मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS
ON
Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways And Related Equipment

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INTRODUCTION TO CONTINUOUS BULK CONVEYING, ELEVATING, HOISTING, AERIAL ROPEWAYS AND RELATED EQUIPMENT

The Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee under the Bureau of Indian Standards (BIS) is responsible for developing and maintaining standards related to equipment used for the continuous handling, transportation, and elevation of bulk materials as well as passenger and material transport by aerial ropeway systems. These systems form the backbone of material handling infrastructure in industries such as mining, power generation, steel, cement, ports, construction, and tourism. As industrial operations become more automated and large-scale, well-defined standards are essential for ensuring safety, interoperability, efficiency, and regulatory compliance across all sectors.

This committee covers a comprehensive range of equipment and systems including belt conveyors, troughed conveyors, flat conveyors, apron conveyors, chain conveyors, roller conveyors, screw conveyors, bucket elevators, feeders of various types, and pneumatic conveying systems. Standards developed by this committee address critical aspects such as equipment selection, component specifications, dimensional requirements, power calculations, safety provisions, maintenance facilities, and operational best practices. Special attention is given to the selection of the correct type of feeder and conveyor based on the bulk material classification and properties.

In addition to bulk material handling equipment, this committee also addresses safety standards for amusement rides and water parks, which involve mechanical conveying and elevating systems used for public entertainment. The committee develops and maintains the IS 15475 series on amusement ride safety and the IS 15492 series on water park safety, ensuring public protection through standardised design, operation, and maintenance requirements. For aerial ropeways and cableways, the committee has developed a comprehensive set of standards covering monocable, bicable, and tricable ropeway systems, funicular railways, material handling ropeways, rope testing, fire safety, corrosion protection, and drive safety. By aligning Indian standards with international best practices, this committee supports safe, efficient, and sustainable material handling and transport operations across India.

1. BELT CONVEYORS

Belt conveyors are one of the most widely used mechanical means of transporting bulk materials over short to long distances in industries such as mining, power plants, ports, and manufacturing. They consist of an endless belt running over a series of rollers or a flat surface, driven by a motor. The belt may be flat or troughed depending on the type of material handled. Belt conveyors offer advantages of high capacity, continuous operation, low energy consumption, and the ability to negotiate gentle curves. Proper selection, installation, and maintenance of belt conveyor components such as belts, pulleys, idlers, and take-up units are essential for reliable and safe operation.

1.1. IS 11592:2000 – Selection and design of belt conveyors – Code of Practice (First Revision)

This standard provides guidelines for the selection and design of belt conveyors used in various industrial applications. It covers aspects such as belt width, speed, capacity, and power requirements for different operational conditions. The code assists engineers in choosing suitable conveyor configurations for specific material handling needs. It also addresses safety considerations and performance criteria. This is the primary reference standard for belt conveyor design in India.

Fig 1.Belt Conveyor

1.2. IS 4776 (Part 1):1977 – Specification for troughed belt conveyors Part 1: Troughed belt conveyors for surface installation

This standard specifies the requirements for troughed belt conveyors intended for surface installation. It covers structural, mechanical, and dimensional requirements for conveyor components. The standard ensures compatibility between different parts of troughed conveyors. It lays down performance criteria for reliable operation under various loading conditions. It is applicable to industries such as mining, cement, and fertilizers for surface material handling.

Fig 2. Troughed Belt Conveyor

1.3. IS 4776 (Part 2):1977 – Specification for troughed belt conveyors Part 2: Troughed belt conveyors for underground installation

This standard specifies the requirements for troughed belt conveyors intended for underground installation in mines and tunnels. It covers structural, safety, and dimensional requirements specific to the confined conditions of underground operations. The standard addresses flameproof and antistatic requirements essential for safe operation in potentially explosive atmospheres. It ensures compatibility and reliability of conveyor components used in underground environments. It is particularly relevant for coal, ore, and tunnel construction applications.

1.4. IS 8597:1977 – Specification for flat belt conveyors

This standard specifies the requirements for flat belt conveyors used for light to medium duty material transport. It covers dimensions, construction, and performance parameters for flat belt conveyor systems. The standard ensures suitability for transporting unit loads, packaged goods, and relatively dry bulk materials. It includes guidance on belt selection, drive units, and support structures. It is widely used in assembly lines, airports, food processing, and warehouses.

Fig 3. Flat Belt Conveyor

1.5. IS 8531:1986/ISO 1536 – Specification for pulleys for belt conveyors (First Revision)

This standard specifies the material, dimensional, and performance requirements for pulleys used in belt conveyor systems. It covers drive pulleys, tail pulleys, and bend pulleys of various sizes. The standard ensures adequate strength, balance, and surface finish for efficient power transmission and belt tracking. It includes requirements for shaft, hub, and shell construction. Proper pulley selection per this standard prevents belt slippage and premature wear.

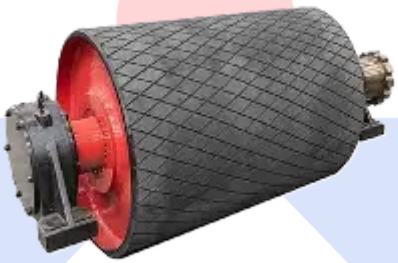

Fig 4. Pulley for Belt Conveyor

1.6. IS 8598:2019 – Idler and Idler Sets for Belt Conveyor – Specification (Second Revision)

This standard specifies the dimensional, material, and performance requirements for idlers and idler sets used in belt conveyors. Idlers support the belt and the material being carried, and their proper specification is critical for belt life and energy efficiency. The standard covers carrying idlers, return idlers, impact idlers, and self-aligning idlers. It ensures smooth belt tracking and minimises resistance. Compliance with this standard extends conveyor operational life significantly.

Fig 5. Idler Sets for Belt Conveyor

1.7. IS 7465:2025 – Portable and mobile troughed belt conveyors – Specification (First Revision)

This standard specifies requirements for portable and mobile troughed belt conveyors used in construction, agriculture, and mining applications. It covers structural, mechanical, and safety requirements for conveyors that can be easily relocated. The standard addresses mobility features such as wheels, folding frames, and telescoping capabilities. It ensures adequate stability during operation in different field conditions. It supports efficient material handling in temporary and dynamic work environments.

Fig 6. Mobile Troughed Belt Conveyor

1.8. IS 14386:1996 – Belt conveyors – Travelling tripper – Motorised – For belt widths 650 mm to 1600 mm – Dimensions

This standard specifies the dimensional and performance requirements for motorised travelling trippers used on belt conveyors with belt widths from 650 mm to 1600 mm. Travelling trippers are devices that divert material from the conveyor belt to designated discharge points along the conveyor length. The standard ensures structural integrity and reliable operation of the tripper mechanism. It includes guidance on drive systems and control provisions. It is particularly useful in storage yards and bulk terminals.

Fig 7. Travelling tripper

1.9. IS 14188:1994 – Conveyor systems – Maintenance facilities – Design parameters

This standard provides design parameters for maintenance facilities associated with conveyor systems. It covers requirements for walkways, access platforms, lighting, and service areas alongside conveyors. The standard ensures that maintenance personnel can safely perform inspections, repairs, and component replacements. It addresses ergonomic and safety aspects of conveyor maintenance infrastructure. Compliance with this standard reduces downtime and improves worker safety during maintenance operations.

