

INCH-POUND

RR-W-410F

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SUPERSEDING

RR-W-410E

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FEDERAL SPECIFICATION

WIRE ROPE AND STRAND

The General Services Administration has authorized the use of this federal specification by all federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers wire ropes and wire seizing strands (see 6.1). This specification does not include all types, classes, constructions, and sizes of wire rope and strand that are commercially available, but it is intended to cover the more common types, classes, constructions, and sizes that are suitable for federal government use.

1.2 Classification.

1.2.1 Types, classes, constructions, and sizes. Wire ropes and wire seizing strands covered by this specification shall be of the following types, classes, constructions, and sizes as specified (see 6.2 (b)). For general rules for selection of wire rope and strand, see 6.3 and the Wire Rope Users Manual. For wire rope and strand definitions and terms, see 6.4 and the Wire Rope Users Manual.

Type I - General purpose wire ropes

Class 1 - 6 by 7

Class 2 - 6 by 19

Construction 1 - 6 by 19 (2 operations)

Construction 2 - 6 by 19 Warrington

Construction 3 - 6 by 19 Seale

Construction 4 - 6 by 19 Filler wire

Construction 5 - 6 by 19 Warrington-Seale

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: STDZNMGT@dla.mil or Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616.

Class 3 - 6 by 37 and 6 by 36

- Construction 1 - 6 by 37 (3 operations)
- Construction 2 - 6 by 37 (2 operations)
- Construction 3 - 6 by 37 Seale (2 operations)
- Construction 4 - 6 by 36 Filler wire
- Construction 5 - 6 by 36 Seale-Warrington
- Construction 6 - 6 by 36 Warrington-Seale
- Construction 7 - 6 by 36 Seale-Filler wire
- Construction 8 - 6 by 36 Filler wire-Seale
- Construction 9 - 6 by 36 Seale-Warrington-Seale

Class 4 - 8 by 19

- Construction 1 - 8 by 19 (2 operations)
- Construction 2 - 8 by 19 Warrington
- Construction 3 - 8 by 19 Seale
- Construction 4 - 8 by 19 Filler wire
- Construction 5 - 8 by 19 Warrington-Seale

Class 5 - 6 by 61

- Construction 1 - 6 by 61 (3 operations)
- Construction 2 - 6 by 61 (2 operations)
- Construction 3 - 6 by 61 (2 operations)
- Construction 4 - 6 by 61 Filler wire-Seale
- Construction 5 - 6 by 61 Seale-Warrington-Seale
- Construction 6 - 6 by 61 Seale-Filler wire-Seale

Class 6 - 6 by 91

- Construction 1 - 6 by 91 (4 operations)
- Construction 2 - 6 by 91 (3 operations)
- Construction 3 - 6 by 91 (3 operations)
- Construction 4 - 6 by 91 (2 operations)

Type II - Elevator

Class 1 - 6 by 19

- Construction 1 - 6 by 19 Warrington
- Construction 2 - 6 by 19 Filler wire
- Construction 3 - 6 by 19 Warrington-Seale

Class 2 - 8 by 19

- Construction 1 - 8 by 19 (2 operations)
- Construction 2 - 8 by 19 Warrington
- Construction 3 - 8 by 19 Seale
- Construction 4 - 8 by 19 Filler wire
- Construction 5 - 8 by 19 Warrington-Seale

Type III- Marine (cables)

Class 1 - 6 by 6 deck lashing ropes

Class 2 - 6 by 12 running ropes

Class 3 - 6 by 24 mooring lines

- Construction 1 - 6 by 24 (2 operations)
- Construction 2 - 6 by 24 Warrington
- Construction 3 - 6 by 24 Seale

- Class 4 - 6 by 3 by 7 spring lay
- Class 5 - 6 by 3 by 19 spring lay
 - Construction 1 - 6 by 3 by 19 (2 operations)
 - Construction 2 - 6 by 3 by 19 Warrington
 - Construction 3 - 6 by 3 by 19 Seale
- Class 6 - 6 by 42 tiller or hand control ropes
- Type IV- Miscellaneous
 - Class 1 - 5 by 19 marline-clad
 - Construction 1 - 5 by 19 (2 operations)
 - Construction 2 - 5 by 19 Warrington
 - Construction 3 - 5 by 19 Filler wire
 - Class 2 - 18 by 7 rotation resistant
 - Class 3 - flattened strand
 - Construction 1 - 6 by 25 style B
 - Construction 2 - 6 by 30 style G
 - Construction 3 - 6 by 27 style H
 - Construction 4 - 6 by 31 style V
 - Class 4 - 8 by 19 rotation resistant
 - Construction 1 - 8 by 19 Seale
 - Construction 2 - 8 by 19 Filler wire
 - Construction 3 - 8 by 19 Warrington-Seale
- Type V - Auxiliary wire strands
 - Class 1 - 1 by 7 seizing strand
 - Class 2 - 1 by 19 seizing strand (2 operations)
- Type VI- Small cords
 - Class 1 - 3 by 7
 - Class 2 - 7 by 7 (6 by 7 wire strand core)
 - Class 3 - 7 by 19 (6 by 19 wire strand core) (2 operations)

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specification

PPP-B-1055 - Barrier Material, Waterproofed, Flexible.

Federal Standard

FED-STD-123 - Marking for Shipment (Civil Agencies).

(Activities outside the federal government may obtain copies of federal specifications, standards, and commercial item descriptions as specified in the General Information section of the Index of Federal Specifications, Standards and Commercial Item Descriptions. The index is for sale on a subscription basis from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Single copies of this specification, and other federal specifications and commercial item descriptions required by activities outside the federal government for bidding purposes are available without charge from the General Services Administration, Federal Supply Service, Specification Section, East 470 L'Enfant Plaza SW, Suite 8100, Washington, DC 20407.)

(Federal government activities may obtain copies of federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications

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| MIL-DTL-83420 | - Wire Rope, Flexible, for Aircraft Control, General Specification for. |
| MIL-P-24216 | - Polypropylene Cores, Strand Centers, and Substrands for Wire Rope. |

(Copies of military specifications required by contractors in connection with specific procurement functions are obtained from the Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Electronic copies of specifications may be obtained from <http://assist.daps.dla.mil/>.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on the date of invitation for bids or request for proposal shall apply.

American Hardboard Association

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| AHA 135.4 | - Basic Hardboard |
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(Private sector and civil agencies may purchase copies of these voluntary standards from the American Hardboard Association, 1210 W. Northwest Highway, Palatine, IL 60067. Requests for electronic copies may be made via email at aha@hardboard.org.)

ASTM International

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| ASTM A 90/A 90M | - Standard Test Method for Weight (MASS) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings. |
| ASTM A 700 | - Standard Practice for Packaging, Marking, and Loading Methods for Steel Products for Shipment. |

ASTM International - Continued

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| ASTM A 1023/A 1023M | - Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes. |
| ASTM B 139/B 139M | - Standard Specification for Phosphor Bronze Rod, Bar, and Shapes. |
| ASTM D 3953 | - Standard Specification for Strapping, Flat Steel and Seals. |
| ASTM D 6039/D 6039M | - Standard Specification for Crates, Wood, Open and Covered. |

(Private sector and civil agencies may purchase copies of these voluntary standards from the ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Electronic copies may be obtained from <http://www.astm.org/>.)

SAE International

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| SAE AMS-STD-66 | - Steel: Chemical Composition and Hardenability. |
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(Private sector and civil agencies may purchase copies of these voluntary standards from the SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001. Electronic copies may be obtained from <http://www.sae.org/>.)

National Motor Freight Traffic Association, Inc.

National Motor Freight Classification

(Private sector and civil agencies may purchase copies of these voluntary standards from the National Motor Freight Traffic Association, Inc., 2200 Mill Road, Alexandria, VA 22314. Electronic copies may be obtained from <http://www.nmfta.org/>.)

Surface Transportation Board

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| WRA UFC 6000 | - Uniform Freight Classification - Ratings, Rules and Regulations. |
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(Private sector and civil agencies may purchase copies of these voluntary standards from the Surface Transportation Board, 1925 K Street NW, Washington, DC 20423-0001. Electronic copies may be obtained from <http://www.stb.dot.gov/>.)

3. REQUIREMENTS

3.1 Material. Wire rope and strand shall be made of carbon steel, corrosion-resistant steel, or phosphor bronze as specified in the detail requirements for the individual wire ropes and strands.

3.1.1 Carbon steel. Material shall be free from defects that are detrimental to its appearance or serviceability. Steel for wires shall be made by either the open-hearth, basic oxygen, or electric furnace process. Carbon steel is used to manufacture wire rope grades of iron, annealed steel, traction steel, improved plow steel, extra improved plow steel and extra extra improved plow steel.

3.1.2 Phosphor bronze. Unless otherwise specified (see 6.2(c)), phosphor bronze shall be in accordance with composition A of ASTM B 139/B 139M.

3.1.3 Corrosion-resistant steel. Corrosion-resistant steel wire ropes shall be made of wires of 302 or 304 composition as specified in SAE AMS-STD-66.

3.1.4 Recovered materials. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

3.2 Wire rope cores and centers for wire strands. Wire rope cores and centers for wire strands shall be as specified in 3.2.1 through 3.2.5 for the individual wire ropes and strand centers.

3.2.1 Fiber core (see figure 1). Unless otherwise specified, fiber core for wire rope shall be one of the hard fibers or polypropylene fiber. The hard fibers are manila (abaca) and sisal (African, Java, Mauritius, Mexican, and Yucatan). Cotton, hemp, or jute fibers, hard laid, may be used in wire rope cores in fiber sizes of 1/8 inch in diameter and smaller. A mixture of two or more species of hard fibers may be used. Polypropylene fibers shall meet the requirements of MIL-P-24216. Fiber cores of wire ropes shall be thoroughly cleaned, free from waste, evenly twisted, and of uniform ply.

3.2.2 Wire strand core (see figure 2). The numbers of wires in the wire strand core shall be not less than the number of wires in the strands of the wire rope. Wires in the wire strand core shall be of the same material, or of a lower tensile strength steel (see table I or ASTM A 1023/A 1023M as applicable), as the wires in the strands of the wire rope. Iron or annealed steel shall not be used.

3.2.3 Independent wire rope core (IWRC) (see figure 3). IWRC may be a 6 by 7 wire rope with either a fibrous or wire strand (making it a 7 by 7) core. Six by 61 (type I, general purpose, class 5) and 6 by 91 (type I, general purpose, class 6) wire rope shall have 19 wire strands instead of 7 wire strands (making it a 7 by 19) in the IWRC. Wire rope with an independent wire rope core shall carry the letters IWRC in its description or designation. Wires in the IWRC shall be of the same material, or of a lower tensile strength steel (see table I or ASTM A 1023/A 1023M as applicable), as the wires in the strands of the wire rope. Iron or annealed steel shall not be used.

3.2.4 Centers for wire strands. Centers in wire strands shall be either of a twisted fibrous material, or a single wire as outlined in the specific strand construction description. When this wire becomes so large (manufacturer's discretion) that it is considered undesirable, a 7 wire strand is allowed to replace it, as specified (see 6.2(d)). This 7 wire strand center shall not increase the number of stranding operations of the main strand or the number of wires in the main strand wire count. Fiber centers for wire strands shall be as specified in 3.2.1.

3.2.5 Other material for cores and centers. When specified (see 6.2(e)), glass fibers, plastic fibers, twisted and waxed kraft paper, spiral springs, or flexible plastic rods may be used in wire rope cores and wire strand centers.

3.3 Mechanical properties (see 3.9).

3.3.1 Tensile strength.

3.3.1.1 Wire ropes. Wire ropes covered in this specification shall meet or exceed the minimum breaking strength (force) requirements specified in the applicable table and/or ASTM A 1023/A 1023M.

3.3.1.2 Main wires (load carrying). Where applicable, main wires in the main strands shall conform with the tensile strength requirements shown in table I or ASTM A 1023/A 1023M.

3.3.1.3 Galvanized wires. When drawn galvanized wire is ordered, it shall conform to the tensile requirements for bright (uncoated) steel wire specified in ASTM A 1023/A 1023M. The weight of zinc coating shall conform to the requirements shown in ASTM A 1023/A 1023M.

3.3.2 Torsion. Where applicable, main wires in the main strands, either bright (uncoated) or galvanized, shall conform to the minimum torsion requirements shown in ASTM A 1023/A 1023M.

3.3.3 Wrapping.

3.3.3.1 Rope wires of iron and steel grades, zinc coated (galvanized) at finished size. Rope wires of iron and steel wire rope grades, zinc coated at finished size, shall withstand wrapping in a close helix for six complete turns around a mandrel, followed by unwrapping without breakage or fracture of the wire. For zinc coated iron wires, the mandrel shall be the same diameter as the wire. For zinc coated steel wires, the mandrel shall be two times the diameter of the wire.

3.3.3.2 Rope wires of uncoated iron and phosphor bronze wire rope grades. Rope wires of uncoated iron and phosphor bronze wire rope grades shall withstand wrapping in a close helix for six complete turns around a mandrel having a diameter the same as the wire.

3.3.4 Pre-stretched wire rope. When specified (see 6.2(f)), the wire rope shall be pre-stretched in accordance with ASTM A 1023/A 1023M.

3.3.5 Finish.

3.3.5.1 Bright (uncoated) carbon steel. Unless otherwise specified (see 6.2(g)), wire used in wire ropes shall be bright (uncoated) carbon steel.

3.3.5.2 Zinc coating (galvanized). When specified (see 6.2(h)), zinc coating shall be applied by either the electrolytic plating process or by hot dipping in molten zinc. The weight of the zinc coating on each wire shall be as specified in ASTM A 1023/A 1023M.

