Import Substitution of Combination Wire Rope-Part V Specifications for Combination Wire Rope for Fishing Purposes

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Specifications for the manufacture of combination wire rope of 14 separate sizes ranging between 12 and 26 mm dia with six distinct strand constructions each of independent wire rope core (IWRC) and fibre core, using steel wires of three different tensile designations and polypropylene twisted tape covering, are reported in this communication in a format suitable for adoption as standards and as an aid to import substitution of combination wire rope for fishing purposes.

The R & D programmes on developing combination wire rope (CWR) indigenously has evolved methodology and guidelines for the manufacture of CWR for fishing purposes (Meenakumari & Panicker, 1988, 1989 a, b, 1990). Six different rope constructions each with fibre and steel core based on number of wires and their orientation in the rope strand were formulated. The rope diameter ranges between 12 and 26 mm with a breaking strength of 12.8 to 187.75 kN. The present communication gives detailed specifications of combination wire ropes of different sizes, construction and strength made with steel wires of three different tensile designations.

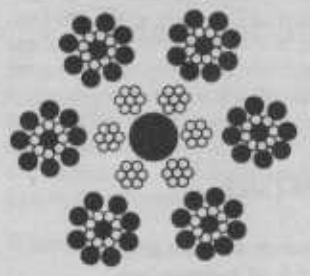
Materials and Methods

The materials and methods in respect of the development of prototype, comparative efficiency studies with imported samples and formulation of guide lines for the manufacture of CWR of standard specifications have already been discussed by Meenakumari & Panicker (1988, 1989 a, b and 1990). The selected data from the guidelines for making standard CWR incorporating rope diameter, mass, tensile strength in kN for ropes made of steel wires of 120, 140 and 160 tensile designations (IS: 1835, 1976) are presented under six separate rope construction methods in a format suitable for adoption as standards. The diameter of steel wires taken for the construction ranges between 0.5 and 1.0 mm. The specification of wires in the outer layer of wires in a double layered rope strand is taken as the main wire component of the rope. The inner layer of wires will always be the next lower in diameter.

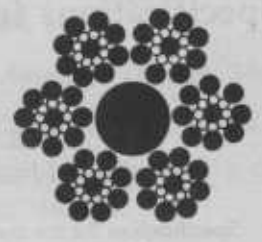
Results and Discussion

The rope constructions of 6 (8/f), 6(12/f), 6x15(9/6/f), 6x18(12/6/f), 6x21(12/9/f) and 6x24(15/9/f) with steel wire rope core and fibre core are presented in Tables 1 - 6. The diameter of rope in 6 (8/f) construction ranges between 12 and 21 mm and breaking strength ranges between 12.8 and 62.02 kN for ropes with fibre core and 20.65 to 101.8 kN for rope with steel core. The wire rope of 6(12/f) construction has a diameter 13 to 23 mm and breaking strength 17.45 to 89.45 kN for ropes with fibre core and 23.8 to 122.0 kN with steel core. In both these, there are six different rope diameters namely 12, 14, 16, 18, 19 and 21 mm in the former and 13, 15, 17, 19, 21 and 23 mm in the latter. In all the others there are two layers of wires of different diameters in the rope strand and 5 different rope diameters in each specifications. For the rope with

Table 1. *Breaking load and mass for 6(8/f) construction*



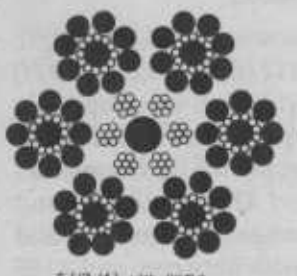
6(8/f) with IWRC



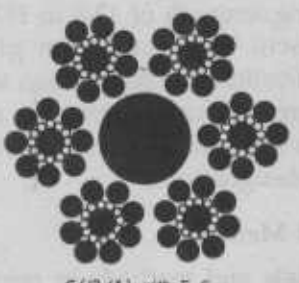
6(8/f) with F.C.