2. FEEDERS

Feeders are mechanical devices used to control and regulate the flow of bulk materials from hoppers, bins, or storage areas to conveyors, processing equipment, or other downstream systems. They play a critical role in ensuring a consistent and controlled feed rate, which is essential for the efficient operation of downstream equipment. Various types of feeders are used depending on the material characteristics and flow requirements, including belt feeders, screw feeders, vibratory feeders, reciprocating feeders, rotary vane feeders, and electromagnetic feeders. Proper selection and operation of feeders improves process efficiency, reduces spillage, and minimises equipment wear.

2.1. IS 12060:1987 – Code of practice for selection of rotary vane feeders

This standard provides guidelines for the selection of rotary vane feeders used in bulk material handling systems. It covers the operational principles, capacity calculations, and material suitability criteria for rotary vane feeders. The code assists in choosing the correct feeder size and speed for required throughput. It also addresses installation considerations and maintenance practices. It is widely used in pneumatic conveying systems for dosing and feeding powdered or granular materials.

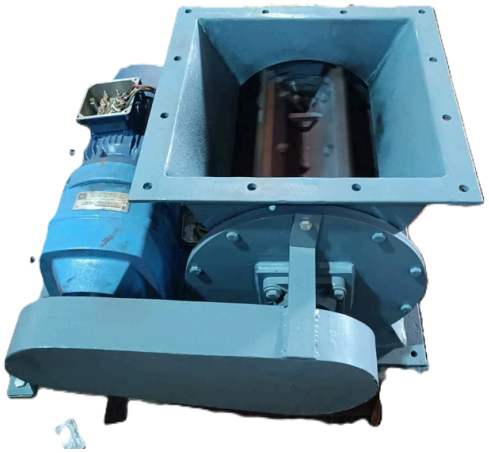

Fig 8. Rotary Vane Feeders

2.2. IS 12108:1987 – Code of practice for selection of rotary table feeders

This standard provides guidelines for the selection of rotary table feeders used to extract and feed bulk materials from storage hoppers. It covers design principles, capacity estimation, and selection criteria based on material properties. The code ensures uniform and controllable feed rates from large storage bins. It includes considerations for peripheral plow arrangement and discharge chute design. It is suitable for handling coarse, lumpy, or sticky materials in various industries.

Fig 9. Rotary Table Feeders

2.3. IS 12204:1987 – Code of practice for selection of reciprocating feeders

This standard provides guidelines for the selection of reciprocating feeders used to withdraw bulk materials from hoppers and bins. It covers the operational mechanism, capacity determination, and selection criteria for different material types. The code ensures reliable and metered material flow from storage to downstream equipment. It includes guidance on stroke length, speed, and feeder pan dimensions. Reciprocating feeders are particularly suitable for handling heavy, abrasive, and irregularly sized materials.

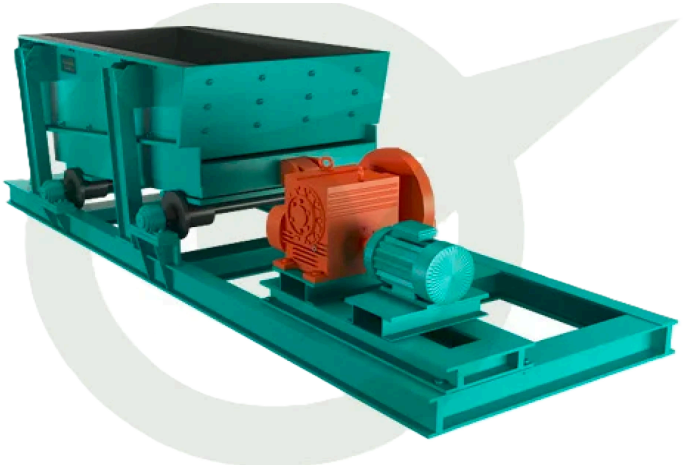

Fig 10. Reciprocating Feeders

2.4. IS 12215:1987 – Code of practice for selection of belt feeders

This standard provides guidelines for the selection of belt feeders used to extract bulk materials from hoppers at a controlled rate. It covers capacity calculation, belt speed determination, and selection based on material characteristics. The code ensures accurate feed rates for downstream conveyors and processing equipment. It addresses considerations such as skirtboard design, belt tensioning, and drive requirements. Belt feeders are widely used for handling fine and powdery bulk materials.

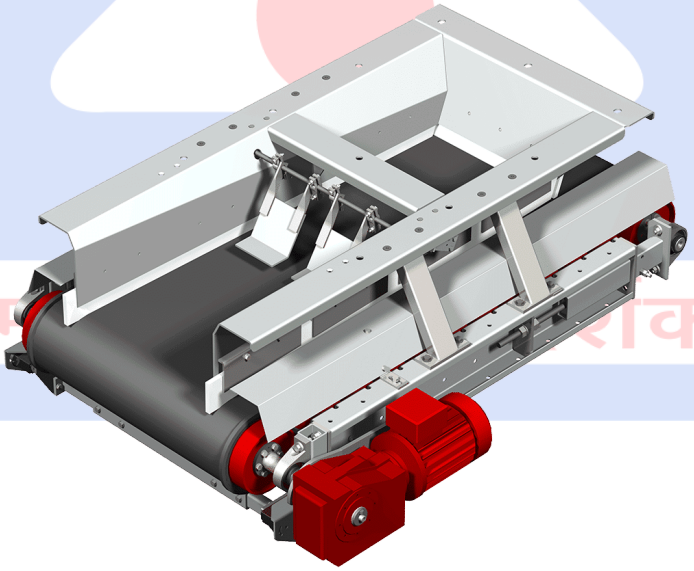

Fig 11. Belt Feeders

2.5. IS 12400:1988 – Code of practice for selection of electromagnetic feeders

This standard provides guidelines for selecting electromagnetic feeders, which use vibration induced by electromagnets to move bulk materials along a trough. It covers operating principles, capacity estimation, and material suitability assessment. The code helps in selecting the appropriate feeder size and electromagnetic drive strength. It also addresses

mounting, isolation, and control requirements. Electromagnetic feeders are used for handling fragile, fine, or abrasive bulk materials requiring gentle handling.

Fig 12. Electromagnetic Feeders

2.6. IS 12401:1988 – Code of practice for selection of mechanical vibrating feeders

This standard provides guidelines for selecting mechanically driven vibrating feeders for bulk material handling. It covers the selection of eccentric or unbalance-type mechanical drives, capacity calculation, and trough sizing. The code ensures efficient and continuous material flow in process industries. It includes guidance on isolation mountings and structural support requirements. Mechanical vibrating feeders are suitable for handling a wide range of bulk materials in heavy-duty industrial applications.