3.3.5.2.1 The zinc coating shall be free from deleterious uncoated spots, lumps, pits, blisters, gritty areas, dross, and flux.

3.4 Fabrication.

3.4.1 Wire rope. A wire rope shall consist of a specified number of wire strands closed around a core. Each strand shall be constructed as specified in the detail requirements for the individual class and construction.

3.4.1.1 Rope and strand wires. Wires in the same layer of wire ropes and strands shall be considered of one diameter when the difference between the largest and the smallest diameters does not exceed the values shown in table II.

3.4.2 Wire joints. Wires up to and including 0.014 inch in diameter may be spliced by twisting. Wires larger than 0.014 inch in diameter shall be joined by lap brazing or butt welding. Butt welds shall be annealed.

3.4.2.1 Twisted splices of wires of any one layer of a strand shall not be closer than 20 feet. Brazed or butt-welded joints in the wires of a strand shall not be closer than 18 inches.

3.4.3 Preformed and non-preformed wire ropes and strands. Unless otherwise specified (see 6.2(i)), the contractor shall supply either preformed or non-preformed wire ropes and strands as specified in 3.4.3.1 and 3.4.3.2.

3.4.3.1 Preformed wire ropes and strands. Wire ropes in which the strands and their wires are permanently shaped during fabrication to a spiral form they assume in the finished wire rope or strand shall be identified as preformed wire ropes or strands.

3.4.3.2 Non-preformed wire ropes and strands. Wire ropes in which the strands and their wires are not permanently shaped during fabrication to a spiral form they assume in the finished wire rope or strand shall be identified as non-preformed wire ropes or strands.

3.4.4 Lays (see figure 4). Wire rope lays shall be as specified in the detail requirements for the individual wire ropes and strands.

3.4.4.1 Right regular lay. Wires in the strand are laid to the left, and strands in the rope are laid to the right.

3.4.4.2 Left regular lay. Wires in the strand are laid to the right, and strands in the rope are laid to the left.

3.4.4.3 Right lang lay. Both the wires in the strand and the strands in the rope are laid to the right.

3.4.4.4 Left lang lay. Both the wires in the strand and the strands in the rope are laid to the left.

3.4.4.5 Rope lay length. Rope lay strength shall not be less than 5 1/2 times the nominal rope diameter. The maximum rope lay length shall be not more than specified in the applicable table or ASTM A 1023/A 1023M.

3.5 Construction. Unless otherwise specified (see 6.2(j)), the contractor may supply wire rope and strand of any construction applicable to the size rope or strand being furnished.

3.6 Lubrication.

3.6.1 Iron or traction steel wire rope for elevator service. Wires of iron or traction steel wire rope for elevator service shall be thoroughly coated with lubricant during the process of manufacture. The lubrication shall be compounded for each specific application so as not to restrict the rope's operating characteristics.

3.6.2 Uncoated iron or steel wire ropes. Unless otherwise specified, wires of uncoated (not galvanized) iron or steel wire ropes shall be thoroughly coated with a lubricant during the process of manufacture. The lubricant shall provide lubrication qualities and corrosion protection during shipping, storage, handling and the initial period of service; provide a suitable lubricant base for subsequent field re-lubrications; and be free of substances injurious to steel wires and fiber cores.

3.6.2.1 When specified (see 6.2(k)), a heavy corrosion inhibitor shall be applied to the entire length of the wire rope after closure to prevent corrosion prior to installation.

3.6.3 Coated (galvanized) steel and iron, corrosion-resistant steel, and phosphor bronze wire ropes. Unless otherwise specified (see 6.2(l)), coated (galvanized) steel and iron, corrosion-resistant steel, and phosphor bronze wire ropes may be lightly lubricated during fabrication.

3.6.4 Fiber centers and cores. Fiber centers and cores shall be thoroughly impregnated during fabrication with a lubricant which shall contain preservative materials to allay deterioration of fiber parts due to rot or mildew and shall not be injurious to the steel wires. This requirement is not applicable to synthetic cores or centers.

3.6.5 Wire strand core and IWRC. Wire strand core and IWRC shall be thoroughly covered with a lubricant for protecting and preserving their wires.

3.7 Diameter of wire rope and strands. Except for type II elevator, type III spring lay, type IV marline clad, type V seizing strand, and type VI small cord, which are of special construction, the actual diameter of wire ropes and strands shall not differ from the ordered diameter by more than the amounts shown in ASTM A 1023/A 1023M or tables III and IV, as applicable.

3.7.1 Traction steel and iron elevator wire rope. The maximum diameter tolerance based on nominal rope diameter shall be as shown in the maximum (no load) column of the applicable table. With a load of 10 percent of minimum breaking strength (force), the minimum diameter tolerance based on nominal rope diameter shall be plus 1/128 inch.

3.8 Seizing. Each end of each length of wire rope shall be suitably seized.

3.9 Mechanical properties. Mechanical properties for wire in ropes and strands shall be as specified in table I and ASTM A 1023/A 1023M, except for filler wires, non-round wires, wires in wire strand cores, and wires in IWRCs (see 3.2.2 and 3.2.3).

3.10 Workmanship. Wire ropes shall be uniform in material and quality and shall be securely laid free from kinks, loose wires, loose strands, or other defects that may be detrimental to their serviceability and appearance. Protruding wires are considered a defect and not more than one broken wire will be accepted in 1000 feet of wire rope.

3.11 Type I, general purpose.

3.11.1 Type I, general purpose, class 1, 6 by 7 (see figure 5 for typical construction).

3.11.1.1 Wire rope shall have 6 strands of 7 wires totaling 42 wires, laid around a fiber core as specified (see 3.11.1.3.4).

3.11.1.2 Each strand shall have 1 wire center and 6 outer wires. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.1.3 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(m-1)).

3.11.1.3.1 Improved plow steel wire rope grade. Type I, general purpose, improved plow steel wire rope grade shall be in accordance with ASTM A 1023/A 1023M (see 3.1.1).

3.11.1.3.2 Galvanized iron wire rope grade. Type I, general purpose, galvanized iron wire rope grade shall be in accordance with the requirements specified herein.

3.11.1.3.3 Finish. Wire ropes of iron shall be of zinc coated (galvanized) wires, and unless a zinc coating material is specified (see 3.3.5 and 6.2(m-2)), improved plow steel shall be of bright (uncoated) wires.

3.11.1.3.4 Cores. Cores shall be of fiber as specified (see 3.2.1, 3.2.5, and 6.2(m-3)).

3.11.1.3.5 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(m-4)).

3.11.1.3.6 Lay. Unless otherwise specified (see 6.2(m-5)), wire ropes shall be supplied with right regular lay (see 3.4.4.1).

3.11.1.3.7 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in ASTM A 1023/A 1023M, as applicable.

3.11.2 Type I, general purpose, class 2, 6 by 19.

3.11.2.1 Material. Material shall be of carbon steel, corrosion-resistant steel, or phosphor bronze as specified (see 3.1 and 6.2(n-1)).

3.11.2.1.1 Finish. Wire rope of phosphor bronze and corrosion-resistant steel shall be of uncoated wires. Wire rope of improved plow steel, extra improved plow steel, or extra extra improved plow steel shall be of bright (uncoated) or zinc coated (galvanized) wires as specified (see 3.3.1.3, 3.3.5, and 6.2(n-2)).

3.11.2.1.2 Cores. Cores shall be in accordance with table VI as specified (see 6.2(n-3)).

3.11.2.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(n-4)).

3.11.2.1.4 Lay. Wire ropes with fiber cores shall be supplied with right regular lay unless otherwise specified (see 3.4.4.1 and 6.2(n-5)).

3.11.2.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables VII through XI.

3.11.2.2 Type I, general purpose, class 2, construction 1, 6 by 19 (2 operations) (see figure 6 for typical construction).

3.11.2.2.1 Wire ropes shall have 6 strands of 19 wires each, totaling 114 wires in the strands. This construction shall not be required in lang lay or in sizes 3/8 inch and larger.

3.11.2.2.2 Each strand shall have 1 wire center, 6 inner wires, and 12 outer wires. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.11.2.3 Type I, general purpose, class 2, construction 2, 6 by 19 (Warrington) (see figure 7 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze, corrosion-resistant steel, and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.2.3.1 Wire ropes shall have 6 strands of 19 wires each, totaling 114 wires in the strands. This construction shall not be required in lang lay.

3.11.2.3.2 Each strand shall have 1 center wire, 6 inner wires, and 12 outer wires. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of two diameters of wire laid alternately. Each strand shall be fabricated in one operation.

3.11.2.4 Type I, general purpose, class 2, construction 3, 6 by 19 (Seale) (see figure 8 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze, corrosion-resistant steel, and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.2.4.1 Wire ropes shall have 6 strands of 19 wires each, totaling 114 wires in the strands.

3.11.2.4.2 Each strand shall have 1 center wire, 9 inner wires, and 9 outer wires. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.2.5 Type I, general purpose, class 2, construction 4, 6 by 19 (Filler wire) (see figure 9 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze, corrosion-resistant steel, improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.2.5.1 Wire ropes shall have 6 strands of not less than 21 wires and not more than 25 wires each, totaling not less than 126 nor more than 150 wires in the strands. This construction shall not be required in sizes smaller than 3/8 inch.

3.11.2.5.2 Each strand shall have 1 wire center, not less than 5 nor more than 6 inner wires, and not less than 10 nor more than 12 outer wires. There shall be not less than 5 nor more than 6 wires (fillers) between the layers. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Filler wires shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.2.6 Type I, general purpose, class 2, construction 5, 6 by 19 (Warrington-Seale) (see figure 10 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze, corrosion-resistant steel, improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.2.6.1 Wire ropes shall have 1 core and 6 strands of 26 wires each, totaling 156 wires in the strands.

3.11.2.6.2 Each strand shall have 1 center wire, 5 inner wires, 10 intermediate wires, and 10 outer wires. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of two diameters of wire laid alternately. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.3 Type I, general purpose, class 3, 6 by 37 and 6 by 36.

3.11.3.1 Material. Material shall be carbon steel or corrosion-resistant steel as specified (see 3.1 and 6.2(o-1)).

3.11.3.1.1 Finish. Wire rope of corrosion-resistant steel shall be uncoated wires. Wire rope of improved plow steel, extra improved plow steel, or extra extra improved plow steel shall be bright (uncoated) wires or zinc coated (galvanized) wires as specified (see 3.3.1.3, 3.3.5, and 6.2(o-2)).

3.11.3.1.2 Cores. Cores shall be in accordance with table VI as specified (see 6.2(o-3)).

3.11.3.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(o-4)).

3.11.3.1.4 Lay. Lay shall be as specified (see 3.4.4 and 6.2(o-5)).

3.11.3.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables VII through X and XII through XV.

3.11.3.2 Type I, general purpose, class 3, construction 1, 6 by 37 (3 operations) (see figure 11 for typical construction). Wire rope grades phosphor bronze, corrosion-resistant steel, improved plow steel, and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.3.2.1 Wire ropes shall have 1 core and 6 strands of not less than 34 nor more than 37 wires each, totaling not less than 204 nor more than 222 wires in the strands. This construction shall not be required in lang lay or in sizes 3/8 inch and larger.

3.11.3.2.2 Each strand shall have 1 center wire, 6 inner wires, 12 intermediate wires, and not less than 15 nor more than 18 outer wires. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in three operations.

3.11.3.3 Type I, general purpose, class 3, construction 2, 6 by 37 (2 operations) (see figure 12 for typical construction). Wire rope grades phosphor bronze, corrosion-resistant steel, improved plow steel, and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.3.3.1 Wire ropes shall have 1 core and 6 strands of not less than 33 nor more than 43 wires each, totaling not less than 198 nor more than 258 wires in the strands. This construction shall not be required in lang lay.

3.11.3.3.2 Each strand shall have 1 center strand of 19 to 25 wires constructed in accordance with 3.11.2.3, 3.11.2.4, and 3.11.2.5. Over this center strand, the outer layer shall be not less than 14 nor more than 18 wires. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.11.3.4 Type I, general purpose, class 3, construction 3, 6 by 37 (Seale) (2 operations) (see figure 13 for typical construction). Wire rope grades phosphor bronze, corrosion-resistant steel, improved plow steel, and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.3.4.1 Wire ropes shall have 1 core and 6 strands of not less than 27 nor more than 37 wires each, totaling not less than 162 nor more than 222 wires in the strands. This construction is generally furnished only in regular lay. It shall not be required in sizes larger than 1 inch.

3.11.3.4.2 Each strand shall have 1 center wire, 6 inner wires, not less than 10 nor more than 15 intermediate wires, and not less than 10 nor more than 15 outer wires. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.11.3.5 Type I, general purpose, class 3, construction 4, 6 by 36 (Filler wire) (see figure 14 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades corrosion-resistant steel, improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.5.1 Wire ropes shall have 1 core and 6 strands of not less than 29 nor more than 37 wires each, totaling not less than 174 nor more than 222 wires in the strands. This construction shall not be required in sizes smaller than 3/8 inch.

3.11.3.5.2 Each strand shall have 1 center wire, not less than 7 nor more than 9 inner wires, and not less than 14 nor more than 18 outer wires. There shall be not less than 7 nor more than 9 filler wires between the inner and outer layers. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Filler wires shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.3.6 Type I, general purpose, class 3, construction 5, 6 by 36 (Seale-Warrington) (see figure 15 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze, corrosion-resistant steel, and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.6.1 Wire ropes shall have 1 core and 6 strands of not less than 29 nor more than 37 wires each, totaling not less than 174 nor more than 222 wires in the strands. This construction shall not be required in lang lay or in sizes smaller than 3/8 inch.

