# TITAN

## OIL FIELD ROPES

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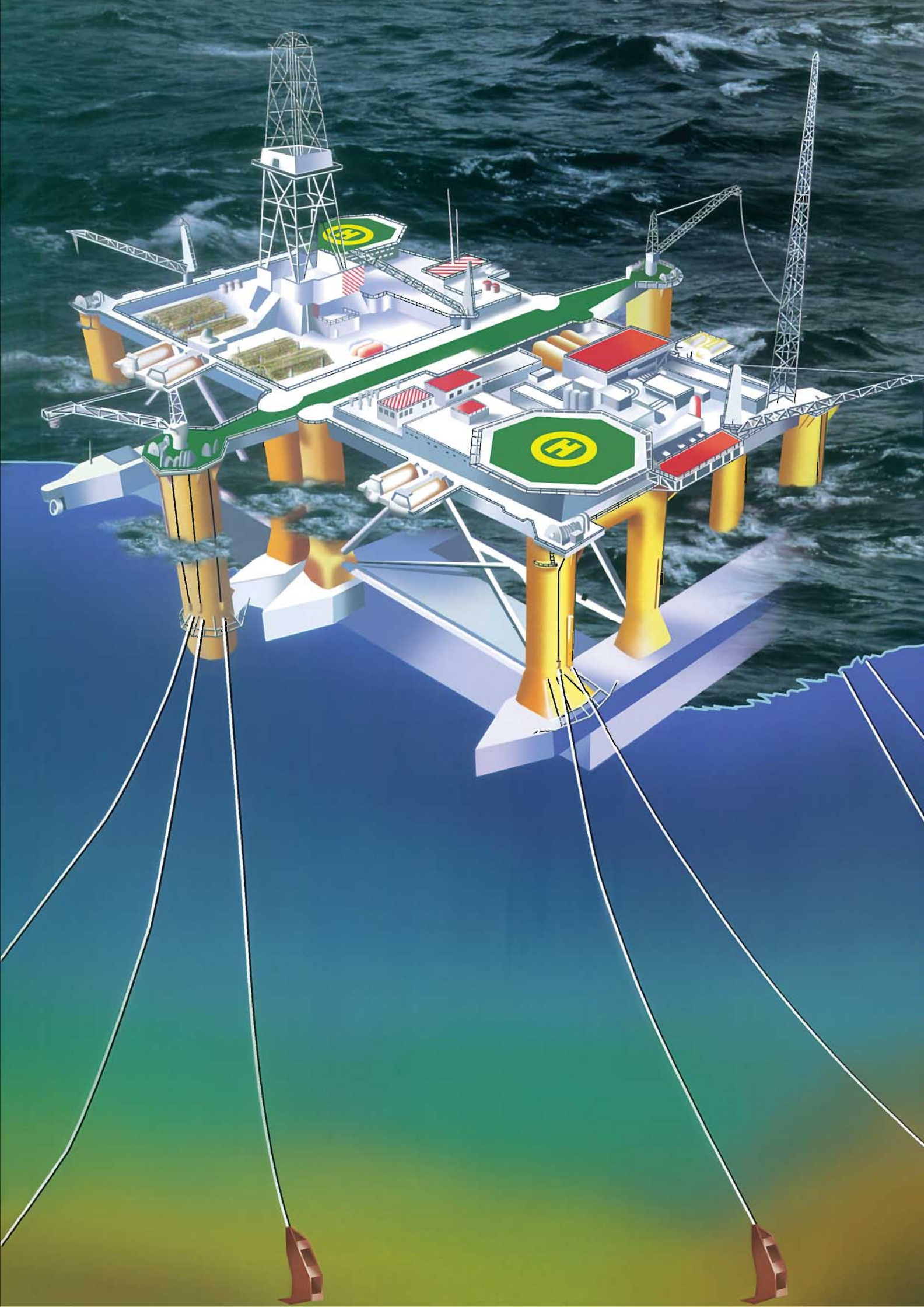