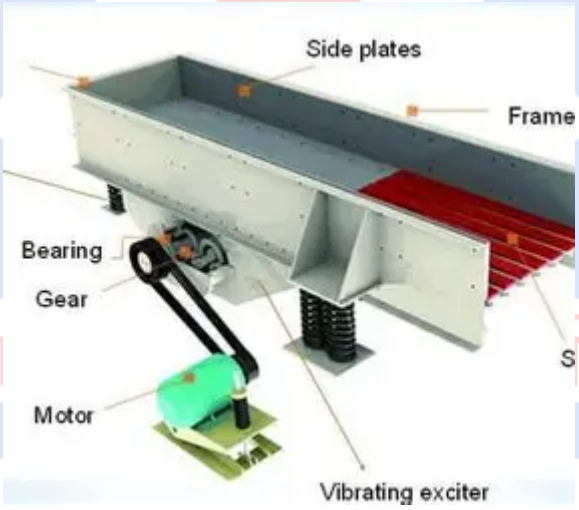

Fig 13. Mechanical Vibrating Feeders

2.7. IS 13324:1992 – Screw feeders – General requirements

This standard specifies the general requirements for screw feeders used to extract and meter bulk materials from hoppers and bins. It covers design, dimensional, and performance requirements for screw feeder components, including the screw, trough, drive unit, and inlet openings. The standard ensures reliable and controllable feed rates for various bulk materials. It includes guidance on variable pitch and variable-diameter screw configurations. It is widely used in chemical, food, pharmaceutical, and construction industries.

Fig 14. Screw Feeders

2.8. IS 12907:1990 – Screw feeder – Purchasers data sheet

This standard provides a standardised purchaser's data sheet format for screw feeders, enabling clear communication of technical requirements between buyers and suppliers. It covers all relevant parameters including capacity, material characteristics, screw dimensions, drive specifications, and operational conditions to be specified during procurement. The standard ensures completeness and consistency in technical specifications submitted during tender and procurement processes. It minimises ambiguity in feeder specifications and facilitates comparison of supplier offers. It is an important procurement tool for industries regularly purchasing screw feeders.

2.9. IS 12960:1990/ISO 7119 – Determination of power requirements of screw feeders – General requirements

This standard specifies the method for calculating the power requirements of screw feeders used in material handling applications. It covers the factors affecting power consumption including material properties, screw geometry, and operational conditions. The standard provides formulae and guidelines for drive motor selection. It ensures that the selected drive is capable of handling starting loads and peak operational demands. Proper power determination per this standard prevents motor overloading and improves energy efficiency.

2.10. IS 14169:2013 – Recommendations for type selection of feeders (First Revision)

This standard provides comprehensive recommendations for selecting the most suitable type of feeder for a given bulk material handling application. It covers all major feeder types including belt, screw, vibratory, rotary, and reciprocating feeders. The standard provides selection criteria based on material characteristics, required feed rates, and operational conditions. It serves as a decision-making guide for engineers and procurement professionals. It helps optimise performance, reduce costs, and improve system reliability.

3. BUCKET ELEVATORS AND SCREW CONVEYORS

Bucket elevators are mechanical conveying devices used to lift bulk materials vertically or at steep angles. They consist of a series of buckets mounted on a belt or chain that moves over head and foot pulleys or sprockets. Bucket elevators are commonly used in grain handling, cement, fertilizer, mining, and chemical industries for vertical transport of granular and powdery materials. Screw conveyors use a rotating helical screw blade to move materials horizontally, on inclines, or vertically through a tube or trough. They are versatile, compact, and suitable for handling a wide range of bulk materials including dry powders, sludges, and fibrous materials in enclosed or open configurations.

3.1. IS 12941:1990 – Code of practice for selection and use of super capacity bucket elevator

This standard provides guidelines for the selection and use of super capacity bucket elevators used for high-throughput vertical transport of bulk materials. It covers selection criteria based on material properties, required capacity, and lift height. The code includes guidance on bucket spacing, belt or chain selection, drive requirements, and casing dimensions. It also addresses safety provisions and operational best practices. It is applicable in grain terminals, port handling systems, and large-scale process industries.

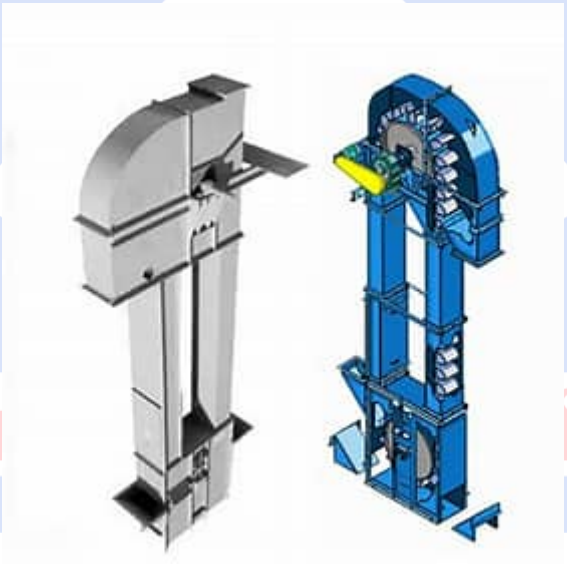

Fig 14. bucket elevator

3.2. IS 6833:1973 – Specification for buckets for bucket elevators

This standard specifies the dimensional, material, and performance requirements for buckets used in bucket elevators. It covers different bucket types including centrifugal discharge, continuous discharge, and positive discharge buckets. The standard ensures adequate strength, capacity, and wear resistance for handling various bulk materials. It includes guidelines for bucket attachment to the belt or chain. Proper bucket selection per this standard improves elevator capacity and reduces spillage.

3.3. IS 6832:1985 – Specification for fixing screws and fixing washers for buckets for bucket elevators (First Revision)

This standard specifies the dimensional and material requirements for fixing screws and fixing washers used to attach buckets to the belt or chain in bucket elevator systems. It covers thread specifications, head dimensions, material grades, and surface treatment requirements for fixings. The standard ensures adequate clamping force and resistance to loosening under dynamic operating conditions. It includes requirements for hardness and corrosion protection of fixing hardware. Proper fastening per this standard prevents bucket detachment and ensures safe elevator operation.

3.4. IS 6930:1973 – Dimensions for fixing arrangements of buckets for bucket elevators

This standard specifies the dimensional requirements for the fixing arrangements used to attach buckets to belts or chains in bucket elevator systems. It covers bolt hole patterns, spacing, and dimensional tolerances for fixing arrangements across different bucket and belt sizes. The standard ensures interchangeability and compatibility of buckets and fixing hardware from different manufacturers. It includes dimensions for both steel and rubber belt fixing arrangements. Standardised fixing dimensions per this standard simplify maintenance and spare parts management.

3.5. IS 7054:1973 – Specification for casing for bucket elevators

This standard specifies the requirements for the casing or housing of bucket elevators. It covers dimensions, construction materials, and structural requirements for elevator casings. The standard ensures adequate enclosure to prevent material spillage and dust emission during operation. It includes requirements for inspection doors, ventilation, and loading and discharge openings. A properly designed casing per this standard contributes to safety and operational efficiency of the elevator.