Nominal diameter +4% -1	Mass (Approx.) Fibre core	Steel core	Minimum breaking load of rope corresponding to tensile designation of the wires 120		140		160	
			Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
12.00	17.90	21.05	12.80	20.65	14.90	24.12	15.51	25.10
14.00	23.20	26.90	16.80	27.25	19.70	31.80	22.00	36.00
16.00	30.10	35.10	23.25	35.55	27.15	43.85	30.55	49.35
18.00	41.30	47.90	30.25	48.85	35.30	57.00	40.25	65.00
19.00	51.40	59.65	38.40	62.00	44.80	72.35	52.35	85.20
21.00	63.50	73.70	46.50	75.15	55.30	87.70	63.02	101.80

Table 2. *Breaking load and mass for 6(12/f) construction)*



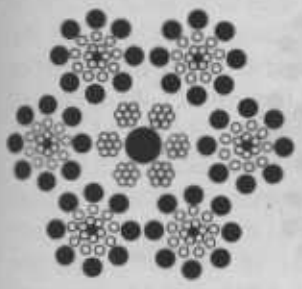
6(12/f) with IWRC



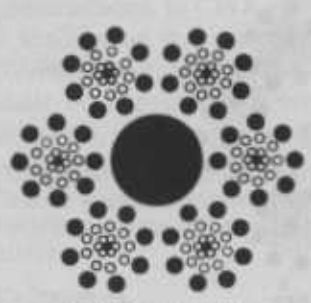
6(12/f) with F.C.

Nominal diameter +4% -1	Mass (Approx.) Fibre core	Steel core	Minimum breaking load of rope corresponding to tensile designation of the wires 120		140		160	
			Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
13.00	21.20	23.70	17.45	23.80	22.40	27.80	21.10	28.75
15.00	26.80	31.10	23.55	32.15	29.50	37.50	31.30	42.65
17.00	36.90	41.50	32.90	44.00	40.70	51.40	42.90	58.50
19.00	50.10	56.30	40.60	58.30	52.75	68.00	56.70	77.40
21.00	63.30	71.15	54.10	73.80	67.20	86.10	72.00	98.00
23.00	78.40	88.90	67.20	91.65	81.45	107.10	89.45	122.00

Table 3. *Breaking load and mass for 6x15 (9/6/f) construction*



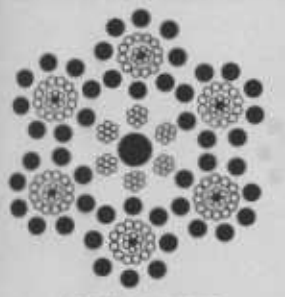
6x15(9/6/1) with IWRC



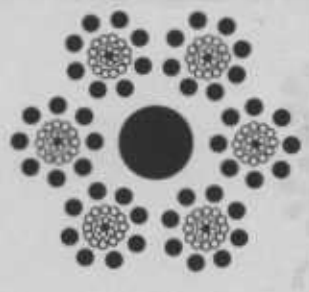
6x15(9/6/1) with F.C.

Nominal diameter	Mass (Approx.)		Minimum breaking load of rope corresponding to tensile designation of the wires					
+4% -1	Fibre core	Steel core	120		140		160	
			Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
14.00	30.20	33.70	26.40	34.60	30.80	40.33	34.00	45.00
16.00	40.10	44.80	35.80	47.25	42.00	55.10	47.80	62.73
18.00	54.15	60.55	63.00	63.00	56.25	74.80	64.00	83.62
20.00	69.90	70.70	62.00	80.55	72.30	94.00	82.55	107.10
22.00	87.30	97.33	77.50	100.45	90.50	117.40	103.10	133.75

Table 4. *Breaking load and mass for 6x18 (12/6/f) construction*



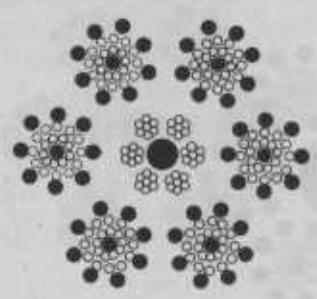
6 x 18(12/6/1) with IWRC



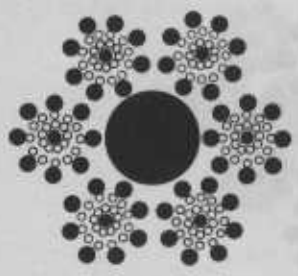
6x18(12/6/1) with F.C.