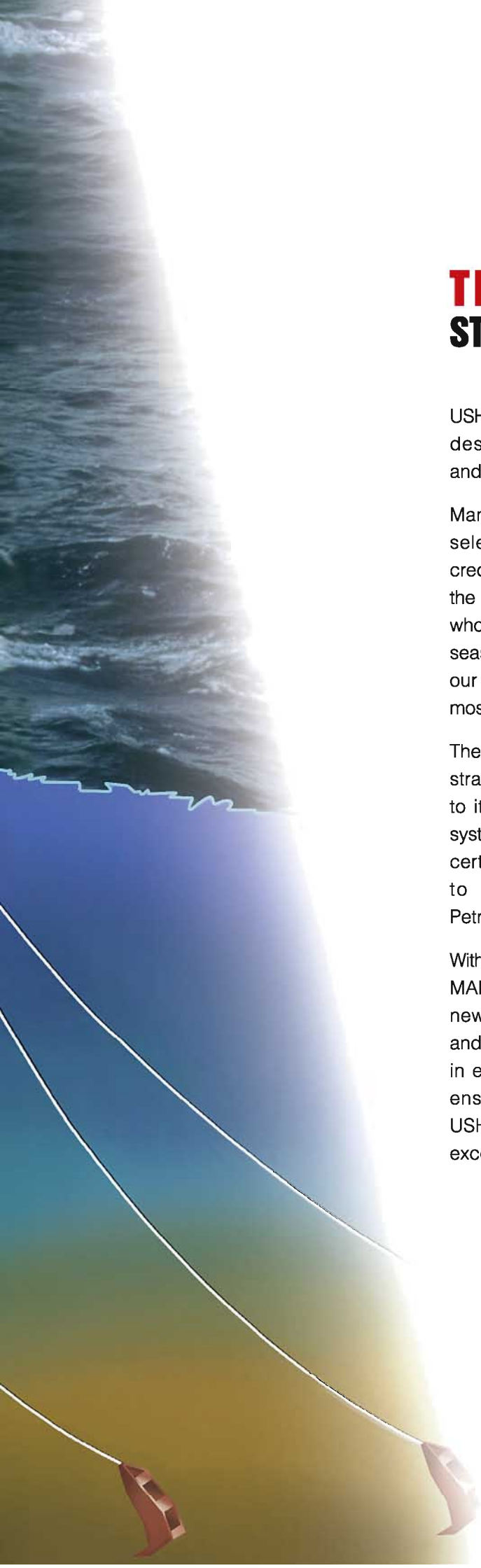

# TITAN
## STRENGTH TO RULE THE SEAS

USHA MARTIN proudly presents TITAN - Oilfield ropes designed to endure ultimate tests of strength and security.

Manufactured by state-of-the-art technology, using selected raw materials, their performance gives credence to their name - TITAN - the super powers of the Universe and the epitome of strength and courage who in their hands held the world and overturned the seas to regain power. Inspired by this tale of strength, our TITAN oil ropes are designed to overpower the most turbulent waters.

They represent what USHA MARTIN strands for - Quality and Perfection to its finest measure. The quality system of USHA MARTIN has been certified to ISO 9001 in addition to licensing by American Petroleum Institute.

With unmatched potential, USHA MARTIN is constantly setting new benchmarks in Quality and Reliability - precipitating in every product. TITAN is ensconced in this quest of USHA MARTIN towards perfection and excellence.

ORIGINAL

**American Petroleum Institute**

LICENSE NO. 5A-0017

Certificate of Authority to Use Official Monogram

THE AMERICAN PETROLEUM INSTITUTE hereby grants to

USHA MARTIN INDUSTRIES, LTD.

Ranchi, India

the right to use the Official Monogram on manufactured products under the conditions specified in the official publications of the American Petroleum Institute entitled API Spec Q1 and Specification 9A and in accordance with the provisions of the License Agreement. In all cases where the Official Monogram is applied, the Monogram should be used in conjunction with this certificate number 5A-0017. The American Petroleum Institute reserves the right to revoke this authorization to use the Official Monogram, for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

Effective Date NOVEMBER 4, 1997

Expiration Date NOVEMBER 4, 2000

AMERICAN PETROLEUM INSTITUTE

BVQI

*Certificate of Approval*

*Awarded to*

USHA MARTIN INDUSTRIES LTD.,
WIRE AND WIRE ROPE DIVISION,
TATISILWAI, RANCHI, BIHAR, INDIA.

*Bureau Veritas Quality International certify that the Quality Management System of the above supplier has been assessed and found to be in accordance with the requirements of the quality standards detailed below*

QUALITY STANDARDS

BS EN ISO 9001:1994

SCOPE OF SUPPLY

DESIGN, MANUFACTURING & SERVICING OF HIGH CARBON ROUND AND SHAPED WIRE AND WIRE ROPE, STAINLESS STEEL WIRE AND WIRE ROPE, LOCKED COIL WIRE ROPE AND SLINGS FOR GENERAL ENGINEERING PURPOSES, MINING INDUSTRIES, ELEVATORS, ROPEWAYS AND OIL INDUSTRIES.

Original approval date: 6TH SEPTEMBER 1994

Subject to the continued satisfactory operation of the supplier's Quality Management System, this Certificate is valid for a period of three years from:

16TH OCTOBER 1997

Date: 30TH OCTOBER 1997

Certificate No: 42012

For Bureau Veritas Quality International

# TITAN ANCHOR MOORING & PENNANT ROPES

**Anchor lines :**

| | |
|---|---|
| Deteriorating Forces | • Heavy Loads in six degrees of freedom<br>• Cyclic loads (Tension & Bending)<br>• Corrosion<br>• Torque |
| Properties required | • High Strength<br>• Structural Rigidity<br>• Resistant to abrasion & fatigue<br>• High elasticity to absorb shock load<br>• Protection for corrosion |
| Types of ropes suggested | • 6x25 F, 6x31 WS, 6x36 WS, 6x41 WS, 6x49 SWS, 6x46(52) WS depending upon rope dia. |

