

**DRAFT STANDARDS FOR STAKEHOLDER ONLY**

**Draft**

**Tanzania Standard**

**Textiles – Ropes Specifications: Part 2. Ropes made from Man-made fibres**

**(First edition)**



**TANZANIA BUREAU OF STANDARDS**

## 0. FOREWORD

**0.1** The range of man-made fibre rope is sufficiently wide to satisfy the varying requirements of modern Industry. The differing properties of Polyester, Polyamide (Nylon), Polypropylene and Polyethylene enables a specific choice to be made when selecting the rope most suited for the function it has to perform. For example, there are ropes which will satisfy any of the individual requirements and some ropes in fact satisfy almost all requirements.

This Draft Tanzania Standard has been set up to prescribe materials, manufacturing and performance requirements of ropes made from man-made fibres.

**0.2** In the preparation of this Draft Tanzania Standard (First edition), assistance was derived from

Local company specifications;

ISO 1140:2012 Fibre Ropes – Polyamide;

ISO 1141:2012 Fibre Ropes – Polyester;

ISO 1346:2012 Fibre Ropes – Polypropylene split film, monofilament and multifilament (PP2) and polypropylene high-tenacity multifilament (PP3), and

ISO 1969: 2013 Fibre Ropes – Polyethylene -3 and 4-strand ropes.

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## 1. SCOPE

This Draft Tanzania Standard describes materials, manufacturing and performance requirements of man-made ropes made of Polyester, Polyamide (Nylon), Polypropylene and Polyethylene for general use.

## 2. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- a) TZS 3: Atmospheric conditions for testing;
- b) TZS 4: Rounding off numerical values.

## 3. TERMS AND DEFINITIONS

For the purpose of this Draft Tanzania Standard, the following terms and definitions shall apply:

**3.1 braid** – rope or textile structure formed by a braiding process, intertwining of strands in a braiding process to produce a rope structure.

**3.2 cordage** – collective terms for twines, cords and rope made from textile fibers and yarns.

**3.3 strand** – largest individual element used in the final rope making process and obtained by joining and twisting together several yarns or groups of yarns.

**3.4 rope fiber** – compact but flexible, torsionally balanced structure produced from strands which are laid, plaited or braided together to produce a product which serves to transmit a tensile force between two points. Generally greater than 4mm diameter

**3.5 laid rope** – rope made by twisting three or more strands together with a twist direction opposite to that of the strands

**3.6 plaited rope** – 8-strand rope consisting of two pairs of strands twisted to the right and two pairs of strands twisted to the left and plaited together such that the pairs of strands of opposite twist alternately overlay one another

**3.7 hawser-laid rope** – made up of three strands, it is the fibre (or yarns) of which have been twisted together in a left-handed direction, these three strands are then twisted together in a right-handed direction to make on a rope.

**3.8 shroud-laid rope** – made of four strands laid right-handed on a core of rope.

## 4. MATERIALS

**4.1** The fibres and yarns materials used in the manufacture of any given rope shall be of one generic type and under no circumstances shall any material other than that type of fibre be used.

**4.2** The fibre ropes may be fabricated from continuous filament, heat and light resistant, industrial grade, having sufficient tenacity to meet this Draft Tanzania Standard.

**4.3** No extraneous materials shall be added for the purpose of weighting the rope. Extractable matter of the finished rope shall not exceed 2%.

**4.4** Overlay finish: When specified, a marine overlay finish shall be applied to all yarns used in the manufacture of the rope. The overlay finish shall be extremely resistant to removal by water, and shall improve fiber to fiber abrasion resistance. The finish content of the yarn shall not exceed 5%.

## **5. MANUFACTURE**

**5.1** The ropes shall be 3-strand hawser-laid, 4-strand shroud, 8-strand plaited or 12-strand plaited construction, as illustrated in Figures 1, 2, 3 and 4.

**5.1.1** 3-strand hawser-laid rope shall be made with 3-strands, each strand having an identical structure and number of yarns. The strands shall be formed and the rope laid to produce a torque-balanced product.

