मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS ON

Ropes

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INTRODUCTION

Rope and cordage are essentially the same thing, referring to materials made by twisting or braiding together strands, fibres, or yarns to create a strong, flexible product.

Ropes are versatile tools used across various fields for lifting, pulling, securing, and supporting loads. In industries, they are essential for rigging, hoisting, and construction work, while in marine settings, they are used for mooring, anchoring, and sailing operations. In agriculture and daily life, ropes help in tying, bundling, and supporting structures. They play a critical role in climbing, adventure sports, rescue missions, and military applications, providing safety and mobility. Additionally, ropes are used in transportation to secure cargo and in crafts or décor for aesthetic and cultural purposes, making them indispensable in both practical and creative domains.

By compiling relevant standards on ropes in a single document, this compendium serves as a ready reference for professionals involved in manufacture of ropes which are efficient, reliable and safe.

The formulation of Indian Standards on Ropes are undertaken by the **Cordage Sectional Committee (TXD 09)** constituted under Textiles Divisional Council of Bureau of Indian Standards.

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A. LIST OF INDIAN STANDARDS ON ROPES

1. **IS 1084 : 2005 Textiles – Manila ropes – Specification (*fifth revision*)**

   This standard outlines the specifications for electromechanically manufactured manila ropes, classified into the following types:

   (a) **3-strand hawser-laid ropes** with diameters ranging from 6 mm to 128 mm.
   (b) **4-strand shroud-laid ropes** with diameters ranging from 8 mm to 128 mm.
   (c) **9-strand cable-laid ropes** with diameters ranging from 40 mm to 144 mm.

   Unlike synthetic ropes, this standard also includes specific requirements for **lubrication** and **rot-proofing treatment** to enhance durability and performance.

2. **IS 1321 (Part 1) : 2003, Sisal ropes — Specification Part 1 Untarred varieties (*fourth revision*)**

   This Standard specifies requirements for untarred sisal ropes. It covers three types: hawser-laid (3-strand), shroud-laid (4-strand), and cable-laid (9-strand) ropes, detailing their dimensions, construction, and performance characteristics like linear density and breaking strength. It mandates the use of quality sisal fibre and disallows hand-spun yarn. The standard sets rules for manufacturing, lubrication, rot-proofing, testing conditions, and packaging. It also outlines sampling methods and criteria for conformity. This revision aligns the standard with ISO 1181:1990 and introduces updated specifications and tolerances.

3. **IS 4572 : 2022 Fibre ropes — Polyamide — 3-, 4-, 8- and 12- strand ropes (*fifth revision*)**

   This standard specifies requirements for 3-strand hawser-laid and 4-strand shroud-laid ropes, 8-strand braided ropes and 12-strand braided ropes for general service made of polyamide. It is identical to **ISO 1140:2021**. This standard specifies designation system, the linear density and minimum breaking strength for different types of ropes and sizes.

4. **IS 5175 : 2022 Fibre ropes — Polypropylene split film monofilament and multifilament (PP2) and polypropylene high tenacity multifilament (PP3) 3-, 4-, 8- and 12- strand ropes (*fourth revision*)**

   This standard specifies the requirements for fibre ropes made from polypropylene split film, monofilament, multifilament (PP2), and high-tenacity multifilament (PP3). It covers 3-strand hawser-laid, 4-strand shroud-laid, 8-strand, and 12-strand braided constructions. The standard includes designations, general requirements, linear density, and minimum breaking strength. It also aligns with **ISO 1346:2021**, ensuring international equivalence. Ropes must be UV-

protected, and physical properties are measured per ISO 2307. Guidelines are also given for marking, packaging, and BIS certification compliance.

5. **IS 8674 : 2013 Fibre ropes – Polyethylene – 3- and 4 -strand ropes (*third revision*)**

This Indian Standard specifies requirements for 3-strand hawser-laid and 4-strand shroud-laid ropes for general service (excluding fittings) made of polyethylene and gives rules for their designation. It is identical to **ISO 1969:2004**.