**Pennant Ropes :**

| | |
|---|---|
| Deteriorating Forces | • Abrasion due to Drum/Sheave under heavy load<br>• Fatigue<br>• Corrosion |
| Properties required | Rope with Optimum balance between<br>• Toughness (Ruggedness) and Abrasion resistance<br>• Flexibility and fatigue resistance |
| Types of ropes suggested | • For smaller dia 6x25 F or 6x36 WS<br>• For large dia 6x41 WS, 6x49 SWS, 6x46(52) WS |


**Super Titan helps you to maintain your competitiveness through superior strength and weight ratio coupled with improved performance and working life.**

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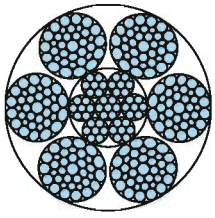
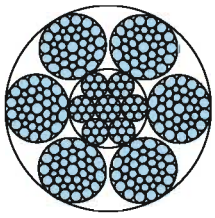
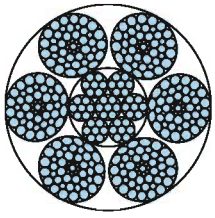
# TITAN ANCHOR MOORING & PENNANT ROPES



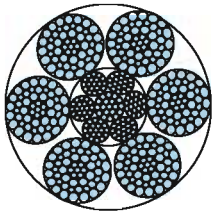
6 x 36 WS – CWR (IWRC)



6 x 41 WS – CWR (IWRC)



6 x 49 SWS – CWR (IWRC)



6 x 46(52) WS – CWR (IWRC)

## 6 x 19 AND 6 x 37 CLASS ROPE WITH CWR (IWRC)

Bright or Drawn Galvanised (RRL)

TABLE OF MINIMUM BREAKING FORCE (STRENGTH) AND MASS (WEIGHT)

| CONSTRUCTION | | | |
|---|---|---|---|
| OF ROPE | OF STRAND | 6 x 19 Class | 6 x 37 Class |
| No. of strand : 6<br>Outer strand : 6<br>No. of strand layer (s) : 1 | No. of Wires (Per stand)<br>Outer wires<br>No. of wire layer (s) | 15 - 26<br>7 - 12<br>2 - 3 | 31 - 52<br>12 - 18<br>3 - 4 |

**TYPICAL EXAMPLE**

| Class | Construction | | No. of Outer Wires | | Nominal Rope Dia | |
|---|---|---|---|---|---|---|
| | Rope | Strand | Total | Per strd. | Inch. | mm |
| 6 x 19<br>6 x 37 | 6 x 25 F | 12-6F-6-1 | 72 | 12 | 1.1/2 - 2.1/2 | 38 - 64 |
| | 6 x 31 WS | 12-6+6-6-1 | 72 | 12 | 1.1/2 - 2.1/2 | 38 - 64 |
| | 6 x 36 WS | 14-7+7-7-1 | 84 | 14 | 1.1/2 - 3 | 38 - 77 |
| | 6 x 41 WS | 16-8+8-8-1 | 96 | 16 | 2 - 3.1/2 | 52 - 90 |
| | 6 x 49 SWS | 16-8+8-8-1 | 96 | 16 | 2 - 3.1/2 | 52 - 90 |
| | 6 x 46(52) WS | 18-9+9-9/6-1 | 108 | 18 | 3 - 4.1/2 | 77 - 115 |