3.11.3.6.2 Each strand shall have 1 center wire, not less than 7 nor more than 9 inner wires, not less than 7 nor more than 9 intermediate wires, and not less than 14 nor more than 18 outer wires. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outer layer shall be of two diameters, laid alternately. Each strand shall be fabricated in one operation.

3.11.3.7 Type I, general purpose, class 3, construction 6, 6 by 36 (Warrington-Seale) (see figure 16 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades corrosion-resistant steel, improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.7.1 Wire ropes shall have 1 core and 6 strands of not less than 31 nor more than 46 wires each, totaling not less than 186 nor more than 276 wires in the strands.

3.11.3.7.2 Each strand shall have 1 center wire, not less than 6 nor more than 9 inner wires, not less than 12 nor more than 18 intermediate wires, and not less than 12 nor more than 18 outer wires. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of two diameters of wires laid alternately. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.3.8 Type I, general purpose, class 3, construction 7, 6 by 36 (Seale-Filler wire) (see figure 17 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades corrosion-resistant steel and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.8.1 Wire ropes shall have 1 core and 6 strands of not less than 36 nor more than 46 wires each, totaling not less than 216 nor more than 276 wires in the strands. This construction shall not be required in sizes 3/8 inch and smaller.

3.11.3.8.2 Each strand shall have 1 center wire, not less than 7 nor more than 9 inner wires, not less than 7 nor more than 9 intermediate wires, and not less than 14 nor more than 18 outer wires. There shall be not less than 7 nor more than 9 filler wires between the intermediate and outer layers. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Filler wires shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.3.9 Type I, general purpose, class 3, construction 8, 6 by 36 (Filler wire-Seale) (see figure 18 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades corrosion-resistant steel and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.9.1 Wire ropes shall have 1 core and 6 strands of not less than 31 nor more than 49 wires each, totaling not less than 186 nor more than 294 wires in the strands. This construction shall not be required in sizes smaller than 1/2 inch.

3.11.3.9.2 Each strand shall have 1 center wire, not less than 5 nor more than 8 inner wires, not less than 10 nor more than 16 intermediate wires, and not less than 10 nor more than 16 outer wires. There shall be not less than 5 nor more than 8 filler wires between the inner and intermediate layers. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Filler wires shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.3.10 Type I, general purpose, class 3, construction 9, 6 by 36 (Seale-Warrington-Seale) (see figure 19 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes up to and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades corrosion-resistant steel and improved plow steel in sizes larger than 2-3/8 inches and extra improved plow steel in sizes larger than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.11.3.10.1 Wire ropes shall have 1 core and 6 strands of not less than 43 nor more than 49 wires each, totaling not less than 258 nor more than 294 wires in the strands. This construction shall not be required in sizes smaller than 2 inches.

3.11.3.10.2 Each strand shall have 1 center wire, not less than 7 nor more than 8 inner wires, not less than 7 nor more than 8 inside intermediate wires, not less than 14 nor more than 16 outside intermediate wires, and not less than 14 nor more than 16 outer wires. Wires in the inner layer shall be of one diameter. Wires in the inside intermediate layer shall be of one diameter. Wires in the outside intermediate layer shall be of two diameters, laid alternately. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.4 Type I, general purpose, class 4, 8 by 19.

3.11.4.1 Material. Material shall be of carbon steel as specified (see 3.1).

3.11.4.1.1 Finish. Wire rope shall be bright (uncoated) or zinc coated (galvanized) wires as specified (see 3.3.5 and 6.2(p-1)).

3.11.4.1.2 Cores. Cores shall be fiber cores in accordance with 3.2.1 or when specified (see 3.2.5 and 6.2(p-2)).

3.11.4.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(p-3)).

3.11.4.1.4 Lay. Lay shall be right regular lay in accordance with 3.4.4.1.

3.11.4.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in table XVI.

3.11.4.2 Type I, general purpose, class 4, construction 1, 8 by 19 (2 operations) (see figure 20 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.11.4.2.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands. This construction shall not be required in sizes larger than 1/4 inch.

3.11.4.2.2 Each strand shall be in accordance with 3.11.2.2.2.

3.11.4.3 Type I, general purpose, class 4, construction 2, 8 by 19 (Warrington) (see figure 21 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.11.4.3.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands. This construction shall not be required in sizes smaller than 1/4 inch.

3.11.4.3.2 Each strand shall be in accordance with 3.11.2.3.2.

3.11.4.4 Type I, general purpose, class 4, construction 3, 8 by 19 (Seale) (see figure 22 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.11.4.4.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands.

3.11.4.4.2 Each strand shall be in accordance with 3.11.2.4.2.

3.11.4.5 Type I, general purpose, class 4, construction 4, 8 by 19 (Filler wire) (see figure 23 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.11.4.5.1 Wire ropes shall have 1 core and 8 strands of not less than 21 nor more than 25 wires, totaling not less than 168 nor more than 200 wires in the strands. This construction shall not be required in sizes smaller than 7/16 inch.

3.11.4.5.1 Each strand shall be in accordance with 3.11.2.5.2.

3.11.4.6 Type I, general purpose, class 4, construction 5, 8 by 19 (Warrington-Seale) (see figure 24 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.11.4.6.1 Wire ropes shall have 1 core and 8 strands of 26 wires each, totaling 208 wires in the strands.

3.11.4.6.2 Each strand shall be in accordance with 3.11.2.6.2.

3.11.5 Type I, general purpose, class 5, 6 by 61 (see figure 25 for typical construction).

3.11.5.1 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(q-1)).

3.11.5.1.1 Finish. Wire rope of improved plow steel or extra improved plow steel shall be of bright (uncoated) or zinc coated (galvanized) wire as specified (see 3.3.5 and 6.2(q-2)).

3.11.5.1.2 Cores. Wire ropes of improved plow steel shall have either fiber core, wire strand core, or IWRC as specified (see 3.2 and 6.2(q-3)). Wire ropes of extra improved plow steel shall have an IWRC in accordance with 3.2.3.

3.11.5.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(q-4)).

3.11.5.1.4 Lay. Lay shall be as specified (see 3.4.4 and 6.2(q-5)).

3.11.5.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables XVII, XVIII, and XIX.

3.11.5.2 Type I, general purpose, class 5, construction 1, 6 by 61 (3 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.2.1 Wire ropes shall have 1 core and 6 strands of not less than 53 nor more than 68 wires each, totaling not less than 318 nor more than 408 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.2.2 Each strand shall have 1 center strand of 19 to 26 wires constructed in accordance with 3.11.2.3.2, 3.11.2.4.2, 3.11.2.5.2, or 3.11.2.6.2. The second layer from the outside shall have not less than 14 nor more than 18 wires. The outer layer shall have not less than 20 nor more than 24 wires. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in three operations.

3.11.5.3 Type I, general purpose, class 5, construction 2, 6 by 61 (2 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.3.1 Wire ropes shall have 1 core and 6 strands of not less than 51 nor more than 74 wires each, totaling not less than 306 nor more than 444 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.3.2 Each strand shall have 1 center strand of 19 to 26 wires constructed in accordance with 3.11.2.3.2, 3.11.2.4.2, 3.11.2.5.2, or 3.11.2.6.2. The second layer from the outside shall have not less than 16 nor more than 24 wires. The outer layer shall have not less than 16 nor more than 24 wires. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.11.5.4 Type I, general purpose, class 5, construction 3, 6 by 61 (2 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.4.1 Wire ropes shall have 1 core and 6 strands of not less than 51 nor more than 73 wires each, totaling not less than 306 nor more than 438 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.4.2 Each strand shall have 1 center strand of 31 to 49 wires constructed in accordance with 3.11.3.5.2, 3.11.3.6.2, 3.11.3.7.2, 3.11.3.8.2, or 3.11.3.9.2. The outside layer shall have not less than 16 nor more than 24 wires. Wires in the outside layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.11.5.5 Type I, general purpose, class 5, construction 4, 6 by 61 (Filler wire-Seale). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.5.1 Wire ropes shall have 1 core and 6 strands of not less than 55 nor more than 61 wires each, totaling not less than 330 nor more than 366 wires in the strand. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.5.2 Each strand shall have one wire center, either 8 or 9 inner wires, either 16 or 18 intermediate wires, and either 16 or 18 outer wires. There shall be a layer of either 8 or 9 filler wires between the inner and intermediate layers. Wires in the inner layer shall be of one diameter. Wires in the intermediate layer shall be of one diameter. Wires in the outside layer shall be of one diameter. Filler wires shall be of one diameter.

3.11.5.6 Type I, general purpose, class 5, construction 5, 6 by 61 (Seale-Warrington-Seale). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.6.1 Wire ropes shall have 1 core and 6 strands of 55 wires each, totaling 330 wires in the strands. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.6.2 Each strand shall have 1 center wire, 9 inner wires, 9 inside intermediate wires, 18 outside intermediate wires, and 18 outer wires. Wires in the inner layer shall be of one diameter. Wires in the inside intermediate layer shall be of one diameter. Wires in the outside intermediate layer shall be of two diameters laid alternately. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.5.7 Type I, general purpose, class 5, construction 6, 6 by 61 (Seale-Filler wire-Seale). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.5.7.1 Wire ropes shall have 1 core and 6 strands of 57 or 64 wires each, totaling 342 or 384 wires in the strands. This construction shall not be required in sizes smaller than 2 inches.

3.11.5.7.2 Each strand shall have 1 center wire, 8 or 9 inner wires, 8 or 9 inside intermediate wires, 16 or 18 outside intermediate wires, and 16 or 18 outer wires. There shall be either 8 or 9 filler wires between the inside and outside intermediate layers. Wires in the inner layer shall be of one diameter. Wires in the inside intermediate layer shall be of one diameter. Wires in the outside intermediate layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Filler wires shall be of one diameter. Each strand shall be fabricated in one operation.

3.11.6 Type I, general purpose, class 6, 6 by 91 (see figure 26 for typical construction).

3.11.6.1 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(r-1)).

3.11.6.1.1 Finish. Wire rope of improved plow steel or extra improved plow steel shall be of bright (uncoated) or zinc coated (galvanized) wire as specified (see 3.3.5 and 6.2(r-2)).

3.11.6.1.2 Cores. Wire ropes of improved plow steel shall have either fiber core, wire strand core, or IWRC as specified (see 3.2 and 6.2(r-3)). Wire ropes of extra improved plow steel shall be IWRC in accordance with 3.2.3.

3.11.6.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(r-4)).

3.11.6.1.4 Lay. Unless otherwise specified (see 6.2(r-5)), the lay shall be right regular lay in accordance with 3.4.4.1.

3.11.6.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables XX, XXI, and XXII.

3.11.6.2 Type I, general purpose, class 6, construction 1, 6 by 91 (4 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.6.2.1 Wire ropes shall have 1 core and 6 strands of not less than 79 nor more than 98 wires each, totaling not less than 474 nor more than 588 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2-1/2 inches.

3.11.6.2.2 Each strand shall have 1 center strand of 19 to 26 wires constructed in accordance with 3.11.2.3.2, 3.11.2.4.2, 3.11.2.5.2, or 3.11.2.6.2. The third layer from the outside shall have not less than 14 nor more than 18 wires. The second layer from the outside shall have not less than 20 nor more than 24 wires. The outer layer shall have not less than 26 nor more than 30 wires. Wires in the third layer from the outside shall be of one diameter. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in four operations.

3.11.6.3 Type I, general purpose, class 6, construction 2, 6 by 91 (3 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.6.3.1 Wire ropes shall have 1 core and 6 strands of not less than 79 nor more than 110 wires each, totaling not less than 474 nor more than 660 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2-1/2 inches.

3.11.6.3.2 Each strand shall have 1 center strand of 19 to 26 wires constructed in accordance with 3.11.2.3.2, 3.11.2.4.2, 3.11.2.5.2, or 3.11.2.6.2. The third layer from the outside shall have not less than 16 nor more than 24 wires. The second layer from the outside shall have not less than 22 nor more than 30 wires. The outer layer shall have not less than 22 nor more than 30 wires. Wires in the third layer from the outside shall be of one diameter. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in three operations.

3.11.6.4 Type I, general purpose, class 6, construction 3, 6 by 91 (3 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.6.4.1 Wire ropes shall have 1 core and 6 strands of not less than 75 nor more than 103 wires each, totaling not less than 450 nor more than 618 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2-1/2 inches.

3.11.6.4.2 Each strand shall have 1 center strand of 29 to 49 wires constructed in accordance with 3.11.3.5.2, 3.11.3.6.2, 3.11.3.7.2, 3.11.3.8.2, or 3.11.3.9.2. The second layer from the outside shall have not less than 20 nor more than 24 wires. The outer layer shall have not less than 26 nor more than 30 wires. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in three operations.

3.11.6.5 Type I, general purpose, class 6, construction 4, 6 by 91 (2 operations). Wire rope grades improved plow steel and extra improved plow steel shall be in accordance with the requirements specified herein.

3.11.6.5.1 Wire ropes shall have 1 core and 6 strands of not less than 75 nor more than 109 wires each, totaling not less than 450 nor more than 654 wires in the strands. This construction is not furnished in lang lay and it is not furnished preformed. This construction shall not be required in sizes smaller than 2-1/2 inches.

3.11.6.5.2 Each strand shall have 1 center strand of 31 to 49 wires constructed in accordance with 3.11.3.5.2, 3.11.3.6.2, 3.11.3.7.2, 3.11.3.8.2, or 3.11.3.9.2. The second layer from the outside shall have not less than 22 nor more than 30 wires. The outer layer shall have not less than 22 nor more than 30 wires. Wires in the second layer from the outside shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.12 Type II, elevator.

