of safety for hydrofluoric acid
33	IS 5208 : 2024	Acetic acid - code of safety (first revision)
34	IS 5302 : 1969 (Reaffirmed in 2021)	Code of safety for acetic anhydride
35	IS 5311 : 1969 (Reaffirmed in 2021)	Code of safety for carbon tetrachloride
36	IS 5685 : 1970 (Reaffirmed in 2021)	Code of safety for carbon disulphide (carbon bisulphide)
37	IS 5931 (part 5) : 2025	Cryogenic liquid - code of safety part 5 liquid hydrogen (first revision)
38	IS 5931 (part 2) : 2025	Cryogenic liquid - code of safety part 2 liquid nitrogen (first revision)
39	IS 5931 (part 6) : 2025	Cryogenic liquid - code of safety part 6 liquid krypton (first revision)
40	IS 5931 (part 1) : 2025	Cryogenic liquid - code of safety part 1 liquid oxygen (first revision)
41	IS 5931 (part 7) : 2025	Cryogenic liquid - code of safety part 7 liquid neon (first revision)
42	IS 5931 (part 3) : 2025	Cryogenic liquid - code of safety part 3 liquid argon (first revision)

43	IS 5931 (part 4) : 2025	Cryogenic liquid - code of safety part 4 liquid helium (first revision)
44	IS 5931 (part 5) : 2025	Code of safety for handling cryogenic liquids
45	IS 6156 : 1971 (Reaffirmed in 2021)	Code of safety for Chlorosulphonic acid
46	IS 6164 : 2023	Hydrochloric acid code of safety (first revision)
47	IS 6269 : 1971 (Reaffirmed in 2021)	Code of safety for Ethylene oxide
48	IS 6270 : 2024	Phenol code of safety (first revision)
49	IS 6818 : 1973 (Reaffirmed in 2021)	Code of safety for Phosphoric acid
50	IS 6819 : 1973 (Reaffirmed in 2021)	Code of safety for Calcium carbide
51	IS 6953 : 1973 (Reaffirmed in 2020)	Code of safety for Bromine
52	IS 6954 : 1973 (Reaffirmed in 2021)	Code of safety for Caustic Potash
53	IS 7415 : 1974 (Reaffirmed in 2023)	Code of safety for Aniline
54	IS 7420 : 1974 (Reaffirmed in 2021)	Code of safety for Phthalic Anhydride
55	IS 7444 : 1974 (Reaffirmed in 2023)	Code of safety for Methanol
56	IS 7445 : 2022	Acetone code of safety (first revision)
57	IS 7812 : 1975 (Reaffirmed in 2021)	Code of safety for mercury
58	IS 8185 : 1976 (Reaffirmed in 2021)	Code of safety for phosgene
59	IS 8388 : 1977 (Reaffirmed in 2023)	Code of safety for nitrobenzene
60	IS 9052 : 1978 (Reaffirmed in 2021)	Code of safety for aluminium chloride, anhydrous
61	IS 9053 : 1978 (Reaffirmed in 2021)	Code of safety for m - dinitrobenzene
62	IS 9277 : 1979 (Reaffirmed in 2021)	Code of safety for monochlorobenzene
63	IS 9278 : 1979 (Reaffirmed in 2021)	Code of safety for zinc phosphide
64	IS 9279 : 2023	Aluminium phosphide - code of safety (first revision)
65	IS 9744 : 1981 (Reaffirmed in 2021)	Code of safety for thionyl chloride
66	IS 9785 : 1981 (Reaffirmed in 2021)	Code of safety for aluminium alkyls
67	IS 9786 : 1981 (Reaffirmed in 2023)	Code of safety for vinyl chloride (vcm)
68	IS 9787 : 1981 (Reaffirmed in 2021)	Code of safety for phosphoryl chloride

Indian Standards on Code of Safety for Laboratories

IS 4209:2013 – Chemical Laboratories — Code of Safety (Second Revision)

This standard prescribes general rules of conduct concerning safety; reference for handling highly toxic materials; emergency alarm systems; etc., in laboratory design; safety details for fire, emergency, and rescue procedures; evacuation of site reporting systems under the organisation of the laboratory; and general laboratory techniques and fires under specific techniques. It also prescribes general guidelines on safe disposal, incompatible materials, safe procedures to deal with spillage, electrical installations, and handling of chemicals at very low temperatures that are incorporated. Moreover, the format for the material safety data sheet and the list of chemicals and their incompatible materials.