| NOMINAL ROPE DIA (d) | | APPROXIMATE MASS (Wt.) | | | | MINIMUM BREAKING FORCE ($F_{min}$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | EIPS | | EIPS | | SUPER TITAN | |
| Inch | mm (approx.) | lb/ft | | kg/m | | 1000 lb | kN | 1000 lb | kN | 1000 lb | kN |
| | | air | submerged wt | air | submerged wt | | | | | | |
| 1-1/2 | 38 | 4.16 | 3.51 | 6.19 | 5.22 | 228 | 1010 | 250 | 1112 | | |
| 1-5/8 | 42 | 4.88 | 4.12 | 7.26 | 6.12 | 264 | 1170 | 292 | 1300 | | |
| 1-3/4 | 45 | 5.67 | 4.78 | 8.44 | 7.12 | 306 | 1360 | 338 | 1500 | | |
| 1-7/8 | 48 | 6.50 | 5.48 | 9.67 | 8.16 | 348 | 1550 | 384 | 1710 | | |
| 2.0 | 52 | 7.39 | 6.23 | 11.00 | 9.28 | 396 | 1760 | 434 | 1930 | 499 | 2222 |
| 2-1/8 | 54 | 8.35 | 7.04 | 12.40 | 10.46 | 442 | 1970 | 488 | 2170 | 560 | 2492 |
| 2-1/4 | 58 | 9.36 | 7.90 | 13.90 | 11.72 | 494 | 2200 | 544 | 2420 | 621 | 2761 |
| 2-3/8 | 60 | 10.40 | 8.77 | 15.50 | 13.07 | 548 | 2440 | 604 | 2690 | 689 | 3063 |
| 2-1/2 | 64 | 11.60 | 9.78 | 17.30 | 14.59 | 604 | 2690 | 664 | 2950 | 757 | 3365 |
| 2-5/8 | 67 | 12.80 | 10.8 | 19.00 | 16.03 | 658 | 2930 | 728 | 3240 | 829 | 3689 |
| 2-3/4 | 71 | 14.00 | 11.81 | 20.80 | 17.54 | 736 | 3270 | 794 | 3530 | 905 | 4025 |
| 2-7/8 | 74 | 15.30 | 12.91 | 22.80 | 19.23 | 796 | 3540 | 864 | 3840 | 985 | 4382 |
| 3.0 | 77 | 16.60 | 14.00 | 24.70 | 20.83 | 856 | 3810 | 936 | 4160 | 1068 | 4751 |
| 3-1/8 | 80 | 18.00 | 15.18 | 26.80 | 22.61 | 920 | 4090 | 1010 | 4490 | 1151 | 5120 |
| 3-1/4 | 83 | 19.50 | 16.45 | 29.00 | 24.46 | 984 | 4380 | 1086 | 4830 | 1239 | 5512 |
| 3-3/8 | 87 | 21.00 | 17.71 | 31.30 | 26.40 | 1074 | 4780 | 1164 | 5180 | 1327 | 5903 |
| 3-1/2 | 90 | 22.70 | 19.15 | 33.80 | 28.51 | 1144 | 5090 | 1242 | 5520 | 1415 | 6294 |
| 3-3/4 | 96 | 26.00 | 21.93 | 38.70 | 32.64 | 1290 | 5740 | 1410 | 6270 | 1580 | 7029 |
| 4.0 | 103 | 29.60 | 24.97 | 44.00 | 37.11 | 1466 | 6520 | 1586 | 7050 | 1778 | 7908 |
| 4-1/4 | 108 | 33.40 | 28.17 | 49.70 | 41.92 | 1598 | 7100 | | | 2008 | 8928 |
| 4-1/2 | 115 | 37.40 | 31.55 | 55.70 | 46.98 | 1777 | 7900 | | | 2214 | 9845 |

*** Ropes with higher breaking force are also available. Please contact us for details.*

# TITAN DRILLING LINES

**Deteriorating Forces**

- Abrasion
- Drum/Sheaves wear fatigue
- Crushing forces from multi-layer winding on drum
- Shock load

**Properties required**

- Flexibility
- Abrasion resistance
- Stable construction to absorb crushing forces

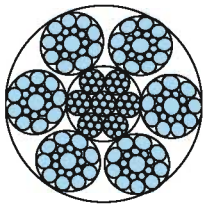
**Types of ropes suggested**

- 6 x 19S IWRC
- 6 x 26WS for larger dia ropes

## 6 x 19 CLASS ROPE WITH CWR (IWRC)

(Bright)

TABLE OF MINIMUM BREAKING FORCE (STRENGTH) AND MASS (WEIGHT)



6 x 19 S – CWR (IWRC)

| CONSTRUCTION | |
|---|---|
| OF ROPE | OF STRAND |
| No. of strand : 6<br>Outer strand : 6<br>No. of strand layer (s) : 1 | No. of Wires (Per stand) : 19<br>Outer wires : 9<br>No. of wire layer (s) : 2 - 3 |

**TYPICAL EXAMPLE**

| Class | Construction | | No. of Outer Wires | | Nominal Rope Dia | |
|---|---|---|---|---|---|---|
| | Rope | Strand | Total | Per strd. | Inch. | mm |
| 6 x 19 | 6 x 19 S<br>6 x 26 WS | 9-9-1<br>10-5+5-5-1 | 54<br>60 | 9<br>10 | 3/4 - 2<br>3/4 - 2 | 19 - 52<br>19 - 52 |

| NOMINAL ROPE DIA (d) | | APPROXIMATE MASS (Wt.) | | MINIMUM BREAKING FORCE ($F_{min}$) | | | |
|---|---|---|---|---|---|---|---|
| | | | | EIPS | | EEIPS | |
| Inch | mm (approx.) | lb/ft | kg/m | 1000 lb | kN | 1000 lb | kN |
| 3/4 | 19 | 1.04 | 1.55 | 59 | 262 | 65 | 288 |
| 7/8 | 22 | 1.42 | 2.11 | 80 | 354 | 87 | 389 |
| 1.0 | 26 | 1.85 | 2.75 | 103 | 460 | 114 | 506 |
| 1-1/8 | 29 | 2.34 | 3.48 | 130 | 568 | 143 | 636 |
| 1-1/4 | 32 | 2.89 | 4.30 | 160 | 711 | 176 | 782 |
| 1-3/8 | 35 | 3.50 | 5.21 | 192 | 854 | 250 | 943 |
| 1-1/2 | 38 | 4.16 | 6.19 | 228 | 1010 | 212 | 1112 |
| 1-5/8 | 42 | 4.88 | 7.26 | 264 | 1170 | 292 | 1300 |
| 1-3/4 | 45 | 5.67 | 8.44 | 306 | 1360 | 338 | 1500 |
| 1-7/8 | 48 | 6.50 | 9.67 | 348 | 1550 | 384 | 1710 |
| 2.0 | 52 | 7.39 | 11.00 | 396 | 1760 | 434 | 1930 |