**5.1.2** 4-strand shroud-laid rope shall be made of four strands laid right-handed on a core of rope.

**5.1.3** 8-strands plaited rope shall be made of 2 pairs of right-twisted strands and 2 pairs of left-twisted strands plaited together such that pairs of strands of the opposite twist alternately pass one over the other, with all strands having identical structure and the same number of yarns.

**5.1.4** 12-strands plaited rope may be made from three or more strands.

**5.2** The mixing of fibre types and grades or fibers of different manufacturers shall not be permitted in the same rope.

**5.3** The use of an internal marker or a surface yarn marker shall be the only exception to the strand-to-strand uniformity requirement.

**5.4** Unless otherwise specified, the length of each finished fibre rope shall be continuous throughout its ordered length.

**5.5** The finished rope shall meet or exceed all the requirements of this Draft Tanzania Standard and the applicable product standard.

**5.6** The finished rope shall contain no cuts, kinks, soft spots, scratch or damaged sections, or broken, lose or projecting ends in the rope.

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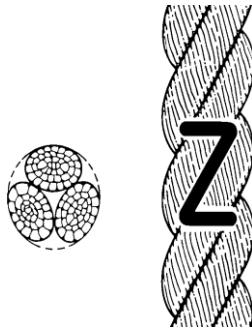


Figure 1 – Shape of a 3-strand hawser-laid rope (type A)

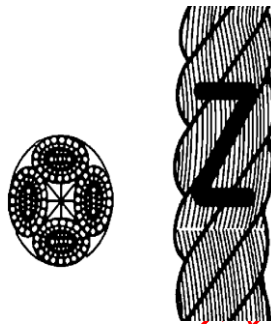


Figure 2 – Shape of a 4-strand shroud-laid rope (type B)



Figure 3 – Shape of an 8-strand braided rope (type C)



Figure 4 – Shape of a 12-strand braided rope (type D)

## 6. PERFORMANCE REQUIREMENTS

6.1 The performance requirements of the fibre ropes shall meet or exceed the requirements as listed in Tables 1, 2, 3, 4, 5, 6 and 7

6.2 When required, performance properties such as elasticity splice ability and hardness shall be included in the individual rope standard

**Table 1 – Requirements of 3-strand hawser laid and 4-strand shroud laid Polyester ropes, type A and B.**

Nominal diameter  (mm)	Linear density		Minimum breaking strength  (kN)
	(Ktex)	Tolerance %	
4	11.5	±10	1.96
4.5	14.2		2.3
5	18.0		3.1
6	23.5		4.4
8	45.0		8.2
10	70.5	±8	13.0
12	100.0		18.1
14	140.5		25.0
16	180.5	±5	28.1
18	240.0		40.2
20	295.0		49.5
22	350.0		58.2
24	425.0		67.5
26	495.0		80.0
28	575.5		90.0
30	650.0		110.5
32	750.0		120.0
36	950.5		148.5
40	1145.0		190
44	1400.0		225
48	1650.0	270	
52	1995.6	305	
56	2150.0	344	
60	2500.0	386	
64	300.0	400	

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**Table 2 – Requirements of 8- and 12-strand braided Polyester ropes, type C and D.**

Nominal diameter  (mm)	Linear density		Minimum breaking strength  (kN)
	(Ktex)	Tolerance %	
12	100	±8	16
16	180	±5	28
20	280		45.6
24	400		70
28	500		90
30	580		105
32	670		124
36	850		148
40	1100		170
44	1300		250
48	1600		280
52	1800		350
56	2100		380
60	2500		430
64	2800		480
72	3600		550
80	4500		770
88	5500		850

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**Table 3 – Requirements of 3-strand hawser laid and 4-strand shroud laid Polyamide (Nylon) ropes, type A and B.**

