Edition: February 2025

HIGH-PERFORMANCE ELEVATOR ROPES

IPH®

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IPH ROPE GRADE EQUIVALENTS

Rope grade	Wire tensile strength		Rope grade value	
	Outer [N/mm²]	Inner [N/mm²]	Newtons [N/mm²]	PSI
Traction	1370	1770	1500	210000
Extra High Strength (EHS)	1570	1770	1670	234000
	1770	1770	1770	248000

IPH'S HISTORY

Founded in 1949 in Buenos Aires, Argentina, IPH has become a leading manufacturer of steel wire ropes in the Americas. Over the years, IPH has built a reputation for delivering solutions to meet the most demanding industry requirements, supported by continuous investment in infrastructure, technology, and research and development.

IPH operates a state-of-the-art facility in Buenos Aires, featuring 484,000 square feet of production space and a monthly capacity of 1,600 tons. Combining cutting-edge technology, highly skilled personnel, and a robust quality management system that adheres to international standards, IPH delivers reliable and high-performance products tailored to the specific needs of various industries.

Our products are designed to excel in applications such as elevators, oil and gas, mining, fishing, energy transport, aerial tramways, port terminals, cranes, and large-scale hoisting.

At IPH, customer satisfaction is a priority. We provide personalized technical support, tailored training programs, and a focus on the efficient and safe operation of our products. These high standards have allowed IPH to distribute its products globally, reaching competitive markets across five continents.

For over 75 years, IPH has upheld a business philosophy rooted in quality and innovation, transforming the company into the global leader it is today.

SAN MIGUEL PLANT, BUENOS AIRES, ARGENTINA.

BELLA VISTA SERVICE CENTER, ARGENTINA.

ITAPEVI SERVICE CENTER, SAO PAULO, BRAZIL.

INDUSTRIES WE SERVE:

ELEVATORS

CRANES

IRON & STEEL INDUSTRY

MINING

OIL AND GAS

CABLEWAY

FISHING

GENERAL PURPOSE

INFRASTRUCTURE

STEEL WIRE ROPE
for North American Elevators

Elevators are the most widely used form of transportation globally. As buildings continue to rise taller around the world, the demand for enhanced safety and comfort grows every day. At IPH, we manufacture and certify our products in compliance with ASME A17.6 and ISO 4344 standards, ensuring the design and construction of steel wire ropes tailored to each specific market and application.

With over 30 years of experience in the elevator industry, IPH combines expertise and advanced technology to develop steel wire ropes that meet the highest international standards. Our products are exported to key markets in Latin America, Europe, the U.S., and Asia, serving a global clientele.

Our vertical integration allows us to produce much of the raw materials used in our steel wire ropes, including sisal cores, individual wires, and even the wooden reels on which they are delivered. This level of control provides the flexibility to create custom rope combinations, ensuring tailored solutions for diverse elevator systems while maintaining the highest standards of quality.

IPH QUALITY

The quality certificate issued by IPH guarantees traceability and compliance with both national and international standards. These standards are applied at every stage of the manufacturing process, from raw material reception to the final product.

MANAGEMENT SYSTEM CERTIFICATIONS:

American Petroleum Institute, API Monogram Spec Q1, Spec 9A.
TÜV Rheinland, ISO 9001:2015.
Fundaçao Vanzolini NBR, ISO 9001:2015.

WIRE ROPES SPECIFIC CERTIFICATIONS:

Marine use
Lloyd's Register plant certification.

Elevators
IRAM-INTI and IRAM 840 product certification.

General purpose
ABNT NBR and ISO 2408 product certification.

Proud members of:

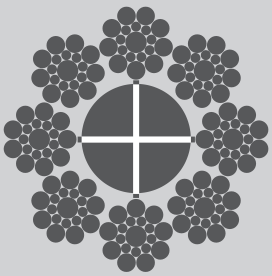
Associated Wire Rope Fabricators

National Association of Elevator Contractors

AWRF

NAEC
National Association of Elevator Contractors

HOIST AND COMPENSATING ROPES FOR CONVENTIONAL ELEVATORS



IPH 819E

8x19 Natural fiber core

Advantages and features

- Lubricated high density natural fiber core made of sisal with perfect diameter uniformity.
- High resistance to bending fatigue.
- Diameter uniformity assures a smooth run, free from vibration and noise.
- Specially formulated lubricant made for traction sheaves.
- The tensile strength resistance of the "dual" wires, with inner wires of 1770 N/mm² raises the overall resistance while the outer wires of 1370 N/mm² minimizes the wear on the sheaves.

For conventional elevators, we recommend our 8x19 traction rope with a sisal fiber core, expertly manufactured in our facilities. Engineered for exceptional fatigue resistance, it meets the highest international standards for safety and durability. The sisal fiber core provides added flexibility, ensuring smooth, quiet operation and reduced wear on sheaves. Its versatile design makes it suitable for a wide range of elevator systems, offering reliable performance in diverse applications and maximizing service life.