3.12.1 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(s-1)). When specified (see 6.2(s-1)), elevator wire ropes of 11/16, 13/16, and 15/16-inch diameters may be of high-rise special steel of greater strengths.

3.12.1.1 Finish. Elevator wire ropes shall be of bright (uncoated) wires in accordance with 3.3.5.1.

3.12.1.2 Cores. Cores shall be fiber cores in accordance with 3.2.1 or 3.2.5.

3.12.1.3 Fabrication. Steel wire ropes shall be fabricated as specified (see 3.4 and 6.2(s-2)). Iron wire ropes shall be non-preformed in accordance with 3.4.

3.12.1.4 Lay. Lay shall be right regular lay in accordance with 3.4.4.1.

3.12.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables XXIII, XXIV, and XXV.

3.12.2 Type II, elevator, class 1, 6 by 19. Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.2.1 Type II, elevator, class 1, construction 1, 6 by 19 (Warrington) (see figure 7 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.2.1.1 Wire ropes shall have 1 core and 6 strands of 19 wires each, totaling 114 wires in the strands. This construction shall not be required in sizes larger than 5/16 inch.

3.12.2.1.2 Strands shall be in accordance with 3.11.2.3.2.

3.12.2.2 Type II, elevator, class 1, construction 2, 6 by 19 (Filler wire) (see figure 9 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.2.2.1 Wire ropes shall have 1 core and 6 strands of not less than 21 and not more than 25 wires each, totaling not less than 126 nor more than 150 wires in the strands. This construction shall not be required in sizes smaller than 3/8 inch.

3.12.2.2.2 Strands shall be in accordance with 3.11.2.5.2.

3.12.2.3 Type II, elevator, class 1, construction 3, 6 by 19 (Warrington-Seale) (see figure 10 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.2.3.1 Wire ropes shall have 1 core and 6 strands of 26 wires each, totaling 156 wires in the strands. This construction shall not be required in sizes smaller than 3/8 inch.

3.12.2.3.2 Each strand shall be in accordance with 3.11.2.6.2.

3.12.3 Type II, elevator, class 2, 8 by 19. Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.1 Type II, elevator, class 2, construction 1, 8 by 19 (2 operations) (see figure 20 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.1.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands. This construction shall not be required in sizes smaller than 1/4 inch.

3.12.3.1.2 Each strand shall be in accordance with 3.11.2.2.2.

3.12.3.2 Type II, elevator, class 2, construction 2, 8 by 19 (Warrington) (see figure 21 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.2.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands. This construction shall be required only in 1/4-inch through 7/16-inch sizes.

3.12.3.2.2 Each strand shall be in accordance with 3.11.2.3.2.

3.12.3.3 Type II, elevator, class 2, construction 3, 8 by 19 (Seale) (see figure 22 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.3.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands.

3.12.3.3.2 Each strand shall be in accordance with 3.11.2.4.2.

3.12.3.4 Type II, elevator, class 2, construction 4, 8 by 19 (Filler wire) (see figure 23 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.4.1 Wire ropes shall have 1 core and 8 strands of not less than 21 nor more than 25 wires each, totaling not less than 168 nor more than 200 wires in the strands. This construction shall not be required in sizes smaller than 7/16 inch.

3.12.3.4.2 Strands shall be in accordance with 3.11.2.5.2.

3.12.3.5 Type II, elevator, class 2, construction 5, 8 by 19 (Warrington-Seale) (see figure 24 for typical construction). Wire rope grades iron and traction steel shall be in accordance with the requirements specified herein.

3.12.3.5.1 Wire ropes shall have 1 core and 8 strands of 26 wires each totaling 208 wires in the strands. This construction shall not be required in sizes smaller than 3/8 inch.

3.12.3.5.2 Each strand shall be in accordance with 3.11.2.6.2.

3.13 Type III, marine (cables).

3.13.1 Type III, marine (cables), class 1, 6 by 6, (deck lashing ropes) (see figure 27 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.1.1 Deck lashing ropes shall have 1 core and 6 strands of 1 fiber center and 6 wires each, totaling 36 wires in the strands.

3.13.1.2 Each strand shall have 1 fiber center and 6 outer wires. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.13.1.3 Material. Material shall be carbon steel as specified (see 3.1).

3.13.1.3.1 Finish. Wire ropes shall be of uncoated or coated (galvanized) wires as specified (see 3.3.5 and 6.2(t-1)).

3.13.1.3.2 Centers and cores. Strand centers and wire rope cores shall be of fiber in accordance with 3.2.1 or 3.2.5.

3.13.1.3.3 Fabrication. Wire ropes shall be preformed in accordance with 3.4.

3.13.1.3.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.13.1.3.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in table XXVI.

3.13.2 Type III, marine (cables), class 2, 6 by 12 (running ropes) (see figure 28 for typical construction). Wire rope grade improved plow steel sizes 5/16 inches through 1 inch shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades phosphor bronze and improved plow steel in sizes less than 5/16 inch and greater than 1 inch shall be in accordance with the requirements specified herein.

3.13.2.1 Running rope shall have 1 core and 6 strands of 1 fiber center and 12 wires each, totaling 72 wires in the strands.

3.13.2.2 Each strand shall have 1 fiber center and 12 outer wires. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.13.2.3 Material. Material shall be carbon steel or phosphor bronze as specified (see 3.1 and 6.2(u-1)).

3.13.2.3.1 Finish. Wire ropes of steel shall be of zinc coated (galvanized) wires in accordance with 3.3.5.2.

3.13.2.3.2 Centers and cores. Wire ropes shall have strand centers and rope cores of fiber in accordance with 3.2.1 or 3.2.5.

3.13.2.3.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(u-2)).

3.13.2.3.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.13.2.3.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in tables XXVII and XXVIII.

3.13.3 Type III, marine (cables), class 3, 6 by 24 mooring lines.

3.13.3.1 Material. Material shall be carbon steel as specified (see 3.1).

3.13.3.1.1 Finish. Wire ropes shall be of zinc coated (galvanized) wires in accordance with 3.3.5.2.

3.13.3.1.2 Centers and cores. Wire ropes shall have strand centers and rope cores of fiber as specified in 3.2.1 or 3.2.5.

3.13.3.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(v-1)).

3.13.3.1.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.13.3.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in table XXIX.

3.13.3.2 Type III, marine (cables), class 3, 6 by 24 (mooring lines), construction 1, (2 operations) (see figure 29 for typical construction). Wire rope grade improved plow steel in sizes up to and including 2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade improved plow steel in sizes greater than 2 inches shall be in accordance with the requirements specified herein.

3.13.3.2.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 24 wires each, totaling 144 wires in the strands.

3.13.3.2.2 Each strand shall have 1 fiber center, 9 wires in the inner layer and 15 wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in 2 operations.

3.13.3.3 Type III, marine (cables), class 3, 6 by 24 (mooring lines), construction 2, (Warrington) (see figure 30 for typical construction). Wire rope grade improved plow steel in sizes up to and including 2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade improved plow steel in sizes greater than 2 inches shall be in accordance with the requirements specified herein.

3.13.3.3.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 24 wires each, totaling 144 wires in the strands.

3.13.3.3.2 Each strand shall have 1 fiber center, 8 wires in the inner layer and 16 wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of two diameters laid alternately. Each strand shall be fabricated in one operation.

3.13.3.4 Type III, marine (cables), class 3, 6 by 24 (mooring lines), construction 3, (Seale) (see figure 31 for typical construction). Wire rope grade improved plow steel in sizes up to and including 2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade improved plow steel in sizes greater than 2 inches shall be in accordance with the requirements specified herein.

3.13.3.4.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 24 wires each, totaling 144 wires in the strands.

3.13.3.4.2 Each strand shall have 1 fiber center, 12 wires in the inner layer and 12 wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in one operation.

3.13.4 Type III, marine (cables), class 4, 6 by 3 by 7 spring lay (see figure 32 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.4.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 6 substrands (3 fiber and 3 steel) each, totaling 126 wires in the steel strands.

3.13.4.2 Each steel substrand shall be in accordance with 3.11.1. Each strand shall have 1 fiber center, 3 fiber substrands, and 3 steel substrands of 7 wires each, totaling 21 wires laid alternately.

3.13.4.3 Material. Material shall be carbon steel as specified (see 3.1).

3.13.4.3.1 Finish. Wire ropes shall be of zinc coated (galvanized) wire in accordance with 3.3.5.2.

3.13.4.3.2 Centers and cores. Centers and cores shall be fiber in accordance with 3.2.1. The alternate (main) fiber strands showing on the surface of the finished spring lay rope shall be made of either polypropylene fiber or a good quality hard fiber. A mixture of two or more kinds of hard fiber may be used.

3.13.4.3.2.1 Preservation and lubrication. Fiber parts shall be treated with a lubricating compound blended to give proper lubricity and water repellency. The materials used shall not accelerate deterioration of the fiber parts during storage or weathering of the spring lay rope, nor adversely affect its handling qualities or durability. This requirement is not applicable to polypropylene parts (see MIL-P-24216).

3.13.4.3.3 Fabrication. Wire rope shall be preformed in accordance with 3.4. This rope shall not be required to meet the requirement of 4.4.5.2.

3.13.4.3.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.13.4.3.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in table XXX.

3.13.5 Type III, marine (cables), class 5, 6 by 3 by 19 spring lay. Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.5.1 Material. Material shall be carbon steel as specified (see 3.1).

3.13.5.1.1 Finish. Wire rope shall be coated as specified (see 3.3.5 and 6.2(w-1)).

3.13.5.1.2 Centers and cores. Centers and cores shall be as specified in 3.13.4.3.2.

3.13.5.1.3 Fabrication. Wire rope shall be preformed in accordance with 3.4. This rope shall not be required to meet the requirement of 4.4.5.2.

3.13.5.1.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.13.5.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be as specified in table XXX.

3.13.6 Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 1, (2 operations) (see figure 33 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.6.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 6 substrands (3 fiber and 3 steel) each, totaling 342 wires in the steel strands.

3.13.6.2 Each steel substrand shall be in accordance with 3.13.4.2. Each strand shall have 1 fiber center, 3 fiber substrands, and 3 steel substrands of 19 wires each, totaling 57 wires laid alternately.

3.13.7 Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 2, (Warrington) (see figure 34 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.7.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 6 substrands (3 fiber and 3 steel) each, totaling 342 wires in the steel strands.

3.13.7.2 Each steel substrand shall be in accordance with 3.11.2.3.2. Each strand shall have 1 fiber center, 3 fiber substrands, and 3 steel substrands of 19 wires each, totaling 57 wires laid alternately.

3.13.8 Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 3, (Seale) (see figure 35 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.13.8.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 6 substrands (3 fiber and 3 steel) each, totaling 342 wires in the steel strands.

3.13.8.2 Each steel substrand shall be in accordance with 3.11.2.4.2. Each strand shall have 1 fiber center, 3 fiber substrands and 3 steel substrands of 19 wires each, totaling 57 wires laid alternately.

3.13.9 Type III, marine (cables), class 6, 6 by 42 tiller or hand control ropes (see figure 36 for typical construction). Wire rope grades phosphor bronze and improved plow steel shall be in accordance with the requirements specified herein.

3.13.9.1 Wire rope shall have 1 core and 6 strands of 1 fiber center and 6 substrands each, totaling 252 wires in the strands.

3.13.9.2 Each steel substrand shall be in accordance with 3.11.1. Each strand shall have 1 fiber center and 6 substrands of 7 wires each, totaling 42 wires.

3.13.9.3 Material. Material shall be carbon steel or phosphor bronze as specified (see 3.1 and 6.2(x-1)).

3.13.9.3.1 Finish. Wire ropes of improved plow steel shall be either zinc coated or bright (uncoated) wires, as specified (see 6.2(x-2)), in accordance with 3.3.5.

3.13.9.3.2 Centers and cores. Centers and cores shall be fiber in accordance with 3.2.1 or 3.2.5.

3.13.9.3.3 Fabrication. Wire ropes shall be non-preformed in accordance with 3.4.3.2.

3.13.9.3.4 Lay. Lay shall be right regular lay in accordance with 3.4.4.1.

3.13.9.3.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with tables XXXI and XXXII.

3.14 Type IV, miscellaneous.

3.14.1 Type IV, miscellaneous, class 1, 5 by 19 marline-clad.

3.14.1.1 Material. Material shall be carbon steel as specified in 3.1.

3.14.1.1.1 Finish. Wire ropes shall be of bright (uncoated) wires in accordance with 3.3.5.1.

3.14.1.1.2 Cores. Wire ropes shall have fiber cores in accordance with 3.2.1 or 3.2.5.

3.14.1.1.3 Fabrication. Wire ropes shall be preformed in accordance with 3.4.3.1.

3.14.1.1.4 Lay. Lay shall be of right regular lay in accordance with 3.4.4.1.

3.14.1.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with table XXXIII.

3.14.2 Type IV, miscellaneous, class 1, 5 by 19 marline-clad, construction 1, (2 operations) (see figure 37 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.14.2.1 Wire rope shall have 1 core and 5 strands of 19 wires each, totaling 95 wires in the strands.

3.14.2.2 Each strand shall be in accordance with 3.11.2.2.2. Each strand shall be served with marline wound tightly on the strand so that it is firm, durable, uniformly smooth, and free from imperfections.

3.14.2.2 Type IV, miscellaneous, class 1, 5 by 19 marline-clad, construction 2, (Warrington) (see figure 38 for typical construction). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.14.2.2.1 Wire rope shall have 1 core and 5 strands of 19 wires each, totaling 95 wires in the strands.