# TITAN RISER TENSIONER ROPES

**Deteriorating Forces**

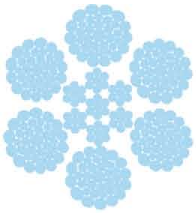
- Continuous bending loads
- Fatigue (Bending & Tension)
- Sheaves and Drum wear
- Crushing/internal wire pressure

**Properties required**

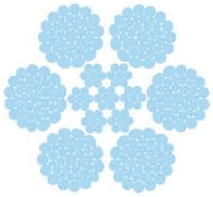
- High degree of flexibility
- Fatigue resistance
- Resistant to drum and sheave wear or Abrasion resistance
- Superior quality core

**Types of ropes suggested**

- 6 x 37 Classification (6 x 36 WS, 6 x 41 WS) - IWRC



6 x 36 WS – CWR (IWRC)



6 x 41 WS – CWR (IWRC)

## 6 x 37 CLASS ROPE WITH CWR (IWRC)

(Bright or galvanised)

TABLE OF MINIMUM BREAKING FORCE (STRENGTH) AND MASS (WEIGHT)
(LANGS LAY)

| CONSTRUCTION | | | | | | |
|---|---|---|---|---|---|---|
| OF ROPE | | | OF STRAND | | | |
| No. of strand : 6 | | | No. of Wires (Per stand) : 36 - 41 | | | |
| Outer strand : 6 | | | Outer wires : 14 - 16 | | | |
| No. of strand layer (s) : 1 | | | No. of wire layer (s) : 3 | | | |
| **TYPICAL EXAMPLE** | | | | | | |
| Class | Construction | | No. of Outer Wires | | Nominal Rope Dia | |
| | Rope | Strand | Total | Per strd. | Inch. | mm |
| 6 x 37 | 6 x 36 WS | 14-7+7-7-1 | 84 | 14 | 1 - 1¾ | 26 - 45 |
| | 6 x 41 WS | 16-8+8-8-1 | 96 | 16 | 1¾ - 2 | 45 - 52 |

| NOMINAL ROPE DIA (d) | | APPROXIMATE MASS (Wt.) | | MINIMUM BREAKING FORCE ($F_{min}$) | |
|---|---|---|---|---|---|
| Inch | mm | lb/ft | kg/m | 1000 lb | kN |
| 1 | 26 | 1.85 | 2.75 | 103 | 458 |
| 1-1/4 | 32 | 2.89 | 4.30 | 160 | 711 |
| 1-1/2 | 38 | 4.16 | 6.19 | 228 | 1010 |
| 1-5/8 | 42 | 4.88 | 7.26 | 264 | 1170 |
| 1-3/4 | 45 | 5.67 | 8.44 | 306 | 1360 |
| 1-7/8 | 48 | 6.50 | 9.67 | 348 | 1550 |
| 2 | 52 | 7.39 | 11.00 | 396 | 1760 |

# SISTANT ROPES

- Crushing forces
- Abrupt loads (Shock Loads)
- Corrosion
- Fatigue (Tension, Bending & Torsional)

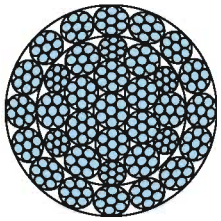
**Properties required**

- Improved resistance to crushing
- Highly flexible
- Protection for corrosion
- Low Rotation Construction

## 35 x 7 ROTATION RESISTANT ROPE – LOW ROTATION

(Bright or Galvanised)

TABLE OF MINIMUM BREAKING FORCE (STRENGTH) AND MASS (WEIGHT)



35 x 7

| CONSTRUCTION | |
|---|---|
| OF ROPE | OF STRAND |
| No. of strand : 35<br>Outer strand : 16<br>No. of strand layer (s) : 3 | No. of Wires (Per stand) : 7<br>Outer wires : 6<br>No. of wire layer (s) : 1 |

| TYPICAL EXAMPLE | | | | | | |
|---|---|---|---|---|---|---|
| Class | Construction | | No. of Outer Wires | | Nominal Rope Dia | |
| | Rope | Strand | Total | Per strd. | Inch. | mm |
| 35 x 7 | 35 x 7 | 16:6+6-6-1 | 210 | 6 | 1/2 - 1.1/2 | 13 - 38 |

