



**PRODUCT MANUAL FOR
WIRE ROPES USED IN OIL WELLS AND OIL WELL DRILLING AND
OTHER APPLICATIONS OF PETROLEUM AND NATURAL GAS
INDUSTRIES
ACCORDING TO IS 4521: 2024**

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification license/certificate.

1.	Product	:	IS 4521: 2024
	Title	:	Wire Ropes used in Oil Wells and Oil Well Drilling and other applications of Petroleum and Natural Gas Industries
	No. of Amendments	:	Nil
2.	Sampling Guidelines:		
a)	Raw material	:	Wires for ropes- Cl. 4.1 of IS 6594 Wires for guy strands- as per Cl. 6.1 of IS 4521 Fiber core- as per IS 1804 Steel Core- as per Cl. 4 and 6.3.2 of IS 6594
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	Mechanical Tests: 4 meter Chemical Tests: 5 pieces of 5cm x 5cm
3.	List of Test Equipment	:	Please refer ANNEX – B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX –C
5.	Possible tests in a day :		Size (Cl. 4), General requirements (Cl. 6), Tests on wire prior to rope manufacture (Cl. 10.1 of IS 6594)
6.	Scope of the Licence :		Please refer ANNEX –D

ANNEX--A

GROUPING GUIDELINES

1. IS 4521: 2024 covers Wire Ropes used in Oil Wells and Oil Well Drilling and other applications of Petroleum and Natural Gas Industries, which are classified into different varieties based on the following:
 - a) Construction (as per Cl. 4)
 - b) Rope/Strand Grade – 450/ 1230/ 1570/ 1770/ 1960/2160/IPS/EIP/EEIP
or any intermediate Rope grade (up to 2160 grade) as per Cl. 4 and Cl. 9 of IS 4521
 - c) Core – Fibre/ Steel or any other type of core as per Cl. 4 and Cl. 6.2 of IS 4521
 - d) Size (Nominal Diameter)
In addition to the size ranges given in Table 1 to 11 of IS 4521, other sizes of ropes may also be manufactured as agreed between manufacturer and purchaser as per Cl. 4 of IS 4521
 - e) Galvanized/ Ungalvanized (Bright)
2. Considering the above, the following grouping guidelines shall be followed for GoL/CSoL:
 - i) Sample of each Construction shall be drawn and tested for all the requirements.
 - ii) Separate samples of Wire Rope of each rope grade shall be tested for all the requirements.
 - iii) Sample of highest size (nominal diameter) from the offered size range shall be drawn to cover all sizes below the tested size.
 - iv) Separate samples of Wire Rope with each core type (Fibre/ Steel or any other type of core as per Cl. 4 and Cl. 6.2 of IS 4521), shall be drawn and tested for all requirements. Firm shall declare the type of core for each variety of wire rope.
 - v) However, ungalvanized steel wire rope may be covered if galvanized steel wire rope of that particular variety is tested.
3. The Firm shall declare the Varieties of various Wire Ropes they intend to cover in the Licence. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
4. During the operation of license, it shall be ensured that all varieties covered in the license are tested in rotation, to the extent possible.

ANNEX--B**List of Test Equipment***Indicative list of major test equipment required to test as per the Indian Standard*

Sr No	Tests used in with clause reference	Test equipment
1	Minimum breaking force - Cl. 5, 6	Tensile testing machine / Breaking Load Testing Machine
2	Torsion test - Cl. 6 (Cl. 10.3.3 of IS 6594, 12.3 of IS 1835)	Torsion testing machine
3	Measurement of mass - Table 1 to 13	Weighing balance
4	Reverse Bend Test (Cl. 10.3.4 of IS 6594)	Bend testing machine
5	Rope size and Tolerance Dimensions - (Cl. 4 of IS 4521, Cl. 5 & Annex B of IS 6594)	Vernier caliper, Micrometer
6	Length of rope - Cl. 6.4 of IS 6594	Measuring tape / Length Counter meter
7	Tests for Galvanizing (Cl. 10.3.5 of IS 6594 ; Cl. 11, 12.6 of IS 1835)	Weighing balance, Chemicals, mandrels of suitable size etc.
8	Wrapping test (Cl. 12.5 of IS 1835)	Suitable fixture

The above list is indicative only and may not be treated as exhaustive.

ANNEX C**Scheme of Inspection and Testing****1. QUALITY ASSURANCE PLAN**

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Assurance Plan i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan defining the control unit i.e. Batch and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4 below.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 **Control Unit:** For the guidance of manufacturers, the recommended definition of Control Unit is All the wire ropes of same nominal diameter and grade manufactured using the same set of strands and same type of core under identical condition of production.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**.

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in-house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer, and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates routine tests where test equipment is required in-house as “R” or other tests which can be sub-contracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as “R” in Column 2 of Table 1) is also optional.