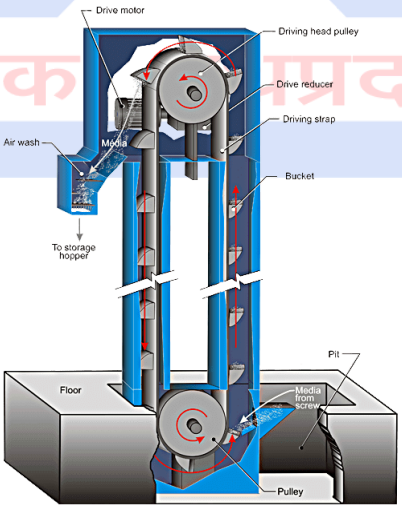

Fig 15. casing for bucket elevators

3.6. IS 7167:1974 – Code for selection and use of bucket elevators

This standard provides a comprehensive code of practice for the selection and use of bucket elevators in various industrial applications. It covers selection criteria based on type of material, required capacity, and lift height. The code provides guidance on elevator type selection including belt type and chain type elevators. It addresses installation, alignment, tensioning, and operational requirements. It is the primary reference for engineers involved in the specification and operation of bucket elevator systems.

3.7. IS 5563:2024 – Screw conveyors for industrial use – Specification (Second Revision)

This standard specifies the requirements for screw conveyors used for handling bulk materials in various industrial applications. It covers dimensional, material, and performance requirements for screw conveyor components including the screw, trough, couplings, and drive units. The standard ensures compatibility, interchangeability, and reliable operation of screw conveyor systems. It includes requirements for both horizontal and inclined screw conveyors. It is widely applicable in agriculture, chemicals, food processing, and construction material industries.

Fig 16. Screw conveyors

4. COMPONENTS AND OTHER RELATED STANDARDS

This section covers Indian Standards related to the components, sub-assemblies, and auxiliary equipment used in continuous material handling systems, as well as other related standards for specialised conveyors. It includes standards for chains, chain-wheels, sprockets, U-links, connector units, scraper bars, roller conveyors, hold-back devices, apron conveyors, aeroslides, vibrating conveyor dimensions, and the classification of bulk materials. These standards define dimensional, material, and performance requirements for individual components, ensuring interchangeability, reliability, and compatibility across different makes of conveying equipment. Standards in this section also address the glossary of conveyor terms and codification of bulk materials essential for consistent engineering communication.

4.1. IS 5626:2024 – Chain conveyors connector units shackle type – Specification

This standard specifies the requirements for shackle-type connector units used in chain conveyors. It covers dimensional, material, and performance requirements for connectors that join individual chain links. The standard ensures adequate strength, fatigue resistance, and interchangeability of connector units. It includes requirements for surface treatment and hardness. Proper connector units per this standard improve chain conveyor reliability and reduce maintenance requirements in heavy-duty industrial applications.

4.2. IS 5895:2024 – Steel roller conveyors – Specification (Second Revision)

This standard specifies the requirements for steel roller conveyors used for transporting unit loads and packages in industrial, warehousing, and distribution applications. It covers dimensions, materials, load capacities, and performance criteria for conveyor rollers and frames. The standard ensures structural integrity and smooth operation under specified load conditions. It includes requirements for both powered and gravity roller conveyors. Compliance ensures long service life and compatibility with standard load handling equipment.

Fig 17. Steel roller conveyor

4.3. IS 6834 (Parts 1 to 3):2024 – Conveyor Chains, Chain Wheels and Attachments – Specification

Part 1: Chains

Part 2: Chain Wheels

Part 3: Attachments

This standard specifies the dimensional, material, and performance requirements for conveyor chains, chain wheels (sprockets), and attachments used in various industrial conveying applications. Part 1 covers different types of conveyor chains including standard series, heavy series, and special attachment chains, ensuring adequate tensile strength, fatigue resistance, and dimensional accuracy along with requirements for surface treatment and lubrication. Part 2 covers tooth profile geometry, pitch circle dimensions, bore tolerances, and surface hardness requirements for chain wheels, ensuring proper engagement with mating chains to minimise wear and prevent premature failure. Part 3 covers various attachment types including straight, bent, and extended pin attachments used for carrying, pushing, or scraping materials, ensuring adequate strength, compatibility, and dimensional accuracy within the chain system. Standardised components per this standard ensure reliable power

transmission, interchangeability, and ease of maintenance across different chain conveyor systems.

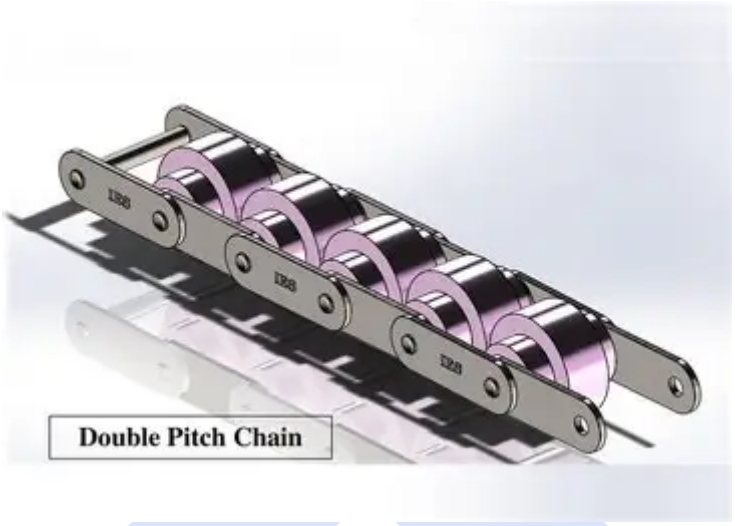

Fig 18.Conveyor chains

Fig 19. chain wheels

4.4. IS 15530:2021/ISO 1977:2006 – Conveyor Chains, Attachments and Sprockets (First Revision)

This standard specifies the requirements for conveyor chains, their attachments, and sprockets used in bulk and unit load conveying systems. It covers dimensional compatibility, material requirements, and performance criteria for chains and their mating sprockets. The standard ensures proper engagement between chains and sprockets to prevent premature wear and failure. It includes requirements for attachment configurations used for special conveying functions. It aligns with ISO 1977:2006 and supports interoperability with international equipment.

4.5. IS 12959:1990 – Technical supply requirements for sprocket wheels for link chains

This standard specifies the technical supply requirements for sprocket wheels used with link chains in conveyor and material handling applications. It covers dimensional, material, and surface treatment requirements for sprocket wheels. The standard ensures proper meshing with link chains to achieve efficient power transmission and minimise chain and sprocket wear. It includes requirements for tooth profile geometry and tolerance grades. Compliance with this standard ensures long service life of both the sprocket and the chain in bulk handling systems.

4.6. IS 12961:1990 – U-Link for chains for bucket elevators – Specification

This standard specifies the dimensional and material requirements for U-links used in chains for bucket elevator applications. U-links serve as the connecting element between chain links and bucket mounting plates, and their reliability is critical to elevator safety. The standard covers breaking load, proof load, dimensional tolerances, and material specifications for U-links. It includes requirements for surface protection and marking. Proper U-links per this standard ensure secure bucket attachment and safe elevator operation under all load conditions.

