

Draft

Tanzania Standard

Textiles – Ropes Specifications: Part 1. Ropes made from natural
fibres

(Second edition)

DRAFT STANDARDS FOR STAKEHOLDER ONLY



TANZANIA BUREAU OF STANDARDS

0. FOREWORD

0.1 The development of this Draft Tanzania Standard 2nd edition is based on the current practices and requirements of the industries and relevant authorities dealing with fibre twines – natural fibre. This Draft Tanzania Standard is the second edition which has been technically revised, where; its foreword, standard title and other portions have been slightly improved. In the cover page, the title of the standard has been changed from “sisal ropes” to read as “Textiles – Ropes– Specifications: Part 1. Ropes made from natural fibre”, also (Clause 1) has to read “This Draft Tanzania Standard describes the requirements of the following types of sisal and manila ropes”.

0.2 In the preparation of this Draft Tanzania Standard, assistance was derived from

BS EN 1261:1995 Fibre ropes for general service. Hemp
ISO 1181:2004 Fibre ropes — Manila and sisal —3-, 4- and 8-strand ropes

ONLY

This second edition cancels and replaces the first edition which was developed in year – 1992

Tanzania Bureau of Standards

Draft Tanzania Standard

TDC8 (5628)P₃

Textiles – Ropes Specifications: Part 1. Ropes made from natural fibres

1. SCOPE

This Draft Tanzania Standard describes the requirements of the following types of sisal and manila ropes.

- a) Plain or hawser-laid (3-strands) ropes of diameter 8 to 96mm and with a linear density from 54 to 6400 kilotex,
- b) Plaited or shroud-laid (4-strand) ropes of diameter 8 to 96mm and with a linear density from 54 to 6400 kilotex and
- c) Cable-laid (9-strand) ropes of diameter 40 to 144mm and with a linear density from 1030 to 113105 kilotex.

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 hawser-laid rope – rope in which three strands are twisted together without a central core, it is generally of Z-lay.

3.2 shroud-laid rope – four strand ropes in which the strands are twisted together with a central core of the basic yarns of which the strands are made.

3.3 cable laid rope – nine strand ropes in which three primaries (hawser-laid)ropes are twisted together without a central core.

3.4 linear densities – mass per unit length of textile products such as ropes, lines, cords and twines. In the universal count system, it is expressed in kilotex.

3.5 rot-proofing – chemical treatments given to natural fibre ropes for protection against microbiological attack and destructive agencies such as sunlight and sea water

3.6 coil– continuous length of rope or line arranged in the form of a spiral.

3.7 pitch (of rope) – distance between two successive spirals of the same strand of a rope measured parallel to the axis of the rope.

3.8 rope – cordage with a circumference of 25mm or more.

3.9 laying – twisting of strands to form a rope (See Figure 1)

4. MANUFACTURE

4.1 Sisal fibre – the fibres used in the manufacture of ropes shall be sisal, true to its type and shall be of long staple it shall be unaltered and free from defects and shorts. The fibre shall be well hackled and of quality, fineness and colour necessary to produce ropes having the characteristics required and specified in Tables 1, 2, 3, 4 and 5.

4.2 Manila fibre – fibres used in the manufacture of ropes shall be from manila, true to its type and shall be of long staple, it shall be unaltered and free from defects and shorts.

4.3 Yarn – the yarn shall be well and evenly spun. To comply with the minimum number of yarns specified in this standard, yarn of 4.6 kilotex (216m/kg) shall be used.

4.4 Strand – the strand of ropes shall be well formed and free from grooves and sunken yarns, and each strand shall contain an equal number of yarns. The number of yarns in each strand shall be as specified in the table 1, 2, 3, 4 and 5. The strand shall have S-lay.

4.5 Ropes – The ropes shall be well laid and free from defects and each package shall be continuous throughout its length and shall not contain loose ends, splices or joins in the strands or in the ropes.

The number of strands in the rope and the lay of rope and the lay of rope, unless otherwise specified, shall be as under:

| Type of rope | No of strands | lay of rope |
|----------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------|
| a) Plain or hawser-laid Manila and sisal rope | 3 | Z (See figure 2) |
| b) Plaited or shroud-laid Manila and sisal rope | 4 | Z (See figure 3) |
| c) Cable-laid sisal rope | 9 (with 3 primary ropes twisted together) (see Figure 4) | Z – lay for primary rope and S-lay for final rope |

4.6 Lubrication – Loading materials shall not be used. For the purpose of dressing the fibre or for the preservation of the rope, a lubricant shall be added. The quantity of dressing applied to the fibre shall, when determined by extraction with petroleum either or other suitable solvent, be not less than 10%, nor more than 15% calculated on the mass of the finished rope.