2.2.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as “R” in Column 2 of Table 1), where different tests given in the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.4 TEST RECORDS- The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. LABELLING AND MARKING – As per the requirement of IS 4521:2024. The Standard Mark, as given in the Schedule of the licence, shall be marked on a metal tag attached to each reel or drum on which ropes are coiled, provided always that the product thus marked conforms to all the requirement of the specification. In addition, the licence no. CM/L-_____ and details of BIS website shall be marked at an appropriate place on product or package as follows: “For details of BIS certification please visit www.bis.gov.in”.

3.1 TEST CERTIFICATE: In addition a certificate of conformance shall also be supplied along with each consignment of wire ropes as per format given in **Annexure- I**, copies of all such certificates be preserved for future reference.

4. REJECTION - All the production which conforms to the Indian Standard and covered under scope of the licence shall be marked with Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act,2016.

TABLE 1

(1)				(2)	(3)		
Test Details					Levels of Control		
Clause	Requirement	Test Methods		Test equipment requirement Required (R) or Sub-contracting permitted (S)	No. of Sample	Frequency	Remarks
		Clause	Reference				
4	Size	4 Annex B	IS 4521 IS 6594	R	Manufacturer shall exercise adequate levels of control to ensure that entire production should conform to the Standard. Appropriate records of testing indicating conformity shall be maintained		
5	Minimum Breaking Force	5, Table 1 to 10 Annex C	IS 2266 IS 6594	R	One	Each Control Unit	
6	General Requirements						
-	Material	4.1 6.1	IS 6594 IS 4521	S	One	Each heat	No testing is required if the material is ISI Marked or accompanied with a test certificate.
-	Length	6.4	IS 6594	R	Manufacturer shall exercise adequate levels of control to ensure that entire production should conform to the Standard. Appropriate records of testing indicating conformity shall be maintained		
-	Approximate Mass	Table 1 to Table 10 6.5	IS 4521 IS 6594	R			

-	Lay of rope	6.5 6.7	IS 4521 IS 6594	R	Manufacturer shall exercise adequate levels of control to ensure that entire production should conform to the Standard. Appropriate records of testing indicating conformity shall be maintained		
-	Length of lay	6.6	IS 4521	R			
-	Joints	6.3 6.8	IS 4521 IS 6594	R			
-	Freedom from defects	7	IS 6594	R			
-	Performing	8	IS 6594	R	One	Every loading length subject to a max. of 5 T	-
-	Lubrication	9	IS 6594	R	Each rope	-	-
-	Tests on wire prior to Rope Manufacture as per 10.1 of IS 6594						
-	a) Diameter	10.1	IS 1835	R	One	Each coil from which a construction and size is made	For individual wires one sample from one end of each coil wound round the bobbins for each size shall be tested for all the tests laid down. If a sample fails in any of the requirements, the particular coil shall be rejected
-	b) Tensile strength	12.2	IS 1835	R	One		
-	c) Torsion test	12.3	IS 1835	R	One		
-	d) Reverse bend test	12.4	IS 1835	R	One		
-	e) Wrapping test*	12.5	IS 1835	R	One		
-	f) Galvanizing test	11, 12.6	IS 1835	R	One		

	Tests on individual Wires*	10.3	IS 6594	-			
-	a) Tensile strength	10.3.2	IS 6594	R	As per Cl. 10.3.1.1 & 10.3.1.2 of IS 6594 (as applicable)	Each coil from which a construction and size is made	
-	b) Torsion test	10.3.3	IS 6594	R			
-	c) Reverse bend test	10.3.4	IS 6594	R			
-	d) Galvanizing test	10.3.5	IS 6594	R			
-	e) Diameter of wire	10.3.6	IS 6594	R			

* To be done only when specified by purchaser.

ANNEXURE- I
(Para 3.1 of Scheme of Inspection and Testing)

Test Certificate (Name of licensee with Address)



Purchaser_____

Certificate No._____

Order No._____

Date _____

We certify that the wire ropes mentioned below conform to IS 4521:2024. Properties of the Product as tested in accordance with scheme of Inspection & Testing contained in BIS Certification Marks License No.CM/L_____are as indicated against each reel/Drum etc. as applicable

{PLEASE REFER TO IS 4521:2024 FOR DETAILS OF SPECIFICATION REQUIREMENTS}

Test Results

Dru m/R eel No.	Quantity (Tons)	Type	construction	Coating	Lay	Rope grade	Core	Size	Length	Breaking Load

Authorized Signatory of the firm

(Designation)

ANNEX D**Scope of Licence**

“Licence is granted to use Standard Mark as per IS 4521: 2024 with the following scope:

Name of the product	Wire Ropes used in Oil Wells and Oil Well Drilling and other applications of Petroleum and Natural Gas Industries
Size	
Construction	
Core	
Rope Grade	
Whether Galvanized or Ungalvanized	