4.7. IS 3948:1986 /ISO 610 – Specification for calibrated high tensile steel round link chain – Electric butt welded – For chain conveyors and coal ploughs used in mines (First Revision)

This standard specifies the requirements for calibrated high tensile steel round link chains manufactured by electric butt welding process, intended for use in chain conveyors and coal ploughs in mining applications. It covers dimensional, mechanical, and testing requirements including tensile strength, proof load, elongation at break, and calibration tolerances. The standard ensures that chains used in arduous underground mining conditions meet stringent safety and performance requirements. It includes requirements for chain marking and certification. These chains are critical safety components in underground coal mining operations.

4.8. IS 11619:1986/ISO 5612 – Specification for scraper bars for armoured face conveyors

This standard specifies the requirements for scraper bars used in armoured face conveyors (AFCs) employed in underground coal mining. It covers dimensional, material, and mechanical property requirements for scraper bars that form the pushing elements of the AFC chain system. The standard ensures adequate strength, wear resistance, and dimensional accuracy for reliable operation under the extreme conditions of underground longwall mining. It includes requirements for chemical composition, heat treatment, and surface hardness of scraper bars. Compliance with this standard is essential for maintaining safe and productive underground face conveyor operations.

4.9. IS 8646:1994 – Conveyors – Scrapper flight – General requirements (First Revision)

This standard specifies the general requirements for scraper flights used in scraper and flight conveyors employed for bulk material handling. It covers dimensional, material, and performance requirements for scraper flights that push or drag materials along the conveyor trough. The standard ensures adequate stiffness, wear resistance, and attachment strength for the flights. It includes guidance on flight spacing, height, and material selection for different types of bulk materials. Properly specified scraper flights per this standard improve conveyor efficiency and reduce maintenance frequency.

4.10. IS 12101:1987 – Specification for roller type hold-back device

This standard specifies the requirements for roller type hold-back devices used in inclined conveyor systems to prevent reverse travel of the belt and loaded material in the event of drive failure. It covers dimensional, material, and performance requirements for the hold-back mechanism including the roller cage, ratchet, and housing. The standard ensures adequate braking torque and reliable engagement under reverse loading conditions. It includes requirements for lubrication and maintenance access. Properly rated hold-back devices per this standard are essential safety components in inclined conveyor installations.

4.11. IS 7423:2022/ISO 7189: 1983 – Continuous mechanical handling equipment – Apron conveyors – Design rules (First Revision)

This standard provides design rules for apron conveyors used in continuous mechanical handling of heavy, lumpy, or hot bulk materials. It covers load capacity calculation, chain selection, apron pan design, drive power determination, and structural requirements for apron conveyors. The standard aligns with ISO 7189:1983 and provides a systematic framework for apron conveyor design. It includes design rules for inclined as well as horizontal apron conveyors. It is the primary technical reference for design engineers working on apron conveyor projects in steel, cement, and mining industries.

4.12. IS 8599:1977 – Recommendations for selection of apron conveyors

This standard provides recommendations for the selection of apron conveyors used for handling heavy, lumpy, or abrasive bulk materials such as ores, coal, and limestone. It covers selection criteria based on material characteristics, required capacity, and conveyor inclination. The standard provides guidance on apron pan design, chain selection, and drive requirements. It includes considerations for impact resistance and material spillage prevention. Apron conveyors selected per this standard provide reliable performance in harsh operating conditions.

Fig 20. Apron Conveyors

4.13. IS 7439:1974/ISO 2326 – Dimensions for aeroslides

This standard specifies the dimensional requirements for aeroslides used for pneumatic conveying of fine dry bulk materials on a fluidised air cushion. It covers trough dimensions, air distributor dimensions, cover plate requirements, and connection dimensions for aeroslide systems. The standard ensures dimensional compatibility of aeroslide components from different manufacturers, facilitating system assembly and maintenance. It provides dimensions for various aeroslide sizes to accommodate different material flow rates. Aeroslides per this standard enable gravity-assisted pneumatic transport of powdery materials such as cement, fly ash, and alumina.

Fig 21. Aeroslides

4.14. IS 8723:1978/ISO 1049 – Dimensions for vibrating conveyors and feeders with rectangular or trapezoidal trough

This standard specifies the dimensional requirements for vibrating conveyors and feeders having rectangular or trapezoidal trough cross-sections. It covers trough width, height, length, and mounting dimensions for various sizes of vibrating conveyors and feeders. The standard ensures dimensional compatibility and interchangeability of troughs and mounting elements. It includes dimensions for both open and covered trough configurations. Standardised

dimensions per this standard simplify installation, maintenance, and component replacement of vibrating conveyor and feeder systems.

4.15. IS 4240:1984/ISO 2148 – Glossary of conveyor terms and definitions (First Revision)

This standard provides a comprehensive glossary of terms and definitions used in the field of conveyors and material handling systems. It covers terminology related to belt conveyors, chain conveyors, roller conveyors, bucket elevators, feeders, and associated components. The standard ensures consistent use of technical terminology in standards, contracts, technical documents, and engineering communications related to conveyor systems. It provides definitions in both English and Hindi. A well-defined glossary per this standard improves clarity and reduces misinterpretation in conveyor engineering.

4.16. IS 8730:2023 – Classification and codification of bulk materials for continuous material handling equipment

This standard provides a systematic classification and codification system for bulk materials handled by continuous mechanical handling equipment. It categorises materials based on properties such as particle size, bulk density, flowability, abrasiveness, moisture content, and hazardous characteristics. The standard enables consistent communication between material handlers, conveyor designers, and equipment manufacturers. It ensures selection of appropriate conveying equipment for specific material properties. It is an essential reference tool for all bulk material handling projects.

5. CONVEYOR SAFETY AND PNEUMATIC HANDLING

Safety in conveyor operations is of paramount importance due to the continuous movement of mechanical parts, high-speed belts, and the potential for entanglement, entrapment, and material spillage. The IS 7155 series provides a comprehensive set of codes of practice covering all aspects of conveyor safety including general requirements, belt conveyors, vibrating conveyors, apron conveyors, flight conveyors, operator training, and inspection and maintenance. These standards protect workers and ensure operational continuity across all types of conveyor installations. Pneumatic conveying systems, which use air pressure or vacuum to transport fine and powdery bulk materials through pipes, also require specific standards for couplings, hose components, piping, and bends to ensure safe and efficient operation.

5.1. IS 7155 (Parts 1 to 8): – Code of Recommended Practice for Conveyor Safety ;

Part 1: General InformationPart 2: General Safety Requirements
Part 3: Belt Conveyors and Feeders
Part 4: Vibrating Conveyor Feede
Part 5: Apron Conveyors, Apron Feeders
Part 6: Selection, Training and Supervision of Operators
Part 7: Inspection and Maintenance
Part 8: Flight Conveyor, Scraper Conveyor.