3.14.2.2.2 Each strand shall be in accordance with 3.11.2.3.2. Each strand shall be served with marline wound tightly on the strand so that it is firm, durable, uniformly smooth, and free from imperfections.

3.14.2.3 Type IV, miscellaneous, class 1, 5 by 19 marline-clad, construction 3, (Filler wire) (see figure 39). Wire rope grade improved plow steel shall be in accordance with the requirements specified herein.

3.14.2.3.1 Wire rope shall have 1 core and 5 strands of not less than 21 nor more than 25 wires each, totaling not less than 105 nor more than 125 wires in the strands.

3.14.2.3.2 Each strand shall be in accordance with 3.11.2.5.2. Each strand shall be served with marline wound tightly on the strand so that it is firm, durable, uniformly smooth, and free from imperfections.

3.14.3 Type IV, miscellaneous, class 2, 18 by 7 rotation resistant (see figure 40 for typical construction). Wire rope grades improved plow steel and extra improved plow steel in sizes 1/4 inch through and including 1-1/2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/4 inch and greater than 1-1/2 inches shall be in accordance with the requirements specified herein.

3.14.3.1 Wire rope shall have 1 core, 6 strands of 7 wires each, totaling 42 wires in the inner layer and 12 strands of 7 wires each totaling 84 wires in the outer layer. The inner rope layer shall be lang lay, left lay, whereas the outer rope layer shall be regular lay, right lay. The wire rope shall be closed in 2 operations. Total number of wires in the rope shall be 126.

3.14.3.2 Each strand shall be in accordance with 3.11.1, except for material and lay.

3.14.3.3 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(y-1)).

3.14.3.3.1 Finish. Wire ropes shall be bright (uncoated) or zinc coated (galvanized) as specified (see 3.3.5 and 6.2(y-2)).

3.14.3.3.2 Cores. Unless otherwise specified (see 6.2(y-3)), cores shall be either fiber or wire strand at option of the contractor (see 3.2.1 and 3.2.2).

3.14.3.3.3 Fabrication. Wire rope shall be preformed in accordance with 3.4.3.1.

3.14.3.3.4 Lay.

3.14.3.3.4.1 Inner layer. The 6 inner strands in the ropes shall be of a left lang lay in accordance with 3.4.4.4 laid around a fiber core or a wire strand core.

3.14.3.3.4.2 Outer layer. The 12 strands in the outer layer shall be laid around the first layer in a right regular lay in accordance with 3.4.4.1.

3.14.3.3.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with tables XXXIV and XXXV.

3.14.4 Type IV, miscellaneous, class 3, flattened strand. Wire rope grades improved plow steel or extra improved plow steel shall be in accordance with the requirements specified herein.

3.14.4.1 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(z-1)).

3.14.4.1.1 Finish. Wire ropes shall be of bright (uncoated) wires in accordance with 3.3.5.1.

3.14.4.1.2 Cores. Wire ropes of improved plow steel shall have fiber, wire strand, or independent wire rope cores as specified (see 3.2 and 6.2(z-2)). Wire ropes of extra improved plow steel shall have a wire strand or IWRC as specified (see 3.2.2, 3.2.3, and 6.2(z-2)).

3.14.4.1.3 Fabrication. Wire ropes shall be fabricated as specified (see 3.4 and 6.2(z-3)).

3.14.4.1.4 Lay. Lay shall be right lang lay in accordance with 3.4.4.3.

3.14.4.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with tables XXXVI, XXXVII, and XXXVIII.

3.14.4.1.6 Style interchangeability. The following four constructions have the same number of inner and outer wires and are differentiated only by the construction of the triangular shaped center around which the two layers of wire are stranded. All four have similar operating characteristics and may be supplied and used interchangeably

3.14.4.2 Type IV, miscellaneous, class 3, flattened strand, construction 1, 6 by 25 style B (see figure 41 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch and greater than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.14.4.2.1 Wire rope shall have 1 core and 6 strands of 1 triangular wire center and 24 wires each, totaling 144 wires and 6 triangular wire centers in the strands.

3.14.4.2.2 Each strand shall have 1 triangular-wire center, 12 round wires in the inner layer, and 12 round wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in two operations.

3.14.4.3 Type IV, miscellaneous, class 3, flattened strand, construction 2, 6 by 30, style G (see figure 42 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch and greater than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.14.4.3.1 Wire rope shall have 1 core and 6 strands of 1 triangular shaped center of 6 wires and 24 wires each, totaling 180 wires in the strands.

3.14.4.3.2 Each strand shall have 1 triangular-shaped center, 12 wires in the inner layer, and 12 wires in the outer layer. Each triangular-shaped center shall have 6 round wires. Each pair of the wires shall be twisted together, then the 3 pairs twisted together so that the cross-section of the center is triangular. There may be filler wires in the center. Wires in the inner layer shall be of one diameter. Wires in the center layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in either two or three operations.

3.14.4.4 Type IV, miscellaneous, class 3, flattened strand, construction 3, 6 by 27, style H (see figure 43 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch and greater than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.14.4.4.1 Wire rope shall have 1 core and 6 strands of 27 wires each, totaling 162 wires in the strands.

3.14.4.4.2 Each strand shall have 1 triangular-shaped center consisting of 3 round wires, 12 round wires in the inner layer, and 12 round wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the center layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in either two or three operations.

3.14.4.5 Type IV, miscellaneous, class 3, flattened strand, construction 4, 6 by 31, style V (see figure 44 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch and greater than 2-3/8 inches shall be in accordance with the requirements specified herein.

3.13.4.5.1 Wire rope shall have 1 core and 6 strands of triangular-shaped brangled center strand of 6 or 7 wires and 24 wires each, totaling either 180 or 186 wires in the strands.

3.14.4.5.2 Each strand shall have 1 triangular-shaped brangled center strand, 12 wires in the inner layer, and 12 wired in the outer layer. Each triangular-shaped brangled strand shall have either a fiber center or a round wire center with 6 round wires laid around it and brangled so that the cross-section of the center strand is triangular. Wires in the center layer shall be of one diameter. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. Each strand shall be fabricated in either 2 or 3 operations.

3.14.5 Type IV, miscellaneous, class 4, 8 by 19 rotation resistant. Wire rope grades improved plow steel or extra improved plow steel shall be in accordance with the requirements specified herein.

3.14.5.1 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(aa-1)).

3.14.5.1.1 Finish. Wire ropes shall be of bright (uncoated) wires or zinc coated (galvanized) wires in accordance with 3.3.5.

3.14.5.1.2 Core. Wire rope shall have an independent wire rope core in accordance with 3.2.3 and it shall be left lang lay in accordance with 3.4.4.4.

3.14.5.1.3 Fabrication. Wire rope shall be preformed in accordance with 3.4.3.1.

3.14.5.1.4 Lay. Wire rope lay shall be right regular lay in accordance with 3.4.4.1.

3.14.5.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with tables XXXIX and XL.

3.14.5.2 Type IV, miscellaneous, class 4, construction 1, 8 by 19 rotation resistant (Seale) (see figure 45 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 2-3/8 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch shall be in accordance with the requirements specified herein.

3.14.5.2.1 Wire ropes shall have 1 core and 8 strands of 19 wires each, totaling 152 wires in the strands.

3.14.5.2.2 Each strand shall be in accordance with 3.11.2.4.2.

3.14.5.3 Type IV, miscellaneous, class 4, construction 2, 8 by 19 rotation resistant (Filler wire) (see figure 46 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 1-1/2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch shall be in accordance with the requirements specified herein.

3.14.5.3.1 Wire ropes shall have 1 core and 8 strands of not less than 21 wires and not more than 25 wires each, totaling not less than 168 nor more than 200 wires in the strands.

3.14.5.3.2 Each strand shall be in accordance with 3.11.2.5.2.

3.14.5.4 Type IV, miscellaneous, class 4, construction 3, 8 by 19 rotation resistant (Warrington-Seale) (see figure 47 for typical construction). Wire rope grades improved plow steel, extra improved plow steel, and extra extra improved plow steel for sizes 1/2 inch through and including 1-1/2 inches shall be in accordance with ASTM A 1023/A 1023M. Wire rope grades improved plow steel and extra improved plow steel in sizes below 1/2 inch shall be in accordance with the requirements specified herein

3.14.5.4.1 Wire ropes shall have 1 core and 8 strands of 26 wires each, totaling 208 wires in the strands.

3.14.5.4.2 Each strand shall be in accordance with 3.11.2.6.2.

3.15 Type V, auxiliary wire strands.

3.15.1 Type V, auxiliary wire strands, class 1, 1 by 7 seizing strand (see figure 48 for typical construction). Wire rope grades iron, annealed steel, and corrosion-resistant steel shall be in accordance with the requirements specified herein.

3.15.1.1 The strand shall have 1 wire center and 6 outer wires. Wires in the outer layer shall be of one diameter. The strand shall be fabricated in 1 operation and shall have 7 wires.

3.15.1.2 Material. Material shall be carbon steel or corrosion-resistant steel as specified (see 3.1 and 6.2(bb-1)).

3.15.1.2.1 Finish. Wires shall be zinc coated in accordance with 3.3.5.2 except corrosion-resistant steel which shall be uncoated.

3.15.1.2.2 Fabrication. Wire strand shall be fabricated as specified (see 3.4 and 6.2(bb-2)).

3.15.1.2.3 Lay. Strands shall be left regular lay in accordance with 3.4.4.2.

3.15.1.2.4 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with table XLI.

3.15.2 Type V, auxiliary wire strands, class 2, 1 by 19 seizing strand (2 operations) (see figure 49 for typical construction). Wire rope grades iron and annealed steel shall be in accordance with the requirements specified herein.

3.15.2.1 The strand shall have 1 wire center, 6 wires in the inner layer, and 12 wires in the outer layer. Wires in the inner layer shall be of one diameter. Wires in the outer layer shall be of one diameter. The strand shall be fabricated in 2 operations and shall have 19 wires.

3.15.2.2 Material. Material shall be carbon steel as specified (see 3.1 and 6.2(cc-1)).

3.15.2.2.1 Finish. Wires shall be zinc coated in accordance with 3.3.5.

3.15.2.2.2 Fabrication. Wire strand shall be fabricated as specified (see 3.4 and 6.2(cc-2)).

3.15.2.2.3 Lay. Strands shall be left regular lay in accordance with 3.4.4.2.

3.15.2.2.4 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with table XLII.

3.16 Type VI, small cords.

3.16.1 Material. Material shall be of carbon steel or corrosion-resistant steel suitable for the purpose and as specified (see 3.1 and (6.2(dd-1))).

3.16.1.1 Finish. Wire rope of corrosion-resistant steel shall be of uncoated wire. Wire rope of carbon steel shall be of zinc coated (galvanized) wires (see 3.3.5).

3.16.1.2 Cores. Cores for class 2 and class 3 shall be wire strand (see 3.2.2). Class 1 shall have no core.

3.16.1.3 Fabrication. Wire rope shall be preformed and fabricated in accordance with 3.4. The diameter at the cut end shall not increase more than shown in table XLIII.

3.16.1.4 Lay. The lay shall be right regular lay in accordance with 3.4.4.1.

3.16.1.5 Dimensions, weight, and strength. Dimensions, weight, and strength requirements shall be in accordance with table XLIII.

3.16.2 Type VI, small cords, class 1, 3 by 7 (see figure 50 for typical construction). Wire rope grade carbon steel, 1/32 inch size, shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade corrosion-resistant steel and carbon steel, 3/64 inch size, shall be in accordance with the requirements specified herein.

3.16.2.1 Wire rope shall have 3 strands of 7 wires each, totaling 21 wires laid together without a core. This class shall be required only in sizes 1/32 and 3/64.

3.16.2.2 Each strand shall be in accordance with 3.11.1.2.

3.16.3 Type VI, small cords, class 2, 7 by 7 (see figure 51 for typical construction). Wire rope grade carbon steel, 1/32 inch size, shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade corrosion-resistant steel shall be in accordance with the requirements specified herein.

3.16.3.1 Wire rope shall have 6 strands of 7 wires each, totaling 42 wires laid around a wire strand core also of 7 wires. This class shall be required only in sizes 3/64, 1/16, and 3/32.

3.16.3.2 Each strand, including the wire strand core, shall be in accordance with 3.11.1.2.

3.16.4 Type VI, small cord, class 3, 7 by 19 (2 operations) (see figure 52 for typical construction). Wire rope grade carbon steel shall be in accordance with ASTM A 1023/A 1023M. Wire rope grade corrosion-resistant steel shall be in accordance with the requirements specified herein.

3.16.4.1 Wire rope shall have 6 strands of 19 wires each, totaling 114 wires laid around a wire strand core also of 19 wires. This class shall be required only in sizes 1/16 through 3/8.

3.16.4.2 Each strand, including the wire strand core, shall be in accordance with 3.11.2.2.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling.

4.2.1 Lot. A lot shall consist of wire rope or strand of one size, type, class, construction and material produced by one machine or by a series of progressive processing machines. A lot shall consist of a maximum of five production lengths.

4.2.2 Production length. A production length is that length of wire rope manufactured in one continuous operation from one loading of the closing machine comprising strands, each of which has been produced in one continuous operation on the stranding machine.

4.2.3 Test sample. One test sample, of sufficient length to perform all tests, shall be taken from each lot.

4.2.4 Sampling for rope wire tests. Sampling for rope main wires shall be in accordance with ASTM A 1023/A 1023M.

4.3 Examination.

4.3.1 Visual examination. Each production length shall be visually examined for workmanship and lubrication.

4.3.2 Examination of diameter. The examination of the wire rope or strand diameter shall be made in accordance with ASTM A 1023/A 1023M.