Elastic Behavior

Diameter tolerance	Constructional stretch	Elastic stretch	Total stretch	E-Module
[No load]: +2/ +5% [At 10% MBL]: 0/ +3%	Max. 0.6%	Max. 0.2%	Constructional + Elastic	5000 daN/mm²

8X19 TRACTION STEEL (TS)

Minimum breaking load

Diameter		Weight		IPH code	1370/1770 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
9.50	3/8	0.307	0.206	00470013095005ND	41.5	9,300
10.00	-	0.340	0.228	00470013100005ND	46.0	10,300
11.00	7/16	0.411	0.276	00470013110005ND	55.7	12,500
12.00	-	0.490	0.329	00470013120005ND	66.2	14,900
12.70	1/2	0.548	0.368	00470013130005ND	77.7	17,500
13.00	-	0.575	0.386	00470013130064ND	81.4	18,300
14.30	9/16	0.685	0.460	00470013143005ND	99.0	22,300
16.00	5/8	0.870	0.585	00470013160005ND	118	26,500
17.50	11/16	1.040	0.699	00470013175005ND	141	31,700
18.00	-	1.100	0.739	00470013180005ND	149	33,500
19.00	3/4	1.230	0.827	00470013190005ND	166	37,300
22.00	7/8	1.650	1.109	00470013220005ND	223	50,100

8X19 EXTRA HIGH STRENGTH (EHS)

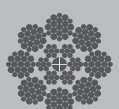
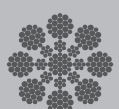
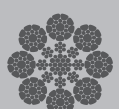
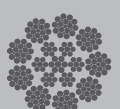
Minimum breaking load

Diameter		Weight		IPH code	1770 N/mm²	
[mm]	[inches]	[kg/m]	[lb/ft]		[kN]	[lbs]
9.50	3/8	0.307	0.206	00470013095005QD	46.8	10,500
10.00	-	0.340	0.228	00470013100005QD	51.9	11,700
11.00	7/16	0.411	0.276	00470013110005QD	62.8	14,100
12.00	-	0.490	0.329	00470013120005QD	74.7	16,800
12.70	1/2	0.548	0.368	00470013130005QD	87.6	18,800
13.00	-	0.575	0.386	00470013130064QD	91.8	20,600
14.30	9/16	0.685	0.460	00470013143005QD	106	23,800
16.00	5/8	0.870	0.585	00470013160005QD	133	29,900
17.50	11/16	1.040	0.699	00470013175005QD	159	35,700
18.00	-	1.100	0.739	00470013180005QD	169	37,800
19.00	3/4	1.230	0.827	00470013190005QD	187	42,000
22.00	7/8	1.650	1.109	00470013220005QD	251	56,400

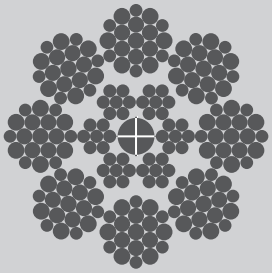
Construction: 8x19 Seale.
Core: Natural fiber core.
Coating: Bright lubricated (galvanized on demand).
Rope grade: 1370/1770 N/mm² Dual tensile (TS) or 1770 N/mm² Single tensile (EHS).
Lay Type: RRL (RLL on demand).
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

CHOOSING THE RIGHT WIRE ROPE

Selecting the right wire rope is essential for ensuring optimal performance, safety, and longevity in elevator systems. While building type and elevator speed are important, other factors such as load requirements, drive sheave configuration, rope construction, and environmental conditions also play a critical role.

HIGH-RISE					✓	✓	✓
MID-RISE			✓	✓	✓		
LOW-RISE	✓	✓	✓	✓			
HIGH SPEED			✓	✓	✓	✓	
NORMAL SPEED	✓	✓	✓	✓			
WIRE ROPE	 8x19 + AFN	 8x19C + AFN	 8x25F + AFN	 8x19 + AACM	 8x19 + AAC	 8x19C + AAC	 9x21F + AAC

HOIST AND COMPENSATING ROPES FOR MID / HIGH-RISE ELEVATORS



IPH 819SR

8x19 Steel-reinforced natural fiber core

Advantages and features

- Special steel reinforced fiber core provides both flexibility and good elastic properties (low elongation).
- Good resistance to bending fatigue and abrasion.
- High breaking load.
- Excellent diameter stability, minimizes vibrations and noise.

Elastic Behavior

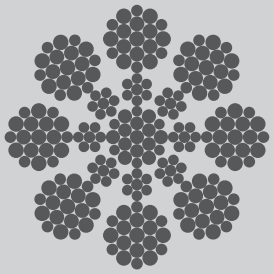
Diameter tolerance	Constructional stretch	Elastic stretch	Total stretch	E-Module
[No load]: 0/ +3% [At 10% MBL]: -1%	Max. 0.3%	Max. 0.18%	Constructional + Elastic	7000 daN/mm²

Minimum breaking load

Diameter		Weight		IPH code	1570 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
8.00	5/16	0.265	0.178	00470053080005OD	40.5	9,100
9.50	3/8	0.374	0.252	00470053095005OD	56.9	12,800
10.00	-	0.415	0.279	00470053100005OD	63.0	14,200
11.00	7/16	0.502	0.337	00470053110005OD	76.1	17,100
12.00	-	0.598	0.402	00470053120005OD	90.7	20,400
12.70	1/2	0.669	0.450	00470053127005OD	101	22,700
13.00	-	0.702	0.472	00470053130005OD	107	24,100
16.00	5/8	1.061	0.713	00470053160005OD	161	36,200
17.50	11/16	1.269	0.853	00470053175005OD	193	43,400
18.00	-	1.346	0.905	00470053180005OD	204	45,900
19.00	3/4	1.499	1.008	00470053190005OD	227	51,000

Construction: 8x19 Seale (Warrington or Filler construction on demand).
Core: Steel reinforced fiber core.
Coating: Bright lubricated (galvanized on demand).
Rope grade: 1570 N/mm² - Single tensile.
Lay Type: RRL (RLL on demand).
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

HOIST AND COMPENSATING ROPES FOR HIGH SPEED ELEVATORS



IPH 819FS

8x19 Independent wire rope core (IWRC)

Advantages and features

- Independent wire rope core combines good flexibility and minimizes rope stretch.
- High resistance to bending fatigue and abrasion.
- High breaking load.
- Excellent diameter stability, minimizes vibration and noise on high rise elevators.
- Provides long service rope life.