This series of standards provides a comprehensive code of recommended practice for safety in all types of industrial conveyor systems. Part 1 establishes the foundational framework, terminology, and hazard identification guidelines applicable to all conveyor types, defining responsibilities of designers, manufacturers, installers, and operators. Part 2 specifies general safety requirements covering guarding, emergency stops, start-up warnings, electrical safety, and control system features applicable across all conveyor installations. Part 3 addresses belt conveyor and feeder-specific safety measures including nip point guarding, belt training, spillage control, pull-cord emergency stops, and safe maintenance procedures. Part 4 covers safety requirements for vibrating conveyors and feeders, including guarding of drive mechanisms, resonance hazard prevention, and noise and vibration exposure limits for personnel. Part 5 provides safety requirements for apron conveyors and feeders handling heavy and abrasive materials, covering chain and sprocket guarding, falling material protection, and safe loading and discharge arrangements. Part 6 addresses the selection, training, and supervision of conveyor operators, including competency requirements, training programme content, assessment procedures, and supervisory record-keeping. Part 7 provides guidelines for systematic inspection and maintenance of conveyor systems, covering inspection schedules, lock-out/tag-out procedures, condition monitoring, and defect reporting to ensure continued safe operation. Part 8 covers safety requirements specific to flight conveyors and scraper conveyors, including chain drive guarding, emergency stop systems, and protection from high tractive force hazards. Together, this series provides a complete safety framework for conveyor system design, operation, maintenance, and personnel management across all industrial applications

5.9. IS 15534:2004 / ISO 5031 – Continuous mechanical handling equipment for loose bulk materials – Couplings and hose components used in pneumatic handling – Safety code

This standard specifies the safety requirements for couplings and hose components used in pneumatic conveying systems for loose bulk materials. It covers design, materials, testing, and marking requirements for these critical components. The standard ensures safe connections that prevent accidental disconnection or leakage during pressurised operation. It includes guidance on pressure ratings, temperature limits, and compatibility with conveyed materials. Compliance ensures personnel safety and system integrity in pneumatic conveying installations.

5.10. IS 15535:2004 / ISO 2327 – Pneumatic handling appliances for loose bulk materials – Piping

This standard specifies the requirements for piping used in pneumatic conveying systems for loose bulk materials. It covers material selection, dimensional requirements, pressure ratings, and installation practices for conveying pipelines. The standard ensures adequate strength, wear resistance, and leak-tightness of the piping system. It includes requirements for bends, fittings, and pipe supports. Proper piping per this standard ensures reliable and safe operation of pneumatic bulk material conveying installations.

5.11. IS 15536:2004 / ISO 3284 – Continuous mechanical handling equipment for loose bulk materials – Dimensions of bends for use in pneumatic handling

This standard specifies the dimensional requirements for bends used in pneumatic conveying pipelines for loose bulk materials. It covers internal diameter, radius of curvature, and end-fitting dimensions for various sizes of conveying bends. The standard ensures dimensional compatibility of bends with mating pipes and fittings from different manufacturers. It includes requirements for straight end lengths and connection dimensions to facilitate system assembly. Standardised bend dimensions per this standard simplify design, procurement, and maintenance of pneumatic conveying pipeline systems.

6. AMUSEMENT RIDES AND WATER PARKS

Amusement rides and water park attractions are public entertainment facilities that carry significant safety responsibilities due to the large number of users, including children, and the dynamic forces involved. Standards for amusement ride safety and water park safety are essential to ensure that these attractions are designed, manufactured, operated, and maintained in a manner that protects users from injury. The IS 15475 series covers all aspects of amusement ride safety including general information, safety requirements, design and manufacture, operator training, operation and maintenance, and performance tests. Similarly, the IS 15492 series addresses safety requirements specifically for water parks. Both series were comprehensively revised in 2022, superseding the earlier 2004 editions.

6.1. IS 15475 (Part 1):2022 – Code of recommended practice for amusement rides safety Part 1: General information (First Revision)

This standard provides general information and foundational definitions for the entire IS 15475 series on amusement ride safety. It covers scope, terminology, and general safety philosophy applicable to all types of amusement rides. The standard establishes the framework for safety requirements, design criteria, and operational guidelines in subsequent parts. It applies to permanently installed as well as temporary and travelling amusement rides. It is the primary reference for regulators, manufacturers, and operators in ensuring safe amusement ride operations.

6.2. IS 15475 (Part 2):2022 – Code of recommended practice for amusement rides safety Part 2: Safety requirements (First Revision)

This standard specifies the safety requirements for amusement rides of all types. It covers structural safety, restraint system requirements, emergency stop provisions, and clearance requirements to prevent passenger contact with ride structures. The standard addresses safety requirements for ride design, installation, and daily pre-operation safety checks. It includes requirements for passenger information, boarding and alighting procedures, and operator control systems. Compliance with this standard is fundamental to ensuring the physical safety of all passengers using amusement rides.

Fig 22. amusement rides

6.3. IS 15475 (Part 3):2022 – Code of recommended practice for amusement rides safety Part 3: Design, manufacture and erection

This standard provides requirements for the design, manufacture, and erection of amusement rides. It covers structural design loads, material selection, fabrication standards, and on-site erection and commissioning requirements. The standard ensures that amusement rides are engineered to withstand all anticipated loads including dynamic, impact, and fatigue loads over the intended service life. It includes requirements for quality assurance during manufacture and inspection procedures during erection. Properly designed and erected rides per this standard provide a safe foundation for public entertainment operations.

6.4. IS 15475 (Part 4):2022 – Code of recommended practice for amusement rides safety Part 4: Selection, training and supervision of operators

This standard provides requirements for the selection, training, and supervision of amusement ride operators. It covers minimum age requirements, physical fitness criteria, training programme content, and competency assessment for ride operators. The standard addresses induction training, on-the-job training, and periodic refresher training requirements. It includes requirements for supervisory responsibilities and operator record-keeping.

Well-trained and properly supervised ride operators per this standard are a critical layer of safety protection for the public using amusement rides.

6.5. IS 15475 (Part 5):2022 – Code of recommended practice for amusement rides safety Part 5: Operation and maintenance procedures

This standard provides a code of practice for the safe operation and systematic maintenance of amusement rides. It covers pre-operation checks, operating procedures, daily maintenance tasks, periodic maintenance schedules, and record-keeping requirements. The standard addresses the management of ride downtime, defect reporting, and ride restoration to service after maintenance. It includes requirements for spare parts management and maintenance documentation. Regular and systematic operation and maintenance per this standard ensures continued ride safety and reliability throughout the operating season.

6.6. IS 15475 (Part 6):2022 – Code of recommended practice for amusement rides safety Part 6: Performance tests

This standard specifies the performance tests to be conducted on amusement rides to verify their safe and satisfactory operation. It covers load testing, ride cycle performance verification, safety device function testing, and emergency stop performance testing. The standard addresses testing procedures for new rides during commissioning as well as periodic testing requirements during the operational life of the ride. It includes acceptance criteria and documentation requirements for test results. Performance testing per this standard provides objective verification of ride safety and performance before and during public use.

6.10. IS 15492 (Part 1):2022 – Code of recommended practice for safety in water parks Part 1: General information

This standard provides general information, scope, and terminology for the IS 15492 series on safety in water parks. It covers foundational safety principles applicable to all types of water park attractions including water slides, wave pools, and lazy rivers. The standard establishes the overall framework for safety requirements, operational procedures, and maintenance practices in subsequent parts. It addresses responsibilities of designers, operators, and maintenance personnel. It serves as the foundational safety document for water park planning and operation in India.