4.3.3 Examination of rope lay. The length of 5 or more rope closing lays shall be measured beginning not less than 10 feet from the end of the production length. The distance measured on a straight length of rope shall be divided by the number of pitches, in order to arrive at the pitch size of the length of a single lay.

4.3.4 Examination for lubricant. The examination of wire strands and cores for lubrication shall be made during the closing of the wire rope. The lubricant shall be sufficient to coat the wire strands, wire cores, independent wire rope cores, and to impregnate fiber cores as specified in 3.6.

4.4 Test methods.

4.4.1 Strength.

4.4.1.1 Breaking strength (force) test of finished wire ropes and strands. The breaking strength (force) of wire ropes or strands shall be determined in accordance with ASTM A 1023/A 1023M. The minimum breaking strength (force) shall be as shown in the applicable tables herein and applicable tables in ASTM A 1023/A 1023M.

4.4.1.2 Tensile test of rope wires. The tensile strength of rope wires shall be determined in accordance with ASTM A 1023/A 1023M. The tensile strength of the main wires shall conform to the tensile strength requirements shown in table I and ASTM A 1023/A 1023M, as applicable.

4.4.2 Torsion test. The torsion test will be conducted in accordance with ASTM A 1023/A 1023M. The minimum torsion values shall conform to the requirements of ASTM A 1023/A 1023M.

4.4.3 Wrapping test of main wires. From each short sample, not less than one specimen of each size of main wires from each wire strand shall be taken. The test specimen may be of any convenient length and shall be as unwound from a strand. One end of the specimen shall be secured on the mandrel in any convenient manner. The diameters of the mandrels and the number of wraps shall be as specified in 3.3.3.1 and 3.3.3.2 for the material and finish of the wires under the test. The wire shall not break or fracture. Occasional breakages at the place where the wire is secured on the mandrel shall be disregarded and an additional specimen substituted for the test.

4.4.4 Zinc coating test.

4.4.4.1 Weight of coating test. The zinc coating shall be tested for weight in accordance with the requirements of ASTM A 90/A 90M.

4.4.5 Fabrication tests (in strands).

4.4.5.1 Determination of the number of stranding operations. The number of stranding operations shall be determined. One of the outside wires in the strand shall be unlaid for a distance of 1 foot, holding the remaining outside wires in their original position. If the unlaid wire was in contact with the same wires in the inside layer, then the two layers were fabricated in one operation. The same tests may be applied to the intermediate layers of the strand after removing all outer layer wires.

4.4.5.2 Preformed wire rope. If the seizing at one end of the wire is removed, the difference between the nominal diameter of the wire rope and the nominal diameter before seizing is removed shall be not more than the values given in table XLIV, or for type VI, small cord, wire rope, in table XLIII.

4.5 Rejection and retests.

4.5.1 Rejection. If any of the test specimens fail to pass any specified tests, all reels or coils from the same production length shall be rejected.

4.5.2 Retest. In the event of failure of one or more representative specimens, retest of additional specimens from the production length will be permitted. If one of the retest specimens fails, all reels or coils from the same production length shall be rejected.

4.6 Inspection of packing. Sample packages and packs, and the inspection of the preservation, packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The preparation for delivery requirements specified herein applies only for direct government procurements. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, (see 6.6)).

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2(ee)).

5.1.1 Level A.

5.1.1.1 Wire rope. Wire rope shall be preserved and packaged in accordance with ASTM A 700. Unless otherwise specified (see 6.2(ff)), rope shall be furnished on reels. Phosphor bronze, corrosion-resistant, and galvanized wire rope shall be packaged as specified for steel wire rope except preservative (protective) coating compounds shall not be required.

5.1.1.2 Seizing strand. Seizing strand shall be furnished on commercial type reels. Reels shall be of sufficient size and construction commensurate with the quantity of strands specified (see 6.2(ff)). Reels shall be wrapped with two thicknesses of waterproofed flexible barrier material conforming to PPP-B-1055 and secured in place with two tension tied steel bandings or wire in accordance with ASTM A 700.

5.1.2 Level C. Wire rope and seizing strand shall be preserved and packaged to afford adequate protection against corrosion, deterioration, and damage during shipment from the supply source to the first receiving activity for immediate use or controlled humidity storage. The contractor may use his standard practice when it needs these requirements.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2(ee)).

5.2.1 Level A.

5.2.1.1 Wire rope shall be packed in accordance with ASTM A 700.

5.2.1.2 Seizing strand reels shall be packed in unsheathed crates conforming to ASTM D 6039/D 6039M. Anchoring of contents and the closure and strapping of containers shall be in accordance with ASTM D 6039/D 6039M. Reels of the "cross-line" and "clothes-line" type may be consolidated for shipment without over-packing. In consolidation, reels in multiples of three shall be lagged together with four lagging members of nominal 1- by 4-inch lumber nailed into the ends of the cross arm members.

5.2.2 Level B.

5.2.2.1 Wire rope on reels.

5.2.2.1.1 Reels exceeding 36 inch diameter. Unless otherwise specified (see 6.2(gg)), wire rope on reels exceeding 36 inches shall be packed as specified in 5.2.1.1.

5.2.2.1.2 Reels 36 inch diameter and under. Wire rope, packaged as specified, shall be packed in accordance with ASTM A 700, level A, except that in lieu of wood lagging, the reels shall have a hardboard veneer conforming to AHA/BOARD A135.4 placed directly on top of the wire rope. This form of lagging shall extend the full inside width between the reel flanges and shall overlap a minimum of 6 inches. The lagging board shall be secured with two steel straps or wires conforming to ASTM D 3953, nailless, finish A or B, grade 2.

5.2.2.2 Seizing strand. Seizing strand shall be packed as specified in 5.2.1.2.

5.2.3 Level C. Wire rope shall be packed in a manner acceptable to the common carrier that will insure safe delivery at destination in a satisfactory condition at the lowest applicable rate.

5.2.4 Containers, packing, or method of shipment shall comply with WRA UFC 6000 or National Motor Freight Classification rules and regulations or other carrier rules as applicable to the mode of transportation.

5.3 Marking.

5.3.1 Military agencies. In addition to any special marking required by the contract or purchase order, shipments shall be marked in accordance with ASTM A 700. Unsheathed crates (see 5.2.1.2) shall be marked with "Center of Balance" and "Use No Hooks" in accordance with ASTM D 6039/D 6039M.

5.3.2 Civil agencies. Marking for shipment shall be in accordance with FED-STD-123.

6. NOTES

INFORMATION FOR GUIDANCE ONLY. (This section contains information of a general or explanatory nature that is helpful, but is not mandatory.)

6.1 Intended use. Wire rope and wire seizing strand covered by this specification are intended for use in general hauling, hoisting, lifting, transporting, well drilling, in passenger and freight elevators, and for marine mooring, towing, trawling, and similar work. (Not intended for aircraft use.)

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, revision, and date of this specification.
- b. Types, classes, construction (see 3.5), and sizes of wire rope and seizing strands required (see 1.2.1).
- c. If phosphor bronze should be other than composition A of ASTM B 139/B 139M (see 3.1.2).
- d. Diameter of wire strand centers (see 3.2.4).
- e. If other core materials are required (see 3.2.5).
- f. When wire rope should be pre-stretched (see 3.3.4).
- g. When other than bright (uncoated) carbon steel is required (see 3.3.5.1).
- h. Process of zinc coating required (see 3.3.5.2).
- i. Whether preformed or non-preformed wire ropes and strands should be supplied (see 3.4.3).
- j. If a particular construction is required (see 3.5).
- k. When no lubricant is to be applied, a heavy corrosion inhibitor shall be applied to the entire length of wire rope (see 3.6.2.1).
- l. If specific lubrication is required for coated (galvanized) steel and iron, corrosion-resistant steel, and phosphor bronze wire ropes (see 3.6.3).
- m. For type I, general purpose, class 1, 6 by 7:
 - (1) Material (see 3.11.1.3).
 - (2) Finish (see 3.11.1.3.3).
 - (3) Cores (see 3.11.1.3.4).
 - (4) Fabrication (see 3.11.1.3.5).
 - (5) Lay (see 3.11.1.3.6).
- n. For type I, general purpose, class 2, 6 by 19:
 - (1) Material (see 3.11.2.1).
 - (2) Finish (see 3.11.2.1.1).

- (3) Cores (see 3.11.2.1.2).
- (4) Fabrication (see 3.11.2.1.3).
- (5) Lay (see 3.11.2.1.4).
- o. For type I, general purpose, class 3, 6 by 37 and 3 by 36:
 - (1) Material (see 3.11.3.1).
 - (2) Finish (see 3.11.3.1.1).
 - (3) Cores (see 3.11.3.1.2).
 - (4) Fabrication (see 3.11.3.1.3).
 - (5) Lay (see 3.11.3.1.4).
- p. For type I, general purpose, class 4, 8 by 19:
 - (1) Finish (see 3.11.4.1.1).
 - (2) Cores (see 3.11.4.1.2).
 - (3) Fabrication (see 3.11.4.1.3).
- q. For type I, general purpose, class 5, 6 by 61:
 - (1) Material (see 3.11.5.1).
 - (2) Finish (see 3.11.5.1.1).
 - (3) Cores (see 3.11.5.1.2).
 - (4) Fabrication (see 3.11.5.1.3).
 - (5) Lay (see 3.11.5.1.4).
- r. For type I, general purpose, class 6, 6 by 91:
 - (1) Material (see 3.11.6.1).
 - (2) Finish (see 3.11.6.1.1).
 - (3) Cores (see 3.11.6.1.2).
 - (4) Fabrication (see 3.11.6.1.3).
 - (5) Lay (see 3.11.6.1.4).
- s. For type II, elevator:
 - (1) Material (see 3.12.1).
 - (2) Fabrication (see 3.12.1.3).
- t. For type III, marine (cables), class 1, 6 by 6 deck lashing rope:
 - (1) Finish (see 3.13.1.3.1).
- u. For type III, marine (cables), class 2, 6 by 12 running rope:
 - (1) Material (see 3.13.2.3).
 - (2) Fabrication (see 3.13.2.3.3).
- v. For type III, marine (cables), class 3, 6 by 24 mooring lines:
 - (1) Fabrication (see 3.13.3.1.3).
- w. For type III, marine (cables), class 5, 6 by 3 by 19 spring lay:
 - (1) Finish (see 3.13.5.1.1).
- x. For type III, marine (cables), class 6, 6 by 42 tiller or hand control ropes:
 - (1) Material (see 3.13.9.3).
 - (2) If required, finish on steel (see 3.13.9.3.1).
- y. For type IV, miscellaneous, class 2, 18 by 7 rotation resistant:
 - (1) Material (see 3.14.3.3).
 - (2) Finish (see 3.14.3.3.1).
 - (3) Cores (see 3.14.3.3.2).
- z. For type IV, miscellaneous, class 3, flattened strand:
 - (1) Material (see 3.14.4.1).
 - (2) Cores (see 3.14.4.1.2) (For Navy aircraft elevator service, cores shall be 100 percent wire).

- (3) Fabrication (see 3.14.4.1.3).
- aa. For type IV, miscellaneous, class 4, 8 by 19 rotation:
 - (1) Material (see 3.14.5.1).
- bb. For type V, auxiliary wire strands, class 1, 1 by 7 seizing strand:
 - (1) Material (see 3.15.1.2).
 - (2) Fabrication (see 3.15.1.2.2).
- cc. For type V, auxiliary wire strands, class 2, 1 by 19 seizing strand:
 - (1) Material (see 3.15.2.2).
 - (2) Fabrication (see 3.15.2.2.2).
- dd. For type VI, small cords:
 - (1) Material (see 3.16.1).
- ee. Selection of applicable levels of preservation, packaging, and packing required (see 5.1 and 5.2).
- ff. Whether rope should be furnished other than on reels (see 5.1.1.1 and 5.1.1.2).
- gg. When reels exceeding 36 inches may be packed as specified (see 5.2.2.1.1).

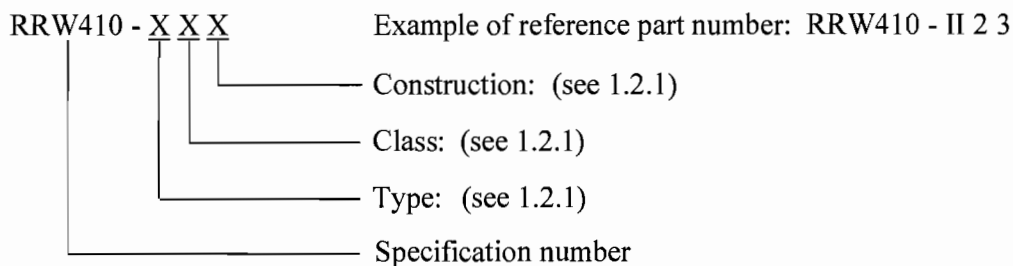
6.3 General rules for selection of wire ropes. General rules for selection of wire rope and strand are contained in the Wire Rope Users Manual. Copies of Wire Rope Users Manual may be obtained from <http://www.domesticwirerope.org/wrtb> or Wire Rope Technical Board, 801 North Fairfax Street, Suite 211, Alexandria, VA 22314. Requests for copies may be made via phone at (703) 299-0000.

6.4 Definitions and terms. Definitions and terms for wire ropes and strands are contained in the Wire Rope Users Manual.

6.5 Specifications and testing procedures. These specifications and testing procedures set forth in this document are applicable to wire rope made or manufactured pursuant to government order only and not intended to apply to rope made or manufactured for any other purchaser.

6.6 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are procured by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.7 Part or identification number (PIN). The following PIN procedure is for government purposes and does not constitute a requirement for the contractor.