Elastic Behavior

Diameter tolerance	Constructional stretch	Elastic stretch	Total stretch	E-Module
[No load]: 0/ +3% [At 10% MBL]: -1%	Max. 0.12%	Max. 0.18%	Constructional + Elastic	7000 daN/mm²

Minimum breaking load

Diameter		Weight		IPH code	1570 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
8.00	5/16	0.265	0.178	00470033080005OD	41.1	9,200
9.50	3/8	0.374	0.252	00470033095005OD	58.0	13,000
10.00	-	0.415	0.279	00470033100005OD	64.3	14,500
11.00	7/16	0.502	0.337	00470033110005OD	77.7	17,500
12.00	-	0.598	0.402	00470033120005OD	92.5	20,800
12.70	1/2	0.669	0.450	00470033127005OD	104	23,400
13.00	-	0.702	0.472	00470033130005OD	109	24,500
16.00	5/8	1.061	0.713	00470033160005OD	164	36,900
17.50	11/16	1.269	0.853	00470033175005OD	197	44,300
18.00	-	1.346	0.905	00470033180005OD	208	46,800
19.00	3/4	1.499	1.008	00470033190005OD	232	52,200

Construction: 8x19 Seale (Warrington or Filler construction on demand).
Core: Independent wire rope core (IWRC).
Coating: Bright lubricated (galvanized on demand).
Rope grade: 1570 N/mm² - Single tensile.
Lay Type: RRL (RLL on demand).
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

HIGH PERFORMANCE ROPES

IPH 819EC

8x19 Compacted strands

Advantages and features

- Lubricated high density sisal fiber core with perfect diameter uniformity.
- Increase of metallic area due to the compacted strands. Increase of breaking load and lower elongation.
- Higher resistance to bending fatigue which increases rope service life.
- Compacted strands improve abrasion resistance and minimizes vibration and noise on ride.

Elastic Behavior

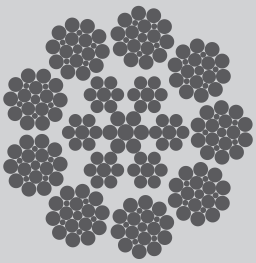
Diameter tolerance	Constructional stretch	Elastic stretch	Total stretch	E-Module
[No load]: 2/ +5% [At 10% MBL]: 0/ +3%	Max. 0.6%	Max. 0.2%	Constructional + Elastic	5000 daN/mm²

Minimum breaking load

Diameter		Weight		IPH code	1570 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
12.70	1/2	0.600	0.403	00471013127005OD	86.0	19,300
13.00	-	0.630	0.423	00471013130005OD	90.2	20,300
16.00	5/8	0.950	0.638	00471013160005OD	136	30,600
17.50	11/16	1.140	0.766	00471013175005OD	163	36,600
18.00	-	1.200	0.808	00471013180005OD	172	38,700
19.00	3/4	1.340	0.900	00471013190005OD	192	43,200

Construction: 8xK19 Seale
Core: Natural fiber core
Coating: Bright lubricated (galvanized on demand).
Rope Grade: 1570 N/mm² - Single tensile
Lay Type: RRL (RLL on demand).
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in the catalog, please contact IPH.

HIGH PERFORMANCE ROPES



IPH 921S

9x21 Independent wire rope core (IWRC)

Advantages and features

- 9 strand configuration with steel core provides a highly rounded surface.
- Increasing the number of wires makes rope more flexible.
- Decreases contact pressure on groove with less sheave wear.
- Increase of bending fatigue resistance.
- Very good diameter stability during service.

Elastic Behavior

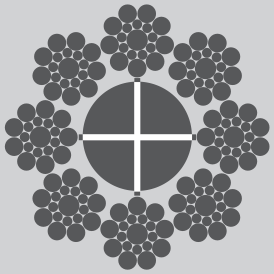
Diameter tolerance	Constructional stretch	Elastic stretch	Total stretch	E-Module
[No load]: 0/ +2% [At 10% MBL]: -1%	Max. 0.10%	Max. 0.12%	Constructional + Elastic	9000 daN/mm²

Minimum breaking load

Diameter		Weight		IPH code	1570 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
9.50	3/8	0.380	0.255	00524033095005OD	60.0	13,500
10.00	-	0.420	0.282	00525033100005OD	67.0	15,100
11.00	7/16	0.510	0.343	00525033110005OD	81.0	18,200
12.00	-	0.600	0.403	00525033120005OD	96.4	21,700
12.70	1/2	0.670	0.450	00525033127005OD	108	24,300
13.00	-	0.710	0.477	00525033130005OD	113	25,400
16.00	5/8	1.070	0.719	00525033160005OD	172	38,700
17.50	11/16	1.280	0.860	00525033175005OD	206	46,300
18.00	-	1.350	0.907	00525033180005OD	218	49,000
19.00	3/4	1.510	1.015	00525033190005OD	242	54,400
22.00	3/4	2.020	1.357	00525033220005OD	325	73,100