6.11. IS 15492 (Part 2):2022 – Code of recommended practice for safety in water parks Part 2: Safety requirements

This standard specifies the safety requirements for water park attractions and facilities. It covers structural safety of water slides and flumes, water quality requirements, lifeguard provisions, and emergency response procedures. The standard addresses safety requirements for splash zones, wave pools, and other interactive water features. It includes requirements for signage, user information, and passenger restraint or containment systems where

applicable. Compliance with this standard is essential for ensuring the safety of water park visitors of all ages.

6.12. IS 15492 (Part 3):2022 – Code of recommended practice for safety in water parks Part 3: Instructions

This standard provides instructions for the safe operation and management of water parks. It covers operational procedures, ride operating instructions, emergency protocols, and visitor safety communication requirements. The standard addresses staff responsibilities, shift management, and safety briefing requirements for water park operations. It includes requirements for ride capacity management, queue management, and visitor conduct guidelines. Comprehensive operational instructions per this standard ensure consistently safe water park experiences for all visitors.

Fig 23. Water Parks

7. AERIAL ROPEWAYS

Aerial ropeways and cableways are transportation systems that use ropes or cables suspended between supports to carry passengers or materials over difficult terrain such as mountains, rivers, and valleys. They include monocable ropeways, bicable and tricable ropeways, funicular railways, and material handling ropeways. These systems are used in tourism, mountain resorts, mines, and construction sites. The safety and reliability of ropeway systems depend critically on the quality of ropes, grips, drives, towers, civil structures, and operational procedures. BIS has developed a comprehensive set of standards through the IS 5228 series and IS 17232–17240 series covering all aspects of ropeway design, construction, operation, maintenance, and safety to align with international best practices.

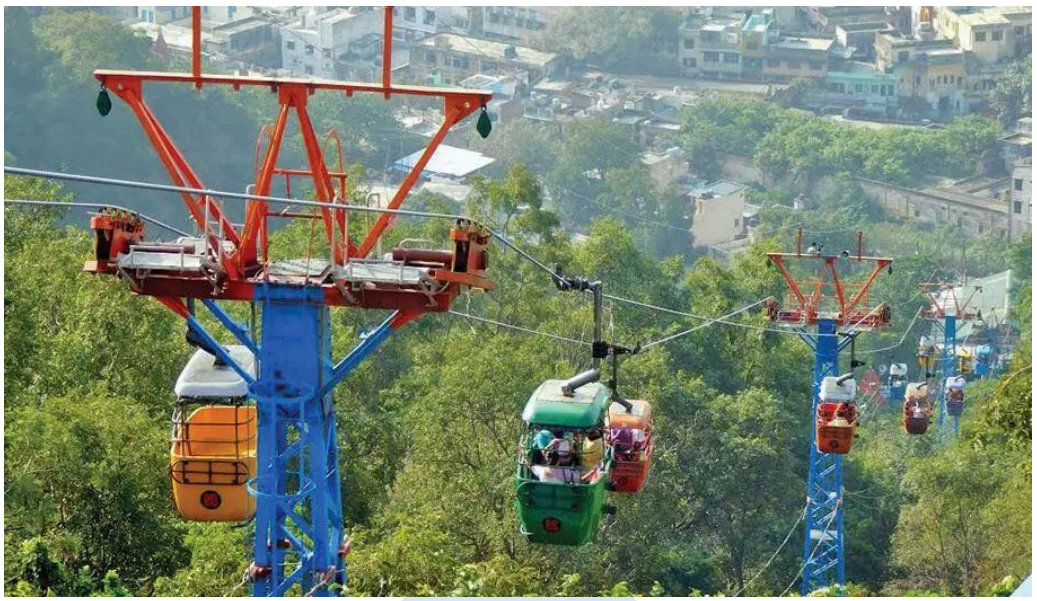

Fig 24. Ropeways

7.1. IS 5228:2017 – Continuous movement monocable ropeways with fixed grips – Code of practice (Second Revision)

This standard provides a code of practice for continuous movement monocable ropeways equipped with fixed grips for transporting passengers or materials. It covers design, construction, installation, operation, and maintenance requirements for this type of ropeway. The standard addresses rope selection, grip design, drive systems, and tower requirements. It includes safety provisions for emergency stopping, passenger evacuation, and routine inspections. It is the primary reference for chairlift-type ropeway systems widely used in hill stations and tourist locations.

7.2. IS 5229:2017 – Continuous movement monocable ropeways with automatic grip – Code of practice (Second Revision)

This standard provides a code of practice for continuous movement monocable ropeways equipped with automatic detachable grips. It covers all aspects of design, construction, operation, and maintenance for this type of ropeway system. Automatic grips allow cabins to slow down at terminals for passenger boarding and alighting, improving safety and comfort. The standard addresses grip engagement and disengagement mechanisms, haul rope requirements, and terminal design. It is applicable to modern gondola lift systems used at ski resorts and urban transport applications.

7.3. IS 5230:2017 – To and fro Jig Back movement Bi-Cable ropeways – Code of practice (Second Revision)

This standard provides a code of practice for jig-back movement bicable ropeways where two cabins move in opposite directions simultaneously. It covers design, construction, installation, operation, and safety requirements for this type of ropeway. The standard addresses track rope and haul rope specifications, cabin requirements, and braking systems. It includes

provisions for automatic safety devices and emergency procedures. Bicable jig-back ropeways are commonly used for passenger transport in mountainous terrain where intermediate support towers are difficult to install.

7.4. IS 9228:2019 – Chairs for chairlifts – Specification (First Revision)

This standard specifies the dimensional, material, and performance requirements for chairs used in chairlift ropeway systems. It covers structural strength, seating dimensions, safety bar design, and grip attachment requirements for chairlift seats. The standard ensures passenger safety and comfort during transport on open chairlift systems. It includes requirements for corrosion protection and surface finish. Proper chair specification per this standard is essential for safe passenger-carrying chairlift operations at ski resorts and tourist destinations.

7.5. IS 9706:2019 – Material handling ropeways – Code of practice (Second Revision)

This standard provides a code of practice for material handling ropeway systems used to transport goods, ores, and construction materials over difficult terrain. It covers design, construction, installation, operation, and maintenance requirements for material carrying ropeways. The standard addresses rope selection, carrier design, loading and unloading stations, and drive systems. It includes safety provisions to prevent material spillage and accidents during operation. It is applicable in mining, quarrying, and construction projects where conventional road transport is not feasible.

7.6. IS 16620:2017 – Jig back movement monocable ropeways with fixed grips – Code of practice

This standard provides a code of practice for jig-back movement monocable ropeways with fixed grips where a single rope is used both as haul rope and track rope. It covers design, installation, operation, and maintenance requirements for this type of ropeway. The standard addresses rope specifications, cabin requirements, counterbalance arrangements, and safety devices. It includes provisions for emergency stopping, manual operation, and passenger evacuation. It is suitable for short to medium span passenger transport in hilly areas.