| NOMINAL ROPE DIA (d) | | APPROXIMATE MASS (Wt.) | | MINIMUM BREAKING FORCE ($F_{min}$) | | | |
|---|---|---|---|---|---|---|---|
| | | | | 1770 N/mm² | | 1960 N/mm² | |
| Inch | mm (approx.) | lb/ft | kg/m | 1000 lb | kN | 1000 lb | kN |
| 1/2 | 13 | 0.49 | 0.73 | 25 | 110 | 27 | 122 |
| 9/16 | 14 | 0.58 | 0.86 | 29 | 128 | 32 | 142 |
| 5/8 | 16 | 0.75 | 1.12 | 38 | 168 | 42 | 186 |
| 5/7 | 18 | 0.95 | 1.41 | 48 | 212 | 56 | 250 |
| 3/4 | 19 | 1.06 | 1.58 | 53 | 236 | 59 | 262 |
| 4/5 | 20 | 1.17 | 1.74 | 59 | 262 | 65 | 290 |
| 6/7 | 22 | 1.42 | 2.11 | 71 | 317 | 79 | 351 |
| 17/18 | 24 | 1.69 | 2.51 | 85 | 377 | 94 | 417 |
| 1 | 26 | 1.98 | 2.95 | 100 | 443 | 110 | 490 |
| 1 1/9 | 28 | 2.29 | 3.41 | 115 | 513 | 128 | 568 |
| 1 1/6 | 30 | 2.64 | 3.93 | 110 | 491 | 149 | 662 |
| 1 1/4 | 32 | 3.00 | 4.46 | 151 | 670 | 167 | 742 |
| 1 3/8 | 35 | 3.39 | 5.04 | 180 | 802 | 200 | 888 |
| 1 1/2 | 38 | 4.22 | 6.28 | 212 | 945 | 235 | 1047 |

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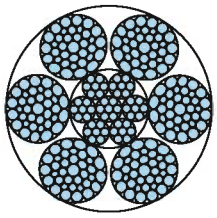
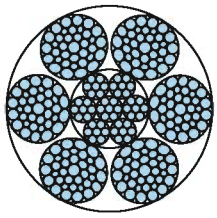
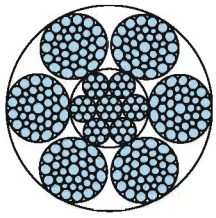
# HOIST & BOOM ROPES FOR CRANES



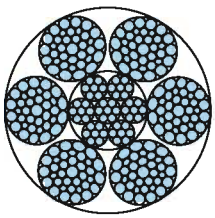
6 x 31 WS – CWR (IWRC)



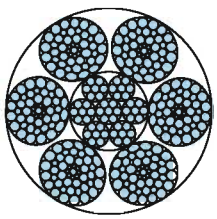
6 x 36 WS – CWR (IWRC)



6 x 41 WS – CWR (IWRC)



6 x 41 SF – CWR (IWRC)



6 x 49 SWS – CWR (IWRC)

## 6 x 19 & 6 x 37 CLASS ROPE WITH CWR (IWRC)

(Bright or Drawn Galvanised)

TABLE OF MINIMUM BREAKING FORCE (STRENGTH) AND MASS (WEIGHT)

| CONSTRUCTION | | | |
|---|---|---|---|
| OF ROPE | OF STRAND | 6 x 19 Class | 6 x 37 Class |
| No. of strand : 6 | No. of Wires (Per stand) | 15 - 26 | 31 - 49 |
| Outer strand : 6 | Outer wires | 7 - 12 | 12 - 16 |
| No. of strand layer (s) : 1 | No. of wire layer (s) | 2 - 3 | 3 - 4 |