4.7 Rot-proofing treatment – If so ordered, ropes shall be rot-proofed by application of rot-proofing agent in appropriate quantity as agreed to between the buyer and the seller. The rot-proofing agent may be used in places of, or in conjunction with, the lubricant (see 4.5) normally used for the purpose of dressing the fibre. Ropes which have been so treated shall otherwise comply, in all respects, with the requirements of this 2nd edition Draft Tanzania Standard.

5. GENERAL REQUIREMENTS

5.1 Manila and sisal ropes shall be made in one of the following constructions as illustrated in the figures 1, 2, 3 and 4:

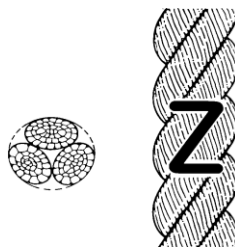


Figure 1 – Shape of a 3-strand hawser-laid rope (type A)

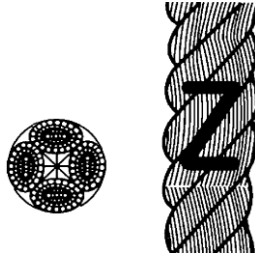


Figure 2 – Shape of a 4-strand shroud-laid rope (type B)



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

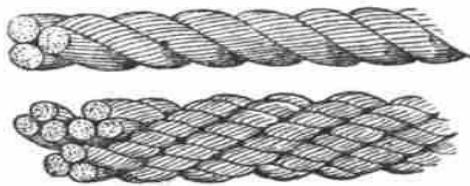
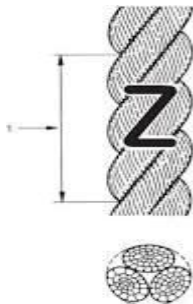


Figure 4 – Cable-laid sisal (9-strands) rope

5.2 The direction of the rope shall be made in one of the following direction lay:



5A Z – lay or right – hand lay



5B S – lay or left – hand lay

Figure 5 – Direction of lay

6. OTHER REQUIREMENTS

6.1 Mass – The gross mass of a lot of ropes when determined according to the method given in A-1 shall be as agreed to between the buyer and the seller, or as entered in the dispatch note subject to a tolerance of $\pm 3.5\%$. The mass of the packing material should not be more than 1.5% of the gross mass of ropes.

6.2 Pitch – The pitch of rope, when determined by the method given in A.2, shall conform to the following requirements:

| Type of rope | Pitch |
|--------------------------------|----------------------------------|
| a. Plain or hawser-laid rope | Shall be between 2.5 D and 3.3 D |
| b. Plaited or shroud-laid rope | Shall be between 2.7 and 3.5 D |
| c. Cable-laid rope | Shall be between 2.2 D and 3.2 D |

Where

D is the diameter of the rope concerned.

6.3 Length of packages – The length of each package shall be 220m unless otherwise agreed to between the buyer and the seller and the length of package shall be determined by the method given in A-3.1.

7. FINISH

Unless specially required by the purchaser, no colouring agent, except of the rot-proofing agent shall be used. All ends shall be securely whipped or marled (secured).

8. GRADES OF ROPE

Manila and Sisal ropes complying with the requirements of this Draft Tanzania Standard (2nd edition) shall be of the standard quality.

9. PHYSICAL PROPERTIES

Linear density and minimum breaking force shall conform to Tables 1, 2, 3, 4 and 5.

TABLE 1 – Requirements of sisal ropes – Plain or Hawser – laid (3-strands)