The main advantage of polyethylene (PE) ropes over other synthetic ropes (like polypropylene, nylon, or polyester) is their **excellent resistance to chemicals and moisture**, combined with being very **lightweight** and **buoyant**.

6. **IS 11066 : 2022 Fibre Ropes — Polyester — 3-, 4-, 8- and 12- Strand Ropes (*third revision*)**

This standard specifies requirements for 3-strand hawser-laid and 4-strand shroud-laid ropes,8-strand braided ropes and 12-strand braided ropes for general service made of polyester. It is identical to ISO 1141:2021. This standard classifies the ropes based on heat set treatment to ensure lay and dimensional stability.

7. **IS 14928 : 2001, Textiles — Composite synthetic fibre ropes — Specification**

This Standard specifies the requirements for composite synthetic fibre ropes made from high-tenacity polyester and polypropylene. It outlines the material composition, construction, physical properties, and performance criteria for these ropes. The standard includes test methods for assessing breaking force, elongation, and other mechanical characteristics. It also details requirements for marking, packaging, and storage. The composite ropes are designed for general-purpose use, combining the strength of polyester with the buoyancy of polypropylene. This standard ensures consistency, safety, and quality in the manufacturing and application of these ropes.

8. **IS 14929 : 2022 Mixed Polyolefin Fibre Ropes (*first revision*)**

This standard specifies requirements for 3-strand hawser-laid and 4-strand shroud-laid ropes, 8-strand braided ropes and 12-strand braided ropes made of mixed polyolefin fibres. It is identical to **ISO 10572:2009**. The ropes covered in the standard shall be constructed using bi-component fibres made of a blend during extrusion of polypropylene and of polyethylene, with a minimum of 15 % and a maximum of 50 % of polyethylene.

9. **IS 17608 : 2021, Polyester fibre ropes - Double braid construction**

This Standard specifies the requirements for polyester fibre ropes with double braid construction, identical to ISO 10547:2009. It defines the structure, dimensions, linear density, and minimum breaking forces for both standard and higher-strength double braided ropes. The ropes feature an inner hollow braid (core) covered by a second braided layer (cover), with weight distribution limits between the two. It outlines manufacturing, testing methods, and permissible strand interchanges. The standard also provides designation formats and marking requirements to ensure performance, safety, and traceability in various applications.

10. **IS 17609 : 2021 Fibre Ropes of Polyester / Polyolefin Dual Fibres**

This standard specifies the requirements for fibre ropes made from a combination of polyester and polyolefin fibres, including 3-strand hawser-laid, 8-strand, and 12-strand braided constructions. It outlines the rope designation, construction types, physical properties like linear density and breaking strength, and performance classifications (standard and high-strength). The ropes use polyester cover yarns over polyolefin cores and must contain at least 40% polyester by mass. Guidelines for labelling, packaging, and testing follow ISO 9554 and ISO 2307. The standard ensures consistent quality for ropes used in general-purpose applications.

11. **IS 17929 (Part 2) : 2022, Fibre ropes for offshore station keeping Part 2: Polyester**

This Standard, identical to ISO 18692-2:2019, specifies the characteristics and testing methods for polyester fibre ropes used in offshore stationkeeping. It defines minimum requirements for breaking strength, core tenacity, dynamic stiffness, torque properties, and resistance to cyclic loading. The ropes must use high-tenacity polyester fibres and provide protection against particle ingress. It includes procedures for type and production testing and mandates certification by a recognized classification society. The standard also covers marking, labeling, and packaging requirements in accordance with IS 17929 (Part 1):2022.

12. **IS 17929 (Part 3) : 2022, Fibre ropes for offshore station keeping Part 3: High Modulus Polyethylene (HMPE)**

This Standard, identical to ISO 18692-3:2020, specifies requirements for high modulus polyethylene (HMPE) fibre ropes used in offshore stationkeeping. It outlines standards for materials, construction, and key performance characteristics such as minimum breaking strength, core tenacity, creep resistance, and cyclic loading durability. The standard mandates

protective features like torque neutrality and particle ingress protection. It also prescribes methods for type and production testing, creep evaluation, and certification procedures. Marking, labeling, and packaging must comply with general specifications outlined in Part 1 of the series.