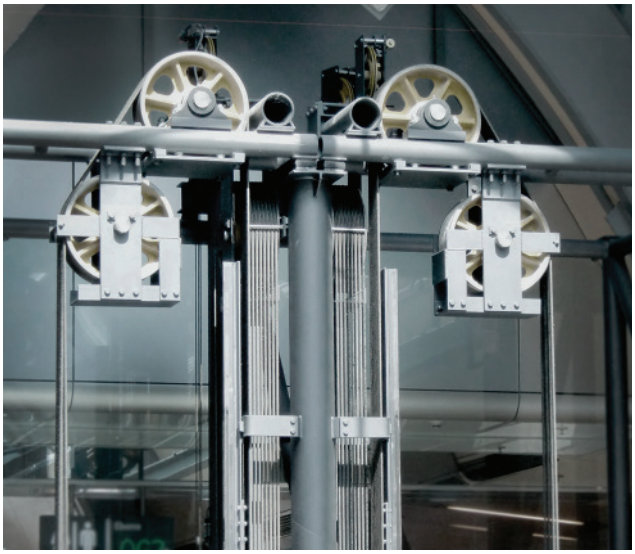
Construction: 9x19 Seale or 9x21 Filler (depending on diameter).
Core: Independent wire rope core (IWRC).
Coating: bright lubricated (galvanized on demand).
Rope grade: 1570 N/mm² - Single tensile.
Lay Type: RRL (RLL on demand).
Normative Reference: ISO 1311/ ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

COMPENSATING ROPES WITH SYNTHETIC FIBER CORE



IPH 819COMP

8x19 Synthetic fiber core (SFC)



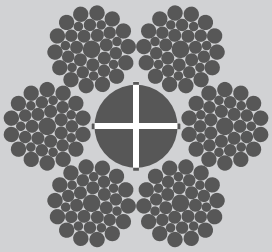
Elastic Behavior

Constructional stretch	Elastic stretch	Total stretch	E-Module
Max. 0.6%	Max. 0.2%	Constructional + Elastic	5000 daN/mm²

Diameter		Weight		IPH code	Minimum breaking load 1370/1770 N/mm²	
[mm]	[inches]	[kg/m]	[lb/ft]		[kN]	[lbs]
8.00	5/16	0.218	0.146	00470023080005ND	29.4	6,600
9.50	3/8	0,307	0.206	00470023095005ND	41.5	9,300
10.00	-	0.340	0.228	00470023100005ND	46.0	10,300
11.00	7/16	0.411	0.276	00470023110005ND	55.7	12,500
12.00	-	0.490	0.329	00470023120005ND	66.2	14,900
12.70	1/2	0.548	0.368	00470023127005ND	74.2	16,700
13.00	-	0.575	0.386	00470023130005ND	77.7	17,500
16.00	5/8	0.870	0.585	00470023160005ND	118	26,500
17.50	11/16	1.040	0.699	00480023175005ND	141	31,700
18.00	-	1.100	0.739	00480023180005ND	149	33,500
19.00	3/4	1.230	0.827	00480023190005ND	166	37,300
22.00	3/4	1.650	1.109	00480023220005ND	223	50,100

Construction: Class 8x19 (Seale or Filler construction depending on diameter).
Core: Synthetic fiber core.
Coating: Bright lubricated (galvanized on demand).
Rope grade: 1370/1770 N/mm² - Dual tensile.
Lay Type: RRL.
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

COMPENSATING ROPES



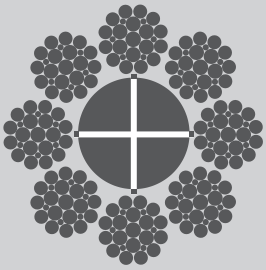
IPH 636

6x36 Synthetic fiber core

Diameter	Weight		IPH code	Minimum breaking load 1960 N/mm²	
[mm]	[kg/m]	[lb/ft]		[kN]	[lbs]
16.00	0.920	0.618	00320023160006SB	166	37,300
18.00	1.160	0.779	00320023180006SB	210	47,200
19.00	1.300	0.874	00320023190006SB	232	52,200
20.00	1.440	0.968	00320023200006SB	259	58,200
22.00	1.740	1.169	00320023220006SB	313	70,400
24.00	2.110	1.418	00320023240006SB	373	83,900
25.00	2.290	1.539	00320023250006SB	404	90,800
26.00	2.480	1.666	00320023260006SB	437	98,200
27.00	2.680	1.801	00320023270006SB	472	106,100
28.00	2.880	1.935	00320023280006SB	507	114,000
29.00	3.090	2.076	00320023290006SB	544	122,300
30.00	3.300	2.217	00320023300006SB	582	130,800
31.00	3.530	2.372	00320023310006SB	622	139,800
32.00	3.760	2.527	00320023320006SB	662	148,800
33.00	4.000	4.240	00320023330006SB	704	158,300
34.00	4.240	2.849	00320023340006SB	748	168,200
35.00	4.500	3.024	00320023350006SB	792	178,000
36.00	4.760	3.199	00320023360006SB	838	188,400
37.00	5.020	3.373	00320023370006SB	885	198,900
38.00	5.300	3.561	00320023380006SB	934	210,000