Angle of lay 37°C

| Diameter (mm) | Minimum No. of yarns per strand | Linear density | | Tensile force to be applied for the measurement of linear density (daN) | Minimum breaking Load (kN) |
|-------------------|---------------------------------------|----------------|-------------|-------------------------------------------------------------------------------------|-------------------------------------|
| | | (Ktex) | Tolerance % | | |
| 8 | 3 | 54 | | 11 | 4.71 |
| 10 | 4 | 68 | | 14 | 6.23 |
| 12 | 6 | 105 | | 21 | 9.92 |
| 14 | 8 | 140 | | 28 | 12.56 |
| 16 | 10 | 190 | | 40 | 17.46 |
| 18 | 13 | 220 | | 48 | 20.89 |
| 20 | 16 | 275 | | 64 | 27.86 |
| 22 | 19 | 330 | | 75 | 33.35 |
| 24 | 23 | 400 | | 89 | 39.83 |
| 26 | 27 | 470 | | 105 | 46.30 |
| 28 | 31 | 532 | | 120 | 52.29 |
| 30 | 36 | 625 | | 134 | 59.84 |
| 32 | 41 | 700 | | 154 | 67.30 |
| 36 | 52 | 890 | | 189 | 84.76 |
| 40 | 64 | 1100 | ±5 | 234 | 102.02 |
| 44 | 77 | 1340 | | 279 | 124.59 |
| 48 | 92 | 1585 | | 329 | 144.21 |
| 52 | 108 | 1870 | | 383 | 169.47 |
| 56 | 125 | 2150 | | 438 | 194.38 |
| 60 | 144 | 2480 | | 498 | 221.75 |
| 64 | 164 | 2880 | | 569 | 252.12 |
| 68 | 185 | 3180 | | 622 | 279.58 |
| 72 | 207 | 3620 | | 696 | 320.79 |
| 76 | 231 | 4000 | | 755 | 343.35 |
| 80 | 253 | 4400 | | 822 | 379.65 |
| 88 | 306 | 5350 | | 971 | 459.11 |
| 96 | 364 | 6400 | | 1101 | 524.83 |
| Method of test | - | A-3 | | - | A -4 |

TABLE 2 – Requirements of sisal ropes – plaited or shroud – laid (4-strands)

| Diameter (mm) | Minimum No. of yarns per strand | Linear density | | Tensile force to be applied for the measurement of linear density (daN) | Minimum breaking Load (kN) |
|-------------------|---------------------------------------|----------------|-------------|-------------------------------------------------------------------------------------|--------------------------------------|
| | | (Ktex) | Tolerance % | | |
| 8 | 2 | 54 | ±5 | 10 | 4.27 |
| 10 | 3 | 68 | | 13 | 5.59 |
| 12 | 4 | 105 | | 19 | 8.44 |
| 14 | 5 | 140 | | 25 | 11.33 |
| 16 | 7 | 190 | | 35 | 15.94 |
| 18 | 9 | 220 | | 42 | 18.83 |
| 20 | 11 | 275 | | 57 | 25.11 |
| 22 | 13 | 330 | | 68 | 30.07 |
| 24 | 15 | 400 | | 80 | 35.98 |
| 26 | 18 | 470 | | 94 | 41.79 |
| 28 | 21 | 532 | | 108 | 46.99 |
| 30 | 24 | 625 | | 121 | 53.81 |
| 32 | 28 | 700 | | 139 | 60.58 |
| 36 | 35 | 890 | | 171 | 86.03 |
| 40 | 43 | 1100 | | 211 | 91.97 |
| 44 | 52 | 1340 | | 251 | 112.13 |
| 48 | 62 | 1585 | | 305 | 130.08 |
| 52 | 73 | 1870 | | 345 | 152.54 |
| 56 | 84 | 2150 | | 394 | 174.96 |
| 60 | 97 | 2480 | | 448 | 199.58 |
| 64 | 111 | 2880 | 512 | 226.90 | |
| 68 | 125 | 3180 | 565 | 251.63 | |
| 72 | 140 | 3620 | 632 | 288.71 | |
| 76 | 156 | 4000 | 697 | 309.01 | |
| 80 | 171 | 4400 | 768 | 341.68 | |
| 88 | 206 | 5350 | 900 | 413.20 | |
| 96 | 246 | 6400 | 1059 | 472.35 | |
| Method of test | - | A-3 | | - | A-4 |

TABLE 3 – Requirements of cable - laid sisal ropes (9-strands).

Angle of lay 37°

Length of coil: 220m

| Diameter (mm) | Minimum No. of yarns per strands | Linear density | | Tensile force to be applied for measurement of linear density (daN) | Minimum breaking load (kN) |
|----------------------|-------------------------------------------|----------------|-------------|-------------------------------------------------------------------------------------|-----------------------------------|
| | | (Ktex) | Tolerance % | | |
| 40 | 17 | 1030 | ±5 | 129 | 64.75 |
| 44 | 20 | 1215 | | 153 | 76.71 |
| 48 | 24 | 1455 | | 179 | 89.66 |
| 52 | 28 | 1695 | | 206 | 103.00 |
| 56 | 33 | 2005 | | 235 | 117.72 |
| 64 | 43 | 2605 | | 298 | 149.11 |
| 72 | 54 | 3230 | | 369 | 184.43 |
| 80 | 67 | 4065 | | 447 | 223.67 |
| 88 | 81 | 4915 | | 534 | 266.83 |
| 96 | 96 | 5825 | | 628 | 313.92 |
| 104 | 113 | 6860 | | 730 | 364.93 |
| 112 | 131 | 7900 | | 844 | 421.83 |
| 120 | 150 | 9105 | | 961 | 480.69 |
| 128 | 171 | 10375 | | 1091 | 545.44 |
| 136 | 193 | 11705 | | 1226 | 613.12 |
| 144 | 216 | 13105 | 1375 | 687.68 | |
| Method of test | - | A-3 | | - | A-4 |