Nominal diameter (mm)	Linear density		Minimum breaking strength (kN)
	(Ktex)	Tolerance (%)	
4	7.5	±10	1.7
4.5	9.15		2.3
5	12.5		3.7
6	15		5.4
8	27.0		9.0
10	50.0	±8	12.0
11	70.0		14.0
12	80		19.5
14	100		24.5
16	140		35.6
18	180	±5	48.0
20	220		55.0
22	250		68.0
24	330		83.5
26	380.5		100
28	450		115
30	500		125
32	600		145
36	750		180
40	900		230
44	1000		275
48	1200		300
52	1450		360
56	1700	400	
60	2000	450	

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**Table 4 – Requirements of 8- and 12-strands braided Polyamide (Nylon) ropes, type C and D.**

Nominal diameter (mm)	Linear density		Minimum breaking strength (kN)
	(Ktex)	Tolerance (%)	
8	48.0	±8	10
10	56		11
12	70.5		18
16	140	±5	30
20	218		48
24	335		70
28	445		110
32	580		166
36	700		190
40	900		210
44	990		260
48	1100		290
52	1400		350
56	1600		425
60	2000		470

**Table 5 – Requirements of 3-strand hawser laid and 4-strand shroud laid Polypropylene ropes, type A and B.**

Nominal diameter (mm)	Linear density		Minimum breaking strength (kN)
	(Ktex)	Tolerance (%)	
4	5.5	±10	1.8
4.5	8.0		2.2
5	9.0		3.0
6	14	±8	3.5
8	25		6.2
10	33		9.5
12	55		12.0
14	75	±5	19.5
16	100		24
18	125		34.8
20	165		40
22	190		50.5
24	230		60
26	285		70
28	345		81.5
30	380		91

**Table 6 – Requirements of 8- and 12-strand braided Polypropylene ropes, type C and D.**

Nominal diameter (mm)	Linear density		Minimum breaking strength (kN)
	(Ktex)	Tolerance (%)	
8	35	±8	6.5
10	46		8.5
12	55		12.3
16	95	±5	23
20	175		35
24	230		48.5
28	330		78
32	420		95
36	500		115
40	650		150
44	760		185.5
48	980		240
52	1020		270
56	1200		290
60	1450		335

**Table 7 – Requirements of 3-strand hawser laid and 4-strand shroud laid Polyethylene ropes, type A and B.**

Nominal diameter (mm)	Linear Density		Minimum breaking strength (kN)
	(Ktex)	Tolerance (%)	
4	7.5	±10	1.2
4.5	8		1.8
5	10		2.0
6	15.5		2.5
8	27.0		4.5
10	45	±8	6.8
12	65		10.3
14	87		14.5
16	112	±5	20.0
18	150		24.6
20	185		30.0
22	220		38.0
24	260		44.4
26	300		54.0
28	350		60.0
30	425		70.3
32	480		84.5
36	600		100

## 7. PACKING, PACKAGING AND LABELING

### 7.1 Packing

The identity of the material, quality and origin of a nylon rope conforming to this Draft Tanzania Standard shall be marked alongside the package so as to remain visible during usage. For covered ropes, the marking tape shall be incorporated between the cover and the core or within the core.

### 7.2 Packaging

**7.2.1** The packaging unit may be a reel, a coil, a box or a bag or as specified by the purchaser.

**7.2.2** The finished rope shall be supplied in a package, so that it can be distributed freely without entanglement of any kind.

**7.2.3** Either the unit mass or the length may be used to invoice the rope. When the gross mass is used for invoicing, the mass of the packaging shall not exceed 1.5% of the gross mass of the rope.

### 7.3 Labeling

Each packaging unit shall have a label, which is firmly fixed in place, giving the following information:

- a) constituent material;
- b) identification of manufacturer and country of origin;
- c) reference number; and
- d) delivered length.

## 8. SAMPLING

Sampling shall be as representative as possible of the batch that is to be subjected to the measurements and tests, and samples shall be selected away from the ends of the packages at points where they are in true lay.

**8.1 Lot** – A quantity of package of the same linear density, same type and same dimensions, manufactured under similar conditions and delivered to a buyer against a dispatch note shall constitute a lot.

**8.2** The conformity of the lot shall be determined on the basis of test carried out on the same sample selected from it.