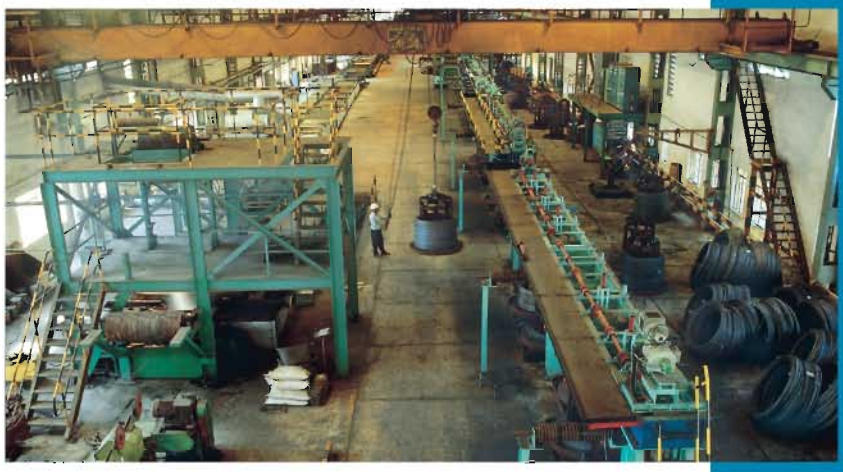
**TYPICAL EXAMPLE**

| Class | Construction | | No. of Outer Wires | | Nominal Rope Dia | |
|---|---|---|---|---|---|---|
| | Rope | Strand | Total | Per strd. | Inch. | mm |
| 6 x 19 | 6 x 19 S | 9-9-1 | 54 | 9 | 1/2 - 1.1/2 | 13 - 38 |
| | 6 x 25 F | 12-6F-6-1 | 72 | 12 | 1/2 - 2 | 13 - 52 |
| | 6 x 21 F | 10-5F-5-1 | 60 | 10 | 1/2 - 1.1/2 | 13 - 38 |
| | 6 x 26 WS | 10-5+5-5-1 | 60 | 10 | 1/2 - 2 | 13 - 52 |
| 6 x 37 | 6 x 31 WS | 12-6+6-6-1 | 72 | 12 | 1/2 - 3/2 | 13 - 19 |
| | 6 x 36 WS | 14-7+7-7-1 | 84 | 14 | 1/2 - 2.1/2 | 13 - 64 |
| | 6 x 41 WS | 16-8+8-8-1 | 96 | 16 | 1.7/8 - 2.1/2 | 48 - 64 |
| | 6 x 41 SF | 16-8F-8-8-1 | 96 | 16 | 1.7/8 - 2.1/2 | 48 - 64 |
| | 6 x 49 SWS | 16-8+8-8-8-1 | 96 | 16 | 2.1/8 - 2.1/2 | 54 - 64 |

| NOMINAL ROPE DIA (d) | | APPROXIMATE MASS (Wt.) | | MINIMUM BREAKING FORCE ($F_{min}$) | | | |
|---|---|---|---|---|---|---|---|
| | | | | EIPS/1770 N/mm² | | EEIPS/1960 N/mm² | |
| Inch | mm (approx.) | lb/ft | kg/m | 1000 lb | kN | 1000 lb | kN |
| 1/2 | 13 | 0.46 | 0.68 | 27 | 118 | 29 | 130 |
| 9/16 | 14.5 | 0.59 | 0.88 | 34 | 149 | 37 | 165 |
| 5/8 | 16 | 0.72 | 1.07 | 41 | 183 | 45 | 202 |
| 3/4 | 19 | 1.04 | 1.55 | 59 | 262 | 65 | 288 |
| 7/8 | 22 | 1.42 | 2.11 | 80 | 354 | 88 | 389 |
| 1 | 26 | 1.85 | 2.75 | 103 | 460 | 114 | 506 |
| 1-1/8 | 29 | 2.34 | 3.48 | 130 | 578 | 143 | 636 |
| 1-1/4 | 32 | 2.89 | 4.30 | 160 | 711 | 176 | 782 |
| 1-3/8 | 35 | 3.50 | 5.21 | 192 | 854 | 212 | 943 |
| 1-1/2 | 38 | 4.16 | 6.19 | 228 | 1010 | 250 | 1112 |
| 1-5/8 | 42 | 4.88 | 7.26 | 264 | 1170 | 292 | 1300 |
| 1-3/4 | 45 | 5.67 | 8.44 | 306 | 1360 | 338 | 1500 |
| 1-7/8 | 48 | 6.50 | 9.67 | 348 | 1550 | 384 | 1710 |
| 2 | 52 | 7.39 | 11.00 | 396 | 1760 | 434 | 1930 |
| 2-1/8 | 54 | 8.35 | 12.40 | 442 | 1970 | 488 | 2170 |
| 2-1/4 | 58 | 9.36 | 13.90 | 494 | 2200 | 544 | 2420 |
| 2-3/8 | 60 | 10.40 | 15.50 | 548 | 2440 | 604 | 2690 |
| 2-1/2 | 64 | 11.60 | 17.30 | 604 | 2690 | 664 | 2950 |

Through an on-going modernisation programme, Usha Martin has established the best technologies of the world to ensure that the wire ropes are of superior quality and match the most demanding applications and operating conditons.

*PLC operated modern pickling plant*



*PLC operated modern Patenting-cum-galvanising line*




*Testing facility ranging from 100 kN for wire to 10000 kN for rope*

# CNVERSION TABLES

| Length | meters(m) | millimeters(mm) | feet(ft) | inches(in.) |
|---|---|---|---|---|
| meters | 1 | $1{,}0 \cdot 10^{3}$ | 3,281 | 39,37 |
| millimeters | $1{,}0 \cdot 10^{-3}$ | 1 | 0,003281 | 0,03937 |
| feet | 0,3048 | 304,8 | 1 | 12 |
| inches | 0,0254 | 25,4 | 0,0833 | 1 |