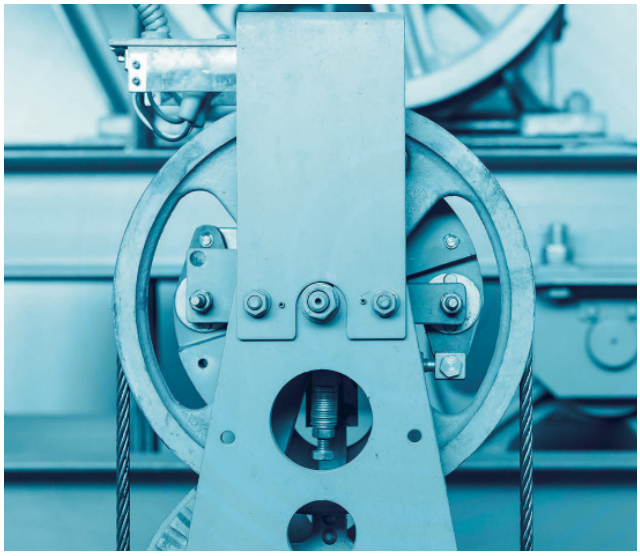
Construction: 6x36.
Core: Synthetic fiber core.
Coating: bright lubricated (galvanized on demand).
Rope grade: 1960 N/mm² - Single tensile.
Lay Type: RRL.
Normative Reference: ISO 4344 / ISO 2408.
For other rope diameters or grades not specified in this chart, please contact IPH.

GOVERNOR ROPES



IPH 825E

8x25 Synthetic fiber core



Minimum breaking load

Diameter		Weight		IPH code	1370 / 1770 N/mm²	
[mm]	**[inches]**	**[kg/m]**	**[lb/ft]**		**[kN]**	**[lbs]**
9.50	3/8	0.307	0.206	00470023095005ND	41.5	9,300
12.70	1/2	0.548	0.386	00470023130005ND	77.7	17,500
16.00	5/8	0.870	0.585	00470023160005ND	118	26,500
17.50	11/16	1.040	0.699	00480023175005ND	141	31,700
18.00	-	1.100	0.739	00480023180005ND	149	33,500
19.00	3/4	1.230	0.827	00480023190005ND	166	37,300

Construction: 8x25 Filler.
Core: Synthetic fiber core.
Coating: Bright lubricated (galvanized on demand).
Rope Grade: 1370/1770 N/mm² - Dual tensile.
Lay Type: RRL.
Normative Reference: ISO 4344 / ASME A17.6
For other rope diameters or grades not specified in this catalog, please contact IPH.

PROCESS AND QUALITY CONTROL

We take pride in our detailed process control, ensuring the highest product quality through:

1. **Traceability and Certification:**
Full documentation and adherence to industry standards for every product.
2. **Customized Engineering Design:**
Tailored solutions to meet the unique needs of each customer.
3. **Skilled Staff:**
A knowledgeable team that ensures rigorous quality at every step.
4. **Expert Customer Advice:**
Providing informed guidance for optimal product use.

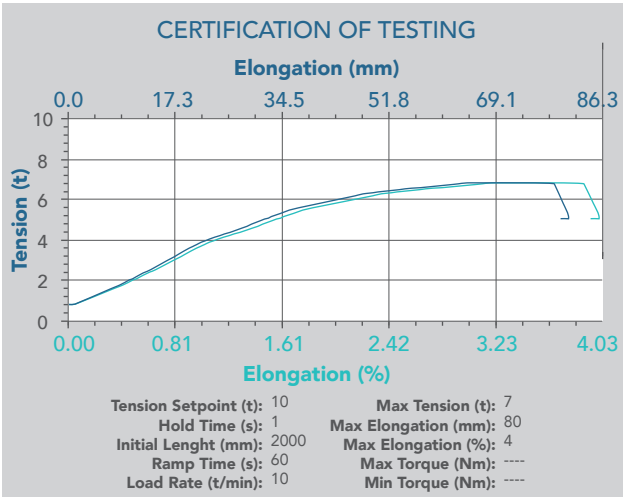
Our process control covers key factors such as:

- **Metallographic Properties:** Grain size, structure, and material integrity.
- **Mechanical Properties:** Tensile strength, hardness, ductility, fatigue, and torsion.
- **Chemical Properties:** Composition, coating control, and lubrication.
- **Dimensional Properties:** Precision in diameter, density, length, and helix preforming.

These stringent controls are applied at every stage of production, from raw material to the finished rope, ensuring reliability and performance in every product.

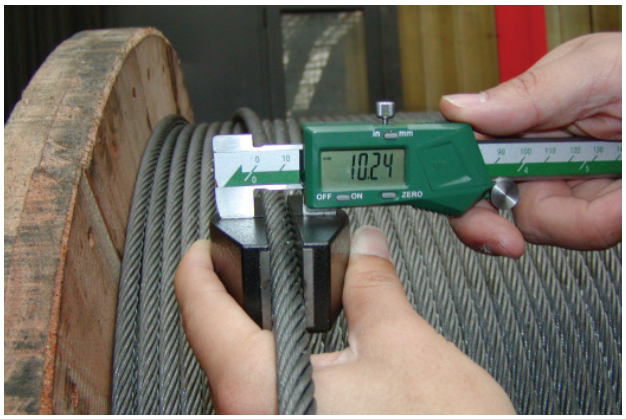
TENSILE STRENGTH / ELONGATION TESTS

In tensile strength test benches, diameter reduction under load and elongation is monitored.