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

| Nominal diameter (mm) | Linear density | | Minimum breaking load (kN) |
|--------------------------|----------------|-------------|-------------------------------|
| | (Ktex) | Tolerance % | |
| 4 | 10 | ±10 | 1.15 |
| 4.5 | 12 | | 1.45 |
| 5 | 15 | | 1.89 |
| 6 | 20 | | 2.40 |
| 8 | 38 | | 4.50 |
| 10 | 64 | ±8 | 6.75 |
| 12 | 90 | | 9.60 |
| 14 | 130 | | 12.5 |
| 16 | 165 | ±5 | 17.6 |
| 18 | 218 | | 22.0 |
| 20 | 260 | | 27.0 |
| 22 | 320 | | 33.8 |
| 24 | 380 | | 39.6 |
| 26 | 445 | | 46.6 |
| 28 | 515 | | 55.0 |
| 30 | 600 | | 63.4 |
| 32 | 680 | | 71.0 |
| 36 | 850 | | 90.5 |
| 40 | 1050 | 110 | |
| 44 | 1200 | 131 | |
| 48 | 1400 | 158 | |
| 52 | 1720 | 184 | |
| 56 | 2050 | 205 | |
| 60 | 2250 | 245 | |
| 64 | 2750 | 270 | |
| 68 | 3000 | 300 | |
| Method of test | A-3 | | A-4 |

Table 5 – Requirements of 8 - strand braided Manila ropes, type C.

| Nominal diameter (mm) | Linear density | | Minimum breaking load (kN) |
|--------------------------|----------------|-------------|-------------------------------|
| | (Ktex) | Tolerance % | |
| 16 | 165 | ±5 | 17.4 |
| 18 | 219 | | 21.9 |
| 20 | 265 | | 25.7 |
| 22 | 327 | | 31.5 |
| 24 | 380 | | 38.8 |
| 26 | 450 | | 45.9 |
| 28 | 520 | | 53.6 |
| 30 | 600 | | 61.3 |
| 32 | 685 | | 70.0 |
| 36 | 880 | | 88.9 |
| 40 | 1000 | | 104 |
| 44 | 1150 | | 128 |
| 48 | 1480 | | 145 |
| 52 | 1700 | | 175 |
| 56 | 2000 | | 202 |
| 60 | 2200 | | 240 |
| 64 | 2650 | | 260 |
| 68 | 3000 | | 300 |
| 72 | 3400 | | 329 |
| 76 | 3800 | | 383 |
| 80 | 4200 | 407 | |
| 84 | 4600 | 445 | |
| 88 | 5000 | 500 | |
| 92 | 5600 | 564 | |
| 96 | 6000 | 599 | |
| Method of test | A-3 | | A-4 |

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10. PACKING

10.1 All ropes shall be neatly coiled. Each package shall be tied with four or more lashings, strong enough to ensure safe transport, apart from slinging, and shall be suitably protected to prevent damage in transit. The mass of the lashings and packing material shall not exceed 1.5% of the gross mass.

10.2 A standard method of coiling should be adopted so that the inner end of the package can be taken out without first it passing through the eye.

11. MARKING

11.1 Each package shall have a label securely attached on which shall be clearly and legibly marked the following:

- a. Manufacturer's name or trade mark
- b. Material
- c. Length and size of the rope in the coil and
- d. Any other marking required by the buyer

The markings shall be protected against obliteration.

11.2 The coils may also be marked with the tbs Certification Mark.

NOTE – The tbs Certification Mark may be used by manufacturers only under license from TBS. Particulars of conditions under which the licenses are granted may be obtained from TBS.

12. 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.

12.1 **Lot** – A quantity of packages 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.

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

12.3 The number of packages to be selected at random from a lot shall be as given in Table 6:

Table 6 – Sampling plan

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

12.4 For evaluating the length, linear density breaking load and pitch, the number of packages selected according to 12.3 shall constitute the test sample.

For evaluating the gross mass of the lot all the packages in the lot shall constitute the test sample.

12.5 **Criteria for conformity** – The lot shall be declared as conforming to this 2nd edition 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 Draft Tanzania 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 12.4) 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)

DRAFT 5

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