Key Safety Provisions:

- General Conduct
- Emergency Preparedness
- Design Safety
- Chemical Storage & Incompatibility
- Chemical Waste Disposal
- Personal Protective Equipment (PPE):
- Safety Equipment

IS 4906:2017 - Radiochemical Laboratory — Code of Safety (First Revision)

This standard recommends measures that should be adopted to prevent or minimize the exposure to ionizing radiation in a radiochemical laboratory handling small amounts of radioactive materials. It describes important characteristics of radioactive materials, nature of hazards, design requirements of laboratories, and other essential information for protection against radiation.

Key Safety Provisions:

- Personnel Safety & Training
- Design Considerations
- Operational Protocols
- Monitoring & Waste Disposal

IS 12035: 1986 Code of Safety in Microbiological Laboratories (Reaffirmed in 2021)

This code recommends safety for microbiological laboratories engaged in research, teaching, hospital, pharmaceutical, and quality control operations. These guidelines are of a general nature and not comprehensive enough to cover specific problems of safety associated with all pathogens of every description or research in molecular biology.

Key Safety Provisions:

- Infection Control
- Laboratory Design
- PPE and Biological Safety Cabinets
- Restricted Access
- Risk Assessment
- Safety Management

Indian Standards on Material Safety Data Sheet and Work Permit System

IS 17893:2023 Work Permit System

Work permit means a certified procedure for allowing certain work to be carried out in a fixed place and during a given period of time. It is also a procedure authorizing entry to certain facilities. It provides a check list for a systematic method of risk assessment, warns the residual hazards in the job, and outlines the precautions to be taken while carrying out the job to achieve the stated objectives.

This standard prescribes work permits for the following work areas:
a) Cold work permit;
b) Hot work permit;
c) Confined space/vessel entry permit;
d) Excavation permit;
e) Electrical work permit;
f) Work at height permit; and
g) Radiography

IS 17889: 2022 Material Safety Data Sheets — Guidelines

This standard prescribes requirements for the format for Material Safety Data Sheet (MSDS). The possible contents that should be given under each of the 16 sections of the format are outlined. Guidelines for compilation and completion of an MSDS also have been provided.
An MSDS shall provide the relevant information about a chemical product in the following 16 section headings:

- Chemical Product And Company Identification
- Hazards Identification
- Composition/Information on Ingredients
- First-Aid Measures
- Fire-Fighting Measures
- Accidental Release Measures
- Handling and Storage
- Exposure Controls and Personal Protection
- Physical and Chemical Properties
- Stability and Reactivity
- Toxicological Information
- Ecological Information
- Disposal Considerations
- Transport Information
- Regulatory Information
- Other Information

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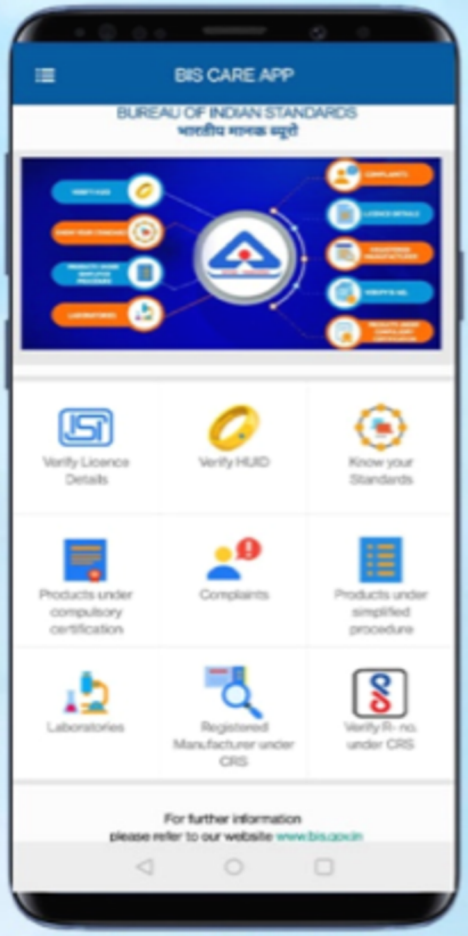

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