FINAL INSPECTION

Dimensional controls, a complete visual inspection and a verification of the production records are carried out at this stage.



FATIGUE TESTS

Our specialized bending fatigue benches simulate real-world stresses, such as repeated bending and load variations, to ensure the durability and reliability of our ropes. This rigorous testing process verifies product stability and performance under demanding conditions, ensuring every rope meets the highest quality standards.

INSTALLATION & MAINTENANCE MANUAL

Elevators are the most frequently used mode of transportation worldwide, moving millions of people daily. As urban landscapes continue to rise with ever-taller buildings, ensuring the safety, reliability, and comfort of elevator systems is more critical than ever.

At IPH, we understand the importance of elevator rope performance in ensuring the smooth and safe operation of these systems. To maximize the service life of elevator ropes and minimize the risk of operational failures, we have compiled a comprehensive set of best practices for their installation and maintenance.

By following these guidelines, you can enhance rope longevity, maintain safety standards, and ensure optimal performance under all operating conditions.

Wire Rope Installation

Proper installation of elevator ropes is essential for ensuring safe and long-lasting operation. It's crucial to follow the manufacturer's guidelines and inspect the ropes for any damage before starting the installation process. Failure to do so can lead to performance issues and reduced rope lifespan.

1.1 Storage

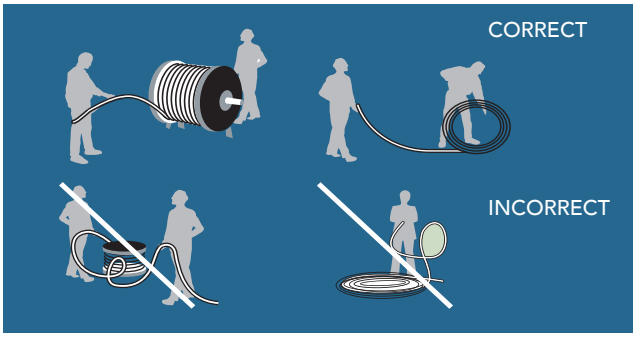
Proper storage of elevator ropes is crucial to prevent damage and ensure long-term performance. Follow these guidelines to maximize rope longevity.

- Store ropes in a well-ventilated, dust-free area, away from moisture, chemicals, or fire hazards.
- Rotate the rope reel 180° every six months to avoid deformation.
- Ensure ropes are not in direct contact with the ground to prevent contamination.
- Regularly inspect stored ropes for rust or external damage, which are common issues during storage.
- Sisal core ropes require special care as they are sensitive to moisture, which can degrade the natural fibers.

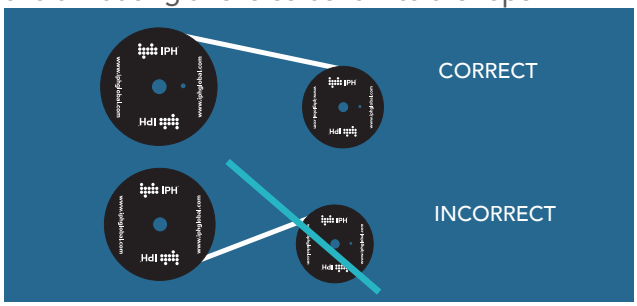
1.2 Handling

Proper handling of wire rope is essential to ensure its safety, performance, and longevity, as even minor damage during installation or use can lead to significant wear, reduced strength, and potential failure.

- It's very important to prevent torsion during unwinding and installation. Twisting can compromise the rope's structural integrity
- When transferring the rope from a reel to the sheave, avoid introducing a reverse bend into the



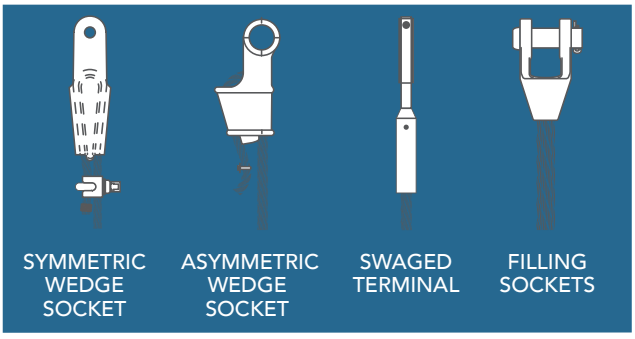
When transferring from a coil to the drive sheave avoid inducing a reverse bend into the rope.



1.3 End Terminations

All terminations should meet the required industry standards, such as those specified by ISO, ASME, or local elevator codes. It is important to use only high-quality, certified terminations that are suited for elevator use.