**8.3** The number of package to be selected at random from a lot shall be as given 8:

**Table 8 – Sampling plan**

Lot size	Sample size
0 to 10 packages	1
11 to 100 packages	10
101 and above	100

**8.4** For evaluating the length, linear density breaking load and pitch, the number of packages selected according to 8.3 shall constitute the test sample.

**8.5 Criteria for conformity** – The lot shall be declared as conforming to this Draft Tanzania Standard if the conditions below are satisfied:

- a. The length of each package is not less than the specified length and
- b. The average values of the test results in respect of other requirements conform to the requirements specified in the standard.

## ANNEX

### A – 1 Mass

**A – 1.1** Without removing the wrapping material, weigh each package in the lot to the nearest 0.5kg and determine the total gross mass of the entire package in the lot.

**A – 1.2** For the purposes of determining the length of the package, calculate the net mass of each coil constituting the test sample, (for purposes of 8.4) by removing the wrapping material and then weighing the coil.

### A – 2 Pitches of rope

Take each package in the sample and apply an appropriate tension as specified in the Table 1, 2 and 3. In plane parallel to the axis of the rope, place two “pitch marks” on two successive spirals of the same strand of the rope and measure the distance between the two points. While the ropes are still under tension, measure the diameter with the help of a Vernier caliper to the following accuracy.

Diameter of rope	Measurement accuracy
Up to 96mm	1mm
Above 96mm	5mm

### A – 3 Linear density

**A - 3.1 Length of coil** – From one end of one of the coils in the sample, cut off a test specimen exactly 2m (l) in the length after applying tension by hand. Weigh the specimen in grams (m). Mark a length of 1m ( $d_1$ ) in the center of the specimen. Apply an appropriate tension as specified in Tables 1, 2 and 3. While rope is still under tension, measure to the nearest mm the distance  $d_2$  between the marks.

**A – 3.2** Calculate the length the linear density T by the following formula:

$$T = \frac{m \times d_1}{l \times d_2}$$

Where

T – linear density in kilotex or g/m

m – mass of the test piece in g

$d_1$  – distance between the marks (1m)

l – length of the test specimen (2m) and

$d_2$  – distance between the marks under tension in meters

**A - 3.3** Calculate the length of the coil by dividing the net weight of the coil as obtained in A - 1.2 by the linear density of the corresponding coil obtained in A - 3.2.

## **A - 4 Breaking load**

**A – 4.1 Apparatus** – Rope tensile testing machine of appropriate capacity with constant rate of traverse of the straining head of not less than 150mm/ minute.

**A-4.2.1** With ordinary grips - Mount each specimen with an initial length of not less than one metre between the grips of the testing machine. Apply gradually and continuously increasing load until the specimen breaks. If fractures occur at or near the grips at less than the specified breaking load, disregard the test and take a further test. Accept the test results corresponding to any specimen without fractures through causes attributable to grip damage as meeting the requirements of the specification provided that the load recorded is not less than 95% of the minimum specified breaking load.

NOTE – When agreed to between the buyer and seller, ropes with the ends "eye – spliced" may be used for the tests in which case the rope will be deemed to comply with the requirements of this specification provided that the breaking load obtained from the specimen is a minimum of 90 percent of the specified breaking load given in Tables 1, 2 and 3 and provided that the fractures occurs at the splice.

**A-4.2.2** With bollard grips – small size ropes may be tested on testing machine with bollard grips. In such cases mount the test specimen with an initial length of not less than 250mm between the bollards of the testing machine ensuring that the rate of transverse of the straining load for constant rate of transverse machine is as near as possible numerically equal in mm per minute to the length of specimen. Apply gradually and continuously increasing load until the specimen breaks.

If fracture occurs at or near the grips at less than the specified breaking load, disregard the test and take a further test. Accept the test results corresponding to any specimen that fractures through causes attributable to grip damage as meeting the requirements of this specification provided that the load recorded is not less than 95 percent of the minimum specified breaking load (see also Note under A-4.2.1)

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