| Mass | kilograms(kg) | grams(g) | metric tons(t) | short tons | long tons | pounds(ib) | ounces(oz) |
|---|---|---|---|---|---|---|---|
| kilograms | 1 | $1{,}0 \cdot 10^{3}$ | $1{,}0 \cdot 10^{-3}$ | $1{,}102 \cdot 10^{-3}$ | $0{,}9842 \cdot 10^{-3}$ | 2,205 | 35,27 |
| grams | 0,001 | 1 | $1{,}0 \cdot 10^{-6}$ | $1{,}102 \cdot 10^{-6}$ | $0{,}9842 \cdot 10^{-6}$ | $2{,}205 \cdot 10^{-3}$ | 0,03527 |
| metric tons | $1{,}0 \cdot 10^{3}$ | $1{,}0 \cdot 10^{6}$ | 1 | 1·102 | 0,9842 | 2204,62 | 35274 |
| short tons | 907,2 | $9{,}072 \cdot 10^{5}$ | 0,9072 | 1 | 0,8929 | 2000 | 32000 |
| long tons | 1016,1 | $1{,}0161 \cdot 10^{6}$ | 1,0161 | 1,120 | 1 | 2240 | 35840 |
| pounds | 0,4536 | 453,6 | $0{,}4536 \cdot 10^{3}$ | $0{,}4464 \cdot 10^{3}$ | 0,5080 | 1 | 16,0 |
| ounces | 0,02835 | 28,35 | $0{,}2835 \cdot 10^{4}$ | $0{,}2572 \cdot 10^{4}$ | $0{,}2881 \cdot 10^{4}$ | 0,0625 | 1 |

| Mass per unit length | kg/m | lb/ft | $g/m^2$ | oz/sq.ft |
|---|---|---|---|---|
| kg/m | 1 | 0,672 | - | - |
| lb/ft | 1,4882 | 1 | - | - |
| $g/m^2$ | - | - | 1 | 0,00328 |
| oz/sq.ft | - | - | 305,16 | 1 |

| Elongation | mm/m | in/ft |
|---|---|---|
| mm/m | 1 | 0,0121 |
| in/ft | 83,34 | |

| Area | $m^2$ | $mm^2$ | sq.ft | sq.in |
|---|---|---|---|---|
| $m^2$ | $1{,}0 \cdot 10^{-6}$ | $1{,}0 \cdot 10^{6}$ | 10,764 | 1550 |
| $mm^2$ | 1 | 1 | $1{,}0765 \cdot 10^{-5}$ | $1{,}55 \cdot 10^{-3}$ |
| sq.ft | 0,0929 | $9{,}29 \cdot 10^{4}$ | 1 | 144 |
| sq.in | $6{,}452 \cdot 10^{-4}$ | 645,2 | $6{,}939 \cdot 10^{-3}$ | 1 |

| Breaking Force | kN | kg-force | metric tonne force | lb-force |
|---|---|---|---|---|
| kN | 1 | 101,97 | 0,10197 | 224,81 |
| kg-force | $9{,}8067 \cdot 10^{-3}$ | 1 | 0,001 | 0,4536 |
| metric tonne force | 9,8067 | $1{,}0 \cdot 10^{3}$ | 1 | 2204,6 |
| lb-force | $4{,}448 \cdot 10^{-3}$ | 0,4536 | $0{,}4536 \cdot 10^{-3}$ | 1 |

| Tensile grade | MPa-N/$mm^2$ | kg/$mm^2$ | p.s.i. | bar |
|---|---|---|---|---|
| MPa-N/$mm^2$ | 1 | 0,10197 | 145.04 | 10 |
| kg/$mm^2$ | 9,8067 | 1 | $1{,}4223 \cdot 10^{-3}$ | 98,067 |
| p.s.i. | $6{,}895 \cdot 10^{-3}$ | $0{,}7031 \cdot 10^{-3}$ | 1 | 0,06895 |
| bar | 0,1 | 0,010197 | 14,504 | 1 |

## WARNINGS

Wire Rope will fail if worn out, overloaded, misused, damaged, improperly maintained or abused.

Wire Rope failure may cause serious injury or death and expensive damage.

- Never overload a Wire Rope.
- Never exceed the Work Load Limit/Safe Working Load.
- Use correct design factor for the application.
- Never use a damaged or corroded rope.
- Inform yourself: Read and understand manufacturers' literature and "Wire Rope Users Manual" and for Sling application "Wire Rope and Wire Rope Sling Safety Bulletin".
- Refer to Application Codes, Standards and Regulations. Obey the relevant inspection requirements and removal critiria.

*For additional information or the bulletins, please ask your supplier*

## LIABILITY

Usha Martin shall not be liable for consequential damages associated with the use of USHA products. Should Usha Martin products prove to be defective in workmanship or meterials, USHA will replace or repair these products.

Warranties, either expressed or implied, are limited to the USHA written representation on the new, unused products and components furnished and sold by USHA.

The user of USHA products has the responsibility for conformance to jurisdictional codes, rules or suitability of components or design for the application even if USHA engineers work together in giving suggestion.

When a rope is cut, fitted with end connection by splicing or other ways, the fabricator has to obey the rules and standards for the fabrication process as well the end product. Any damage resulting from incorrect handling, cutting, splicing, fitting or reeving, will not be the responsibility of the rope manufacturer.

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