RRW410 - II 2 3 indicates: type II - elevator; class 2 - 8 by 19; construction 3 - 8 by 19 Seale.

6.8 Subject term (key word) listing.

cable	mooring line
elevator	right lang lay
fiber core	right regular lay
lashing rope	running ropes
left lang lay	seizing strand
left regular lay	spring lay
marine	zinc coated

6.9 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

TABLE I. Tensile strength requirements of main wires removed from finished rope.

Rope grade	Tensile strength (minimum)	
	Bright (uncoated) or galvanized (lb./in. ²)	Galvanized at finish size (lb./in. ²)
Designated commercially as:		
Annealed steel	---	60,000
Iron	70,000	55,000
Phosphor bronze	90,000	---
Corrosion-resistant steel	205,000	---

TABLE II. Permissible variations in wire diameters of one diameter wires removed from finished ropes.

Wire diameters (inch)	Bright (uncoated) and galvanized wires (inch)	Zinc coated at finish size (inch)
0.010 - 0.027	0.0015	--
0.028 - 0.059	0.002	0.0035
0.060 - 0.092	0.0025	0.0045
0.093 - 0.141	0.003	0.0055
0.142 - 0.200	0.0035	0.0075
0.201 - 0.250	0.004	0.0095

TABLE III. Rope or strand diameters for all ropes except type II elevator, type III spring lay, type IV, 5 by 19 marline clad, type V, seizing strand, and type VI, small cords.

Rope diameter (inch)	Tolerance (percent)	
	Under	Over ¹
3/16	0	7
7/32	0	6
1/4	0	6
5/16	0	6
3/8 and larger	0	5

¹A question may develop as to whether or not the wire rope complies with the oversize tolerance. In such cases, a tension of not less than 10 percent nor more than 20 percent of nominal required breaking strength (force) is applied to the rope and the rope again measured while under this tension.

TABLE IV. Rope diameters for type VI small cords.

Rope diameter (inch)	Tolerance (inch)	
	Under	Over
1/32	0	0.006
3/64	0	0.008
1/16	0	0.010
3/32	0	0.012
1/8	0	0.014
5/32	0	0.016
3/16	0	0.018
7/32	0	0.018
1/4	0	0.018
9/32	0	0.020
5/16	0	0.022
3/8	0	0.026

TABLE V. Type I, general purpose, class 1, 6 by 7, iron galvanized, regular lay, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inches)	Maximum (inches)					
1/4	0.265	3/4	2	0.094	1,840	1,800
5/16	0.331	1	2 1/2	0.15	2,840	2,760
3/8	0.394	1 1/8	3	0.21	4,080	3,980
7/16	0.459	1 3/8	3 1/2	0.29	5,520	5,380
1/2	0.525	1 5/8	4	0.38	7,160	6,980
9/16	0.591	1 3/4	4 1/2	0.48	9,020	8,800
5/8	0.656	2	5	0.59	11,080	10,800
3/4	0.788	2 3/8	6	0.84	15,800	15,400
13/16	0.853	2 1/2	6 1/2	0.99	18,460	18,000
7/8	0.919	2 3/4	7	1.15	21,400	20,800
1	1.050	3 1/8	8	1.50	27,600	27,000
1 1/16	1.116	3 3/8	8 1/2	1.70	31,000	30,200
1 1/8	1.181	3 1/2	9	1.90	34,600	33,800
1 3/16	1.247	3 3/4	9 1/2	2.12	38,400	37,400
1 1/4	1.313	3 7/8	10	2.34	42,400	41,400

TABLE VI. Core materials.

Rope grade	Core
Extra improved plow steel	Wire strand core or IWRC
Improved plow steel	Fiber core, wire strand core or IWRC
Corrosion-resistant steel	Wire strand core or IWRC
Phosphor bronze	Fiber core

TABLE VII. Type I, general purpose, class 2, 6 by 19, and class 3, 6 by 37, single operation strand, improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
			Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	7 7/8	16 7/8	18 1/8	10.5	488,000	476,000	440,000	429,000
2 3/4	2.888	8 5/8	18 9/16	19 15/16	12.7	584,000	570,000	526,000	512,000
3	3.150	9 3/8	20 1/4	21 3/4	15.1	685,000	668,000	616,000	601,000
3 1/4	3.413	10 1/4	21 15/16	23 9/16	17.7	798,000	778,000	718,000	700,000
3 1/2	3.675	11	23 5/8	25 3/8	20.6	914,000	892,000	822,000	802,000

TABLE VIII. Type I, general purpose, class 2, 6 by 19, and class 3, 6 by 37, single operation strand, improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
			Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	7 7/8	16 7/8	18 1/8	11.6	524,000	511,000	472,000	460,000
2 3/4	2.888	8 5/8	18 9/16	19 15/16	14.0	628,000	612,000	566,000	552,000
3	3.150	9 3/8	20 1/4	21 3/4	16.6	740,000	722,000	666,000	650,000
3 1/4	3.413	10 1/4	21 15/16	23 9/16	19.5	858,000	836,000	772,000	752,000
3 1/2	3.675	11	23 5/8	25 3/8	22.7	982,000	958,000	884,000	862,000

TABLE IX. Type I, general purpose, class 2, 6 by 19, and class 3, 6 by 37, single operation strand, extra improved plow steel, wire strand core or IWRC.

Rope diameter		Maximum rope length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)	Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	16 7/8	18 1/8	11.6	604,000	589,000	544,000	530,000
2 3/4	2.888	18 9/16	19 15/16	14.0	722,000	704,000	650,000	634,000
3	3.150	20 1/4	21 3/4	16.6	850,000	828,000	765,000	745,000
3 1/4	3.473	21 15/16	23 9/16	19.5	984,000	960,000	886,000	864,000
3 1/2	3.675	23 5/8	25 3/8	22.7	1,128,000	1,100,000	1,016,000	990,000

TABLE X. Type I, general purpose, class 2, 6 by 19, and class 3, 6 by 37, single operation strand, corrosion-resistant steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope length		Approximate weight (lb./ft.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Regular lay (inches)	Lang lay (inches)			
7/16	0.459	1 3/8	2 31/32	3 3/16	0.35	16,300	15,900
1/2	0.525	1 5/8	3 3/8	3 5/8	0.46	22,800	22,200
9/16	0.591	1 3/4	3 13/16	4 3/32	0.59	28,500	27,800
5/8	0.656	2	4 7/32	4 17/32	0.72	35,000	34,100
3/4	0.788	2 3/8	5 1/16	5 7/16	1.04	49,600	48,400
7/8	0.919	2 3/4	5 29/32	6 11/32	1.42	66,500	64,800
1	1.050	3 1/8	6 3/4	7 1/4	1.85	85,400	83,300
1 1/8	1.181	3 1/2	7 19/32	8 5/32	2.34	106,400	103,700
1 1/4	1.313	3 7/8	8 7/16	9 1/16	2.89	129,400	126,200
1 3/8	1.444	4 3/8	9 9/32	9 31/32	3.50	153,600	149,800
1 1/2	1.575	4 3/4	10 1/8	10 7/8	4.16	180,500	176,000

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TABLE XI. Type I, general purpose, class 2, 6 by 19, phosphor bronze, regular lay, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inch)	Maximum (inch)					
3/16	0.201	5/8	1 9/32	0.06	1,370	1,340
7/32	0.232	11/16	1 1/2	0.09	1,830	1,780
1/4	0.265	3/4	1 11/16	0.11	2,380	2,320
5/16	0.331	1	2 1/8	0.18	3,680	3,580
3/8	0.394	1 1/8	2 17/32	0.25	5,240	5,100
7/16	0.459	1 3/8	2 31/32	0.34	7,080	6,900
1/2	0.525	1 5/8	3 3/8	0.45	9,220	8,980
9/16	0.591	1 3/4	3 13/16	0.57	11,500	11,220
5/8	0.656	2	4 7/32	0.70	14,160	13,800
3/4	0.788	2 3/8	5 1/16	1.01	19,960	19,460

TABLE XII. Type I, general purpose, class 3, construction 1, 2, or 3, 6 by 37, multiple operation strand, improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inch)	Maximum (inches)		Uncoated regular lay (inches)	Galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	1 13/16	0.105	5,180	5,060	4,660	4,540
5/16	0.331	1	2 1/8	2 9/32	0.164	8,060	7,860	7,260	7,080
3/8	0.394	1 1/8	2 17/32	2 23/32	0.236	11,540	11,260	10,380	10,120
7/16	0.459	1 3/8	2 31/32	3 3/16	0.32	15,640	15,240	14,080	13,720
1/2	0.525	1 5/8	3 3/8	3 5/8	0.42	20,400	19,900	18,360	17,900
9/16	0.591	1 3/4	3 13/16	4 3/32	0.53	25,800	25,200	23,200	22,600
5/8	0.656	2	4 7/32	4 17/32	0.66	31,600	30,800	28,400	27,600
3/4	0.788	2 3/8	5 1/16	5 7/16	0.95	45,200	44,000	40,600	39,600
7/8	0.919	2 3/4	5 29/32	6 11/32	1.29	61,200	59,600	55,000	53,600
1	1.050	3 1/8	6 3/4	7 1/4	1.68	79,600	77,600	71,600	69,800

TABLE XIII. Type I, general purpose, class 3, construction 1, 2, or 3, 6 by 37, multiple operation strand, improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	1 13/16	0.116	5,560	5,420	5,000	4,880
5/16	0.331	1	2 1/8	2 9/32	0.180	8,660	8,440	7,800	7,600
3/8	0.394	1 1/8	2 17/32	2 23/32	0.26	12,400	12,100	11,160	10,880
7/16	0.459	1 3/8	2 31/32	3 3/16	0.35	16,820	16,400	15,140	14,760
1/2	0.525	1 5/8	3 3/8	3 5/8	0.46	22,000	21,400	19,800	19,300
9/16	0.591	1 3/4	3 13/16	4 3/32	0.59	27,800	27,200	25,000	24,400
5/8	0.656	2	4 7/32	4 17/32	0.72	34,000	33,200	30,600	29,800
3/4	0.788	2 3/8	5 1/16	5 7/16	1.04	48,600	47,400	43,800	42,800
7/8	0.919	2 3/4	5 29/32	6 11/32	1.42	65,800	64,200	59,200	57,800
1	1.050	3 1/8	6 3/4	7 1/4	1.85	85,600	83,400	77,000	75,000

TABLE XIV. Type I, general purpose, class 3, construction 1, 2, or 3, 6 by 37, multiple operation strand, extra improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inch)	Maximum (inches)		Uncoated regular lay (inches)	Galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	1 13/16	0.116	6,400	6,240	5,760	5,600
5/16	0.331	1	2 1/8	2 9/32	0.180	9,960	9,720	8,960	8,740
3/8	0.394	1 1/8	2 17/32	2 23/32	0.26	14,280	13,920	12,860	12,540
7/16	0.459	1 3/8	2 31/32	3 3/16	0.35	19,340	18,860	17,400	16,960
1/2	0.525	1 5/8	3 3/8	3 5/8	0.46	25,200	24,600	22,600	22,000
9/16	0.591	1 3/4	3 13/16	4 3/32	0.59	31,800	31,000	28,600	27,800
5/8	0.656	2	4 7/32	4 17/32	0.72	39,200	38,200	35,200	34,400
3/4	0.788	2 3/8	5 1/16	5 7/16	1.04	55,800	54,400	50,200	49,000
7/8	0.919	2 3/4	5 29/32	6 11/32	1.42	75,600	73,800	68,000	66,400
1	1.050	3 1/8	6 3/4	7 1/4	1.85	98,200	95,800	88,400	86,200

TABLE XV. Type I, general purpose, class 3, construction 2 or 3, multiple operation strand, 6 by 37, corrosion-resistant steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length			Approximate weight (lb./ft.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Regular lay (inches)	Lang lay (inches)	Maximum rope lay length			
7/16	0.459	1 3/8	2 31/32	3 3/16	0.35	15,800	15,400	
1/2	0.525	1 5/8	3 3/8	3 5/8	0.46	20,400	19,900	
9/16	0.591	1 3/4	3 13/16	4 3/32	0.59	25,500	24,900	
5/8	0.656	2	4 7/32	4 17/32	0.72	31,300	30,500	
3/4	0.788	2 3/8	5 1/16	5 7/16	1.04	44,400	43,300	
7/8	0.919	2 3/4	5 29/32	6 11/32	1.42	59,700	58,200	
1	1.050	3 1/8	6 3/4	7 1/4	1.85	77,300	75,400	

TABLE XVI. Type I, general purpose, class 4, 8 by 19, improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated (inches)	Galvanized (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	1 13/16	0.098	4,700	4,580	4,240	4,140
5/16	0.331	1	2 1/8	2 9/32	0.15	7,300	7,120	6,580	6,420
3/8	0.394	1 1/8	2 17/32	2 23/32	0.22	10,480	10,220	9,440	9,200
7/16	0.459	1 3/8	2 31/32	3 3/16	0.30	14,180	13,820	12,760	12,440
1/2	0.525	1 5/8	3 3/8	3 5/8	0.39	18,460	18,000	16,620	16,200
9/16	0.591	1 3/4	3 13/16	4 3/32	0.50	23,200	22,600	20,800	20,200
5/8	0.656	2	4 7/32	4 17/32	0.61	28,600	27,800	25,800	25,200
3/4	0.788	2 3/8	5 1/16	5 7/16	0.88	41,000	40,000	37,000	36,000
7/8	0.919	2 3/4	5 29/32	6 11/32	1.20	55,400	54,000	49,800	48,600
1	1.050	3 1/8	6 3/4	7 1/4	1.57	72,000	70,200	64,800	63,200
1 1/8	1.181	3 1/2	7 19/32	8 5/32	1.99	90,600	88,400	81,600	79,600
1 1/4	1.313	3 7/8	8 7/16	9 1/16	2.45	111,400	108,600	100,20	97,600
1 3/8	1.444	4 3/8	9 9/32	9 31/32	2.97	134,200	130,800	120,80	117,800
1 1/2	1.575	4 3/4	10 1/8	10 7/8	3.53	158,800	154,800	143,00	139,400