13. **IS 17929 (Part 4) : 2024, Textiles — Fibre Ropes for Offshore Stationkeeping — Part 4 Polyarylate**

This Standard, identical to ISO 18692-4:2023, specifies the requirements for polyarylate fibre ropes used in offshore stationkeeping. It outlines the material properties, including minimum breaking strength, core tenacity, and resistance to axial compression fatigue. The standard also covers construction, torque, cyclic loading performance, and protection against particle ingress. Detailed test methods for performance evaluation are prescribed, including type tests and tests for current production. Additional annexes provide procedures for fibre qualification and guidance on axial compression fatigue. This standard ensures reliability and durability of polyarylate ropes in demanding marine environments.

14. **IS 17929 (Part 5) : 2024, Textiles — Fibre Ropes for Offshore Stationkeeping — Part 5 Aramid**

This Standard, identical to ISO 18692-5:2024, specifies the requirements for aramid fibre ropes used in offshore stationkeeping. It defines essential properties like minimum breaking strength, core tenacity, and resistance to axial compression fatigue. The ropes must demonstrate performance under cyclic loading and provide protection against particle ingress. The document outlines testing procedures including type testing, current production testing, and fibre qualification. Special attention is given to the impact of compression fatigue and methods to mitigate it. Marking, packaging, and certification requirements are also standardized.

B. LIST OF INDIAN STANDARDS ON CODE OF PRACTICE RELATED TO ROPES

1. **IS 9560 : 2023 Textiles - Colour code for identification of ropes and cordage (*first revision*)**

   This standard prescribes a colour code for the identification of ropes and cordage made from different natural and man-made fibres (covered by various Indian Standard specifications) by using yarn(s) of easily identifiable colour, placed inside the rope/cordage, or by colouring the rope/cordage entirely in the same colour.

2. **IS 4575 : 2024 Textiles - Code for handling of fibre ropes (*third revision*)**

   This Indian Standard provides guidelines for the safe handling, inspection, and maintenance of fibre ropes made from both natural and man-made fibres. It highlights causes of rope damage such as abrasion, fraying, chemical attack, heat, UV exposure, and overloading. Regular inspection protocols are recommended to detect internal and external wear, especially in hazardous applications. The standard emphasizes proper storage, safe working loads, and precautions to avoid mechanical failure. It also includes guidance on knotting, splicing, and avoiding kinks or cockles. The performance of ropes is evaluated based on fibre type, rope construction, and finishing treatments. This revision updates earlier versions with practical experience and newer related standards.

3. **IS 4145 : 2023 Textiles - Storage of ropes - Code of practice (*second revision*)**

   This Indian Standard provides guidelines for the proper storage of ropes made from both natural and synthetic fibres to minimize deterioration. It specifies optimal conditions such as cool, dry, and well-ventilated storage spaces with protection from moisture, heat, direct sunlight, and harmful chemicals. The ropes should be stacked to allow air circulation, kept away from damp conditions, and periodically inspected for microbial or mechanical damage. Recommendations are also included for storing ropes onboard ships. The standard emphasizes precautions like anti-termite treatment, use of appropriate roofing, and regular rotation of rope coils.

C. LIST OF REFERRED INDIAN STANDARDS ON TEST METHODS FOR EVALUATION OF TECHNICAL REQUIREMENTS

1. **IS 7071 : 2021 Fibre Ropes — Determination of Certain Physical and Mechanical Properties (*second revision*)**

   This Indian Standard specifies methods for determining key physical and mechanical properties of fibre ropes, including linear density, diameter, lay length, braid pitch, elongation, and breaking force. It is identical to **ISO 2307:2019**. The standard outlines testing procedures using tensile machines, appropriate sample preparation, and reference tension values. It also covers methods to assess water repellency, lubrication, and finish content upon request. The results are expressed with detailed calculation formulas and guidelines for reporting. The standard ensures uniformity and reliability in rope performance testing.