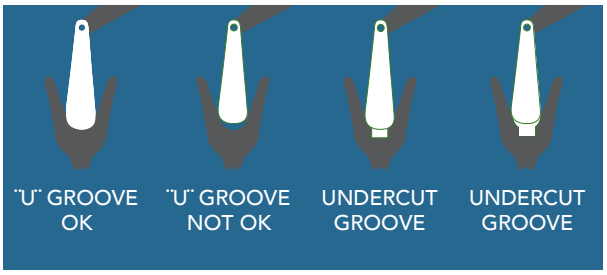
Regularly inspect the terminations for signs of wear, deformation, corrosion, or slippage. Worn or damaged terminations can result in loss of strength and increased risk of failure.



1.4 Replacing Ropes on Existing Installations

Before replacing ropes, inspect the sheave grooves for wear.

Re-groove or replace sheaves if wear is evident, as uneven grooves can affect performance and safety.



Example of wear defects on grooves.Reference: Range of traction sheave hardness according to rope grade (Tensile strength of outer wires)

Minimum tensile grade Outer wires [N/ mm²] Length	Sheave hardness [HB] Length
1118	190-220
1370	200-230
1570	210-240
1670	220-250
1770	230-270
1960	240-280
2050	250-300

1.5 Rope Surface Line

IPH hoist ropes feature a white painted line to help installers detect if ropes have twisted during installation. After installation, run the elevator and count the number of rotations of the surface line. The number of twists per 100 feet (30 meters) should not exceed:

1.5 twists for ropes with 1:1 roping.

3.0 twists for ropes with 2:1 roping.

1.6 Tension Equalization

Maintaining equal tension across all ropes is critical to extending the service life of both ropes and sheaves, while improving ride quality.

- Re-check rope tension after 4-6 weeks, 6 months, and annually.
- If tension cannot be equalized within 6 months, replace the entire set of ropes.
- Adjust rope tension by shortening loose ropes, not by twisting or unwinding them.

Common causes of Unequal Tension: Installation errors, groove wear, or variation in rope diameter and lubrication.

Consequences of Unequal Tension: Shortened rope service life, increased noise and vibration, and slippage that impacts elevator control and safety.

2.0 Wire Rope Diameter

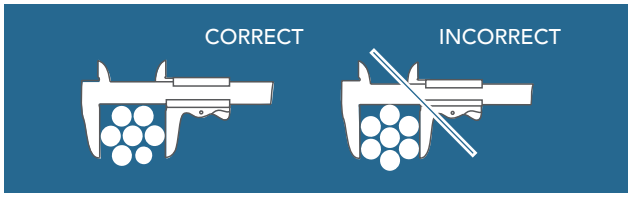
Regular inspections of wire ropes are essential to maintaining safe and reliable operation. Conduct inspections every six months, considering working conditions and usage.

WIRE ROPE INSPECTION

2.1 Wire Rope Diameter

Regular monitoring of wire rope diameter is essential for ensuring safe operation. Measuring diameter and ovality helps detect wear or damage that may compromise performance.

- Measure the rope diameter and ovality at the most worn sections.
- Take measurements at two points, spaced at least 3 feet apart, ensuring they are at right angles to the circumscribed circle.
- Replace the rope if the diameter is reduced by 6% of the nominal size.
- If proper tension equalization cannot be maintained after six months, replace the entire set of ropes.

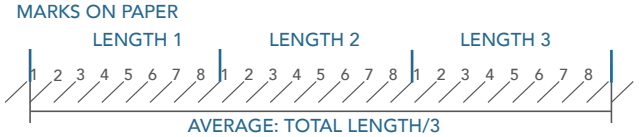


$$Rd(\%)= (nd-ad)/nd \times 100$$

Rd(%): Reduction in diameter
nd: Nominal diameter [inches]
ad: Actual diameter [inches]

2.2 Lay Length

Lay a section of paper on the wire rope and mark the crowns. Depending on the number of outer strands, the number of crowns to be measured will change. The procedure must be repeated for all the ropes. Make sure you mark off at least 3 lay lengths on each rope. Then calculate the average (Average = Total length/3). Record this information and note if the lay length of one or more ropes is considerably different than the other ropes. An increase in the lay length is related to a diameter reduction and degradation of the core of the rope.



Example of lay length measure for a 8 strands wire rope.

DISCARD CRITERIA

Discard Criteria for Elevator Ropes

Elevator ropes must be regularly inspected for signs of wear and damage. A thorough examination by a skilled professional is necessary to determine whether a set of ropes should be replaced.

• Broken wires and excessive wear are primary indicators for discarding ropes.

• Other factors include:

- Diameter reduction
- Local damage caused by metallic edges or deformations
- Waviness in the rope
- Corrosion (rouge) or excessive stretching

• If any of these conditions are present on even one single rope, the entire set of ropes should be replaced.

3.1 Broken Wires

Wire breaks are a key indicator of rope wear and can be classified into two types: crown breaks and valley breaks. Regular inspection for broken wires is essential for ensuring safe operation, and specific criteria must be followed to determine when replacement is necessary.

• Crown Breaks: Fatigue failure of the outer wire, typically following diameter reduction due to wear.

• Valley Breaks: Wire breaks that occur outside the crown wear area, while the crown wire remains intact.

Replacement should occur under the following conditions:

• Broken crown wires are randomly distributed among the strands, and the number of broken wires per rope lay in the worst section exceeds the values in "Normal Wear Conditions."

• Breaks are unevenly distributed, with crown breaks concentrated in one or two strands, exceeding the values in "Normal Wear Conditions."