Nominal diameter	Mass (Approx.)		Minimum breaking load of rope corresponding to tensile designation of the wires					
+4% -1	Fibre core	Steel core	120		140		160	
			Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
15.00	33.10	38.60	32.30	39.65	37.65	46.30	41.80	51.75
17.00	50.30	55.20	44.10	54.20	51.40	63.20	58.55	72.00
19.00	63.00	69.40	58.90	72.20	68.70	84.25	78.15	95.85
21.00	80.95	88.90	75.20	92.20	88.10	107.60	102.15	122.60
23.00	95.40	101.40	94.25	114.95	110.10	134.30	125.45	153.0

Table 5. *Breaking load and mass for 6 x 21 (12/9/f) construction*



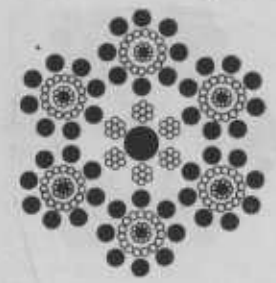
6x21(12/9/f) with IWRC



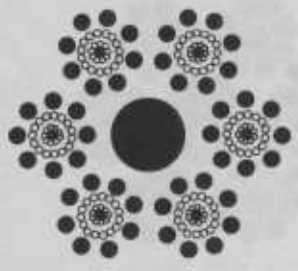
6x21(12/9/f) with F C

Nominal diameter	Mass (Approx.)		Minimum breaking load of rope corresponding to tensile designation of the wires					
+4%	Fibre	Steel	120		140		160	
-1	core	core	Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
16.00	38.85	42.35	36.65	43.40	42.55	50.65	47.85	56.25
18.00	51.85	56.25	50.00	59.25	58.30	69.15	66.35	78.70
20.00	69.60	76.00	66.76	79.20	78.15	92.35	88.90	105.10
22.00	89.90	97.60	76.15	94.40	100.55	118.30	114.55	131.85
24.00	112.10	122.60	101.75	117.60	125.90	147.90	143.45	168.50

Table 6. *Breaking load and mass for 6x24 (15/9/f) construction*



6x24(15/9/f) with IWRC



6x24(15/9/f) with F.C.

Nominal diameter	Mass (Approx.)		Minimum breaking load of rope corresponding to tensile designation of the wires					
+4%	Fibre	Steel	120		140		160	
-1	core	core	Fibre core	Steel core	Fibre core	Steel core	Fibre core	Steel core
mm	kg/100 m	kg/100m	kN	kN	kN	kN	kN	kN
18.00	43.75	47.25	42.55	48.50	49.50	56.55	54.90	63.00
20.00	58.10	62.80	58.00	66.20	67.70	77.25	79.10	87.95
22.00	78.50	84.85	77.65	88.40	90.60	103.15	103.10	117.30
24.00	101.05	109.05	99.70	123.10	116.30	131.90	132.55	150.35
26.00	126.50	136.65	124.60	141.65	155.50	164.80	165.80	187.75

6x15 construction (9/6/f), the diameter ranges from 14-22 mm and breaking load 26.4 to 103.1 kN for fibre core and 34.6 to 133.75 kN for steel core construction. Ropes with 6x18 strand construction (12/6/f), has a diameter 15- 23 mm and breaking strength 32.3 to 125.45 kN for ropes with fibre core and 39.65 to 153 kN for ropes with steel core. In 6x21 construction (12/9/f) the diameter ranges from 16-24 mm and breaking strangth 36.65 to 143.45 kN for fibre core and 43.4 to 168.5 kN for steel core. For the rope with 6x24 (15/9/f) construction, the diameter ranges from 18-26 mm and breaking strength from 42.55 to 165.8 kN for fibre core and 48.52 to 187.75 kN for steel core.

The breaking load given are the minimum requirement of the rope calculated from the product of the square of the nominal diameter of the wire component, the tensile designation of the wire and a coefficient appropriate to the construction of the rope. The main core of the rope shall be of a size sufficient to give full support to the strands and shall be of steel wire or fibre construction as detailed in the different constructions. In CWR with steel wire core, it shall be an independant wire rope core (IWRC) construction. The size of the rope shall be expressed in terms of nominal diameter.

The authors are indebted to Shri M.R. Nair, former Director Central Institute of Fisheries Technology, Kochi for encouragements and permission for the publication.

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