7.7. IS 16623:2017 – Pulsated movement monocable ropeways with fixed grips – Code of practice

This standard provides a code of practice for pulsated movement monocable ropeways where carriers move intermittently in a pulsed manner. It covers design, construction, operational requirements, and safety provisions for this ropeway type. The standard addresses carrier spacing, rope speed, pulsation control systems, and terminal arrangements. It includes provisions for safe loading, unloading, and emergency operations. Pulsated movement ropeways are used for specific passenger and material handling applications requiring controlled intermittent movement.

7.8. IS 17232:2019 – Continuous movement bicable tricable ropeways with detachable grip – Code of practice

This standard provides a code of practice for continuous movement bicable and tricable ropeways equipped with detachable grips for high-capacity passenger transport. It covers design, construction, installation, operation, and maintenance requirements for large gondola and cable car systems. The standard addresses track rope and haul rope specifications, detachable grip mechanisms, and terminal design. It includes safety requirements for high-speed detachable gondola systems. These systems are used for high-capacity urban and resort transport applications.

7.9. IS 17233:2019 – Acceptance and certification criteria for design and construction of all types of ropeways intended for transportation of passengers

This standard specifies the acceptance and certification criteria for the design and construction of all types of passenger-carrying ropeway installations. It covers the documentation, inspections, and tests required before a ropeway system is commissioned for passenger service. The standard ensures that ropeway systems meet all safety and performance requirements before opening to the public. It addresses requirements for design verification, load testing, rope inspection, and safety device testing. It is a key regulatory document for ropeway certification authorities.

7.10. IS 17234:2019 – Operation and maintenance of all types of ropeways intended for transportation of passengers – Code of practice

This standard provides a comprehensive code of practice for the operation and maintenance of all passenger-carrying ropeway systems. It covers daily operational procedures, periodic inspections, preventive maintenance schedules, and emergency response procedures. The standard ensures that ropeway systems are operated safely and maintained in reliable condition throughout their service life. It addresses staff training, safety checks, and record-keeping requirements. Compliance with this standard is essential for maintaining safe and continuous ropeway operations.

7.11. IS 17235:2019 – Magnetic rope testing MRT – Specification

This standard specifies the requirements and procedures for magnetic rope testing (MRT) of wire ropes used in ropeway installations. MRT is a non-destructive testing method that detects internal and external defects in wire ropes using magnetic flux analysis. The standard covers equipment requirements, testing procedures, acceptance criteria, and reporting requirements for MRT inspections. It ensures early detection of rope deterioration before it becomes a safety hazard. Regular MRT per this standard is essential for maintaining wire rope safety in passenger ropeway systems.

7.12. IS 17236:2019 – Prevention and safety against fire in ropeways – Code of practice

This standard provides a code of practice for fire prevention and safety measures in ropeway installations used for passenger transportation. It covers fire risk assessment, passive and active fire protection measures, and emergency evacuation procedures for ropeways. The standard addresses fire-resistant material requirements for cabins, stations, and rope drive systems. It includes requirements for fire detection and suppression systems in terminal buildings and drive rooms. Compliance ensures passenger safety and minimises fire-related disruption to ropeway operations.

7.13. IS 17237:2019 – Code of practice for design and construction of civil engineering works for ropeways – General requirements

This standard provides a code of practice for the design and construction of civil engineering works associated with ropeway installations. It covers foundation design, tower base construction, terminal building design, and anchor block requirements for all types of passenger and material handling ropeways. The standard addresses geotechnical investigation requirements, structural load calculations, and material specifications for civil works. It includes requirements for drainage, access roads, and protective earthworks around ropeway installations. Properly designed and constructed civil works per this standard provide a stable and safe foundation for ropeway systems in varied terrain conditions.

7.14. IS 17238:2019 – Safety requirements for ropeways installations designed to carry persons – Quality control

This standard specifies quality control requirements for ropeway installations designed to carry passengers. It covers quality assurance procedures applicable during the design, manufacturing, installation, and commissioning phases of ropeway projects. The standard addresses documentation requirements, material certification, component testing, and system performance verification. It ensures that all safety-critical components meet specified quality standards before being put into service. Proper quality control per this standard reduces the risk of failures in passenger ropeway systems.

7.15. IS 17239:2019 – Safety requirements for drives used for ropeway installation for passenger transportation

This standard specifies safety requirements for drive systems used in passenger-carrying ropeway installations. It covers main drives, auxiliary drives, and emergency drives including their mechanical, electrical, and braking components. The standard ensures that drives are capable of safe starting, stopping, and emergency halting of the ropeway under all load conditions. It includes requirements for redundancy, speed monitoring, and automatic safety shut-off systems. Properly designed drives per this standard are fundamental to safe ropeway operation.

7.16. IS 17240:2019 – Corrosion protection of iron and steel sections used in passenger ropeways – Code of practice

This standard provides a code of practice for protecting iron and steel structural sections used in passenger ropeway installations from corrosion. It covers surface preparation methods, coating systems, and inspection procedures for corrosion protection of towers, terminals, and support structures. The standard ensures long-term structural integrity of ropeway support infrastructure in various environmental conditions. It includes guidance on touch-up maintenance and re-coating intervals. Proper corrosion protection per this standard extends the service life of ropeway structures significantly.

7.17. IS 17405:2020 – Calculation for design of ropeway installation intended for transportation of passengers – Code of practice

This standard provides a code of practice for the structural and mechanical calculations required for the design of passenger ropeway installations. It covers load calculations including dead loads, live loads, wind loads, snow loads, and dynamic loads for ropeway towers and support structures. The standard provides design methodologies and safety factors applicable to Indian conditions. It ensures that ropeway structures are designed with adequate strength and stability. It is an essential engineering reference for structural designers involved in passenger ropeway projects.

7.18. IS 17406:2020 – Transportation, storage, installation and tensioning of wire ropes for passenger ropeway – Code of practice

This standard provides a code of practice for the transportation, storage, installation, and tensioning of wire ropes used in passenger ropeway systems. It covers handling procedures to prevent damage to ropes during transit and storage. The standard addresses installation methods including splicing, socketing, and tensioning procedures for track ropes and haul ropes. It includes tension monitoring and adjustment procedures to maintain safe rope tensions during operation. Proper rope handling and installation per this standard is critical for ropeway safety and performance.

Fig 25. Installation of wire ropes

7.19. IS 17938:2022 – Design and construction of funicular railway – Code of practice

This standard provides a code of practice for the design and construction of funicular railway systems used for transporting passengers up steep gradients. It covers civil, mechanical, and electrical engineering requirements for funicular railway installations including tracks, cabins, rope systems, and drive mechanisms. The standard addresses safety requirements for braking, emergency stops, and passenger protection. It includes requirements for gradients, curvature, and track alignment. Funicular railways are used in hill stations, tourist locations, and urban transport applications for steep terrain.

Fig 26. Funicular Railway

7.20. IS 7649:2025 – Aerial ropeways and cableways relevant words in relation – Glossary of terms

This standard provides a comprehensive glossary of terms relevant to aerial ropeways and cableway systems. It covers definitions of technical terms used in the design, construction, operation, and maintenance of ropeway installations. The standard ensures consistent use of terminology across all ropeway-related standards, contracts, and technical documents. It covers terms related to ropes, grips, carriers, towers, drives, and safety systems. A clear and standardised glossary per this standard improves communication among engineers, operators, regulators, and manufacturers.