• Four or more adjacent broken wires are found in any strand, with breaks exceeding "Normal Wear Conditions."

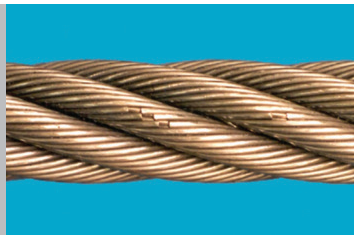
• Excessive wear, unequal tension, or poor sheave grooves are present, requiring the use of the "Unfavorable Wear Conditions" criteria.

• Red dust (rouge) is visible, and the number of broken wires exceeds the values specified in "Rope Showing Rouge."

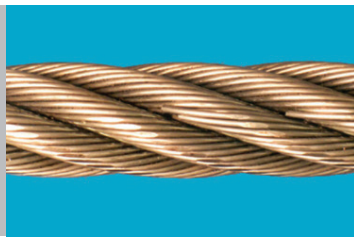
• There is more than one valley break per rope lay.

• Valley breaks occur at any location where rouge is present.

Crown Breaks:
Fatigue failure of the outer wire following a diameter reduction due to wear.



Valley Breaks:
Wire breaks that are visible and occur outside of the crown wear area with the crown wire intact.



The following chart indicates the number of visible broken wires in the worst section of the rope for different construction where replacement should take place.

Wire Breaks Crown Wire Breaks Per Lay Length			
6-Strand Rope Applications			
	Normal Wear Conditions	Unfavorable Wear Conditions	Ropes Showing Rouge
Distributed breaks (max.)	24	12	12
Unequal breaks (max.)	8	4	4
4 Side-by-Side Breaks	12	6	6
8- and 9- Strand Rope Applications			
	Normal Wear Conditions	Unfavorable Wear Conditions	Ropes Showing Rouge
Distributed breaks (max.)	32	16	16
Unequal breaks (max.)	10	5	5
4 Side-by-Side Breaks	16	8	8

3.2 Diameter Reduction

Replace the rope if the diameter is reduced by more than 6% of the nominal diameter.

3.3 Corrosion (Rouging)

Rust - occurs when moisture directly affects the metal surface.

• Rouge - caused by abrasion between the rope's wires. Rouge occurs as small metal particles from wear start to rust, often due to insufficient lubrication.

Rouging reduces the number of allowable wire breaks (see chart according to ASME A17.6, replacement criteria) as it indicates internal wear that cannot be reversed by re-lubrication. While field lubrication can slow further damage, it cannot restore the rope to its original condition once rouge is present. Detection is critical to prevent further degradation.

Steel ropes consist of numerous moving parts. For example, an 8x19 construction rope is made up of 152 wires grouped into 8 strands. Both the wires and strands experience tension and bending during operation, leading to wear from contact with each other and with sheaves.

Proper lubrication is essential to minimize friction and prevent overheating. During manufacturing, the wires and strands are pre-lubricated, with a new rope typically containing about 1.2% lubricant by weight. As the rope undergoes cycles in operation, lubricant gradually migrates to the surface. On average, a rope loses about 0.12% of its lubricant by weight every 100,000 cycles. To ensure optimal performance and extend the lifespan of both the rope and sheaves, regular re-lubrication is necessary.

Implementing a periodic inspection plan is critical. A small annual investment in lubrication can prevent costly early replacements of ropes and sheaves.

4.1 Inspections

The frequency of re-lubrication depends on environmental and operational conditions, such as temperature, humidity, elevator speed, and rope pressure. Under challenging conditions, increasing the frequency of inspections is recommended.

Field lubrication is required when the rope feels dry to the touch or at least once a year.

4.2 Lubricant Content

Maintaining the correct amount of lubricant is crucial. Insufficient lubrication increases friction and wear, raises operating temperatures, and can lead to rouging. Conversely, over-lubrication can cause rope slippage on the drive sheave, especially during acceleration and deceleration.

Lubricant can be applied using an automatic device or manually, with both methods being acceptable. As a guideline for annual re-lubrication, follow the recommended values in the table. If the rope is completely dry, double the suggested amounts.

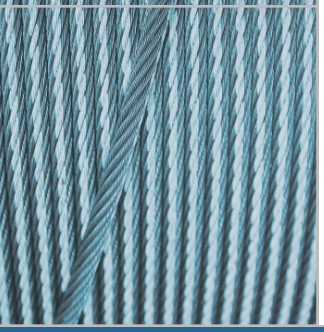
Lubrication should be applied evenly along the rope's length. Localized application can lead to dry areas and others with excess lubricant, causing uneven performance.

Rope diameter	Amount of lubrication per 100 feet
[inches]	[ounces]
3/8	1.0
1/2	1.5
5/8	2.0
11/16	2.3
3/4	2.5
7/8	2.8
1	3.0

NOTE: If the rope is completely dry to the touch, duplicate these values.

4.3 Notes

Avoid using solvents to clean ropes, as they can dissolve the lubricant embedded within the strands. Do not re-lubricate governor ropes, as lubrication can reduce friction with the drive sheave and impair the safety system.
Natural fiber core ropes offer lubrication advantages over steel core ropes. Fiber cores can retain 10-15% of their weight in lubricant and act as a self-lubricating system. Under operational pressure, the core gradually releases lubricant, enhancing rope performance and extending its lifespan.



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