TABLE XVII. Type I, general purpose, class 5, 6 by 61, improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2	2.100	6 1/4	13 1/2	14 1/2	6.72	308,000	300,000	278,000	272,000
2 1/8	2.231	6 5/8	14 11/32	15 13/32	7.59	346,000	338,000	312,000	304,000
2 1/4	2.363	7 1/8	15 3/16	16 5/16	8.51	386,000	376,000	348,000	340,000
2 1/2	2.625	7 7/8	16 7/8	18 1/8	10.5	472,000	460,000	424,000	414,000
2 3/4	2.888	8 5/8	18 9/16	19 15/16	12.7	568,000	554,000	512,000	500,000
3	3.150	9 3/8	20 1/4	21 3/4	15.1	670,000	654,000	603,000	588,000
3 1/4	3.413	10 1/4	21 15/16	23 9/16	17.7	780,000	760,000	702,000	684,000
3 1/2	3.675	11	23 5/8	25 3/8	20.6	898,000	876,000	808,000	788,000
3 3/4	3.938	11 3/4	25 5/16	27 3/16	23.6	1,022,000	996,000	920,000	896,000
4	4.200	12 1/2	27	29	26.9	1,154,000	1,126,000	1,038,000	1,012,000
4 1/4	4.463	13 3/8	28 11/16	30 13/16	30.3	1,292,000	1,260,000	1,162,000	1,132,000
4 1/2	4.725	14 1/8	30 3/8	32 5/8	34.0	1,438,000	1,402,000	1,294,000	1,262,000
4 3/4	4.988	15	32 1/16	34 7/16	37.9	1,588,000	1,548,000	1,430,000	1,394,000
5	5.250	15 3/4	33 3/4	36 1/4	42.0	1,744,000	1,700,000	1,570,000	1,530,000

TABLE XVIII. Type I, general purpose, class 5, 6 by 61, improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2	2.100	6 1/4	13 1/2	14 1/2	7.39	330,000	322,000	297,000	290,000
2 1/8	2.231	6 5/8	14 11/32	15 13/32	8.35	372,000	362,000	334,000	326,000
2 1/4	2.363	7 1/8	15 3/16	16 5/16	9.36	414,000	404,000	372,000	362,000
2 1/2	2.625	7 7/8	16 7/8	18 1/8	11.6	508,000	496,000	458,000	446,000
2 3/4	2.888	8 5/8	18 9/16	19 15/16	14.0	610,000	594,000	549,000	536,000
3	3.150	9 3/8	20 1/4	21 3/4	16.6	720,000	702,000	648,000	632,000
3 1/4	3.413	10 1/4	21 15/16	23 9/16	19.5	838,000	818,000	754,000	736,000
3 1/2	3.675	11	23 5/8	25 3/8	22.7	966,000	942,000	870,000	848,000
3 3/4	3.938	11 3/4	25 5/16	27 3/16	26.0	1,098,000	1,070,000	988,000	964,000
4	4.200	12 1/2	27	29	29.6	1,240,000	1,210,000	1,116,000	1,088,000
4 1/4	4.463	13 3/8	28 11/16	30 13/16	33.3	1,388,000	1,354,000	1,250,000	1,218,000
4 1/2	4.725	14 1/8	30 3/8	32 5/8	37.4	1,544,000	1,506,000	1,390,000	1,356,000
4 3/4	4.988	15	32 1/16	34 7/16	41.7	1,706,000	1,664,000	1,536,000	1,498,000
5	5.250	15 3/4	33 3/4	36 1/4	46.2	1,874,000	1,828,000	1,686,000	1,644,000

TABLE XIX. Type I, general purpose, class 5, 6 by 61, extra improved plow steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2	2.100	6 1/4	13 1/2	14 1/2	7.39	380,000	370,000	342,000	334,000
2 1/8	2.231	6 5/8	14 11/32	15 13/32	8.35	428,000	418,000	386,000	376,000
2 1/4	2.363	7 1/8	15 3/16	16 5/16	9.36	478,000	466,000	430,000	420,000
2 1/2	2.625	7 7/8	16 7/8	18 1/8	11.6	584,000	570,000	526,000	512,000
2 3/4	2.888	8 5/8	18 9/16	19 15/16	14.0	700,000	682,000	630,000	614,000
3	3.150	9 3/8	20 1/4	21 3/4	16.6	828,000	808,000	746,000	728,000
3 1/4	3.413	10 1/4	21 15/16	23 9/16	19.5	966,000	942,000	870,000	848,000
3 1/2	3.675	11	23 5/8	25 3/8	22.7	1,110,000	1,082,000	999,000	974,000
3 3/4	3.938	11 3/4	25 5/16	27 3/16	26.0	1,264,000	1,232,000	1,138,000	1,110,000
4	4.200	12 1/2	27	29	29.6	1,426,000	1,390,000	1,283,000	1,251,000
4 1/4	4.463	13 3/8	28 11/16	30 13/16	33.3	1,598,000	1,558,000	1,438,000	1,402,000
4 1/2	4.725	14 1/8	30 3/8	32 5/8	37.4	1,776,000	1,732,000	1,598,000	1,558,000
4 3/4	4.988	15	32 1/16	34 7/16	41.7	1,962,000	1,913,000	1,766,000	1,722,000
5	5.250	15 3/4	33 3/4	36 1/4	46.2	2,156,000	2,102,000	1,940,000	1,892,000

TABLE XX. Type I, general purpose, class 6, 6 by 91, improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	7 7/8	17 1/2	18 1/8	10.5	450,000	438,000	406,000	396,000
2 3/4	2.888	8 5/8	19 1/4	20	12.7	540,000	526,000	486,000	473,000
3	3.150	9 3/8	21	21 3/4	15.1	636,000	620,000	572,000	558,000
3 1/4	3.413	10 1/4	22 3/4	23 1/2	17.7	742,000	724,000	668,000	652,000
3 1/2	3.675	11	24 1/2	25 3/8	20.6	852,000	830,000	766,000	746,000
3 3/4	3.938	11 3/4	26 1/4	27 1/4	23.6	972,000	948,000	874,000	852,000
4	4.200	12 1/2	28	29	26.9	1,096,000	1,068,000	986,000	962,000
4 1/4	4.463	13 3/8	29 3/4	30 7/8	30.3	1,228,000	1,198,000	1,106,000	1,078,000
4 1/2	4.725	14 1/8	31 1/2	32 5/8	34.0	1,366,000	1,332,000	1,230,000	1,200,000
4 3/4	4.988	15	33 1/4	34 1/2	37.9	1,506,000	1,468,000	1,356,000	1,322,000
5	5.250	15 3/4	35	36 1/4	42.0	1,658,000	1,616,000	1,492,000	1,454,000
5 1/4	5.513	16 1/2	36 3/4	38 1/8	46.3	1,812,000	1,766,000	1,630,000	1,589,000
5 1/2	5.775	17 1/4	38 1/2	39 7/8	50.8	1,972,000	1,922,000	1,774,000	1,730,000
5 3/4	6.038	18 1/8	40 1/4	41 3/4	55.5	2,136,000	2,082,000	1,922,000	1,814,000
6	6.300	18 7/8	42	43 1/2	60.5	2,306,000	2,248,000	2,076,000	2,024,000

TABLE XXI. Type I, general purpose, class 6, 6 by 91, improved plow steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	7 7/8	17 1/2	18 1/8	11.6	484,000	472,000	436,000	426,000
2 3/4	2.888	8 5/8	19 1/4	20	14.0	580,000	566,000	522,000	508,000
3	3.150	9 3/8	21	21 3/4	16.6	684,000	666,000	616,000	600,000
3 1/4	3.413	10 1/4	22 3/4	23 1/2	19.5	798,000	778,000	718,000	700,000
3 1/2	3.675	11	24 1/2	25 3/8	22.7	916,000	894,000	824,000	804,000
3 3/4	3.938	11 3/4	26 1/4	27 1/4	26.0	1,044,000	1,018,000	940,000	916,000
4	4.200	12 1/2	28	29	29.6	1,178,000	1,148,000	1,060,000	1,034,000
4 1/4	4.463	13 3/8	29 3/4	30 7/8	33.3	1,320,000	1,288,000	1,188,000	1,158,000
4 1/2	4.725	14 1/8	31 1/2	32 5/8	37.4	1,468,000	1,432,000	1,322,000	1,288,000
4 3/4	4.988	15	33 1/4	34 1/2	41.7	1,620,000	1,580,000	1,458,000	1,422,000
5	5.250	15 3/4	35	36 1/4	46.2	1,782,000	1,738,000	1,604,000	1,564,000
5 1/4	5.513	16 1/2	36 3/4	38 1/8	49.8	1,948,000	1,900,000	1,754,000	1,710,000
5 1/2	5.775	17 1/4	38 1/2	39 7/8	54.5	2,120,000	2,068,000	1,908,000	1,860,000
5 3/4	6.038	18 1/8	40 1/4	41 3/4	59.6	2,296,000	2,238,000	2,066,000	2,014,000
6	6.300	18 7/8	42	43 1/2	65.0	2,480,000	2,418,000	2,232,000	2,176,000

TABLE XXII. Type I, general purpose, class 6, 6 by 91, extra improved plow steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)		Uncoated regular lay (inches)	Uncoated lang lay or galvanized regular lay (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
2 1/2	2.625	7 7/8	17 1/2	18 1/8	11.6	554,000	540,000	498,000	486,000
2 3/4	2.888	8 5/8	19 1/4	20	14.0	666,000	650,000	600,000	585,000
3	3.150	9 3/8	21	21 3/4	16.6	786,000	766,000	708,000	690,000
3 1/4	3.413	10 1/4	22 3/4	23 1/2	19.5	916,000	894,000	824,000	804,000
3 1/2	3.675	11	24 1/2	25 3/8	22.7	1,054,000	1,028,000	948,000	924,000
3 3/4	3.938	11 3/4	26 1/4	27 1/4	26.0	1,200,000	1,170,000	1,080,000	1,053,000
4	4.200	12 1/2	28	29	29.6	1,354,000	1,320,000	1,218,000	1,188,000
4 1/4	4.463	13 3/8	29 3/4	30 7/8	33.3	1,518,000	1,480,000	1,366,000	1,332,000
4 1/2	4.725	14 1/8	31 1/2	32 5/8	37.4	1,688,000	1,646,000	1,520,000	1,482,000
4 3/4	4.988	15	33 1/4	34 1/2	41.7	1,864,000	1,818,000	1,678,000	1,636,000
5	5.250	15 3/4	35	36 1/4	46.2	2,048,000	1,996,000	1,844,000	1,798,000
5 1/4	5.513	16 1/2	36 3/4	38 1/8	49.8	2,240,000	2,184,000	2,016,000	1,966,000
5 1/2	5.775	17 1/4	38 1/2	39 7/8	54.5	2,438,000	2,378,000	2,194,000	2,140,000
5 3/4	6.038	18 1/8	40 1/4	41 3/4	59.6	2,640,000	2,574,000	2,376,000	2,317,000
6	6.300	18 7/8	42	43 1/2	65.0	2,852,000	2,780,000	2,566,000	2,502,000

TABLE XXIII. Type II, elevator, class 1, 6 by 19, or class 2, 8 by 19, traction steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight		Nominal and minimum breaking strength (force) (lb.)
Nominal (ordered) (inches)	Maximum (no load) (inches)			6 by 19 (lb./ft.)	8 by 19 (lb./ft.)	
1/4	17/64	3/4	1 11/16	0.10	0.09	3,600
5/16	21/64	1	2 1/8	0.16	0.14	5,600
3/8	13/32	1 1/8	2 17/32	0.23	0.20	8,200
7/16	15/32	1 3/8	2 31/32	0.31	0.28	11,000
1/2	17/32	1 5/8	3 3/8	0.40	0.36	14,500
9/16	19/32	1 3/4	3 13/16	0.51	0.46	18,500
5/8	21/32	2	4 7/32	0.63	0.57	23,000
11/16	23/32	2 1/8	4 5/8	0.76	0.69	27,000
3/4	25/32	2 3/8	5 1/16	0.90	0.82	32,000
13/16	27/32	2 1/2	5 1/2	1.06	0.96	37,000
7/8	29/32	2 3/4	5 29/32	1.23	1.11	42,000
15/16	31/32	3	6 5/16	1.41	1.27	48,000
1	1 1/32	3 1/8	6 3/4	1.60	1.45	54,000
1 1/16	1 3/32	3 3/8	7 3/16	1.81	1.64	61,000

TABLE XXIV. Type II, elevator, class 1, 6 by 19, or class 2, 8 by 19, high-rise, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight		Nominal and minimum breaking strength (force) (lb.)
Nominal (ordered) (inches)	Maximum (no load) (inches)			6 by 19 (lb./ft.)	8 by 19 (lb./ft.)	
11/16	23/32	2 1/8	4 5/8	0.76	0.69	30,000
13/16	27/32	2 1/2	5 1/2	1.06	0.96	46,000
15/16	31/32	3	6 5/16	1.41	1.27	60,000

TABLE XXV. Type II, elevator, class 1, 6 by 19, or class 2, 8 by 19, iron, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight		Nominal and minimum breaking strength (force)	
Nominal (ordered) (minimum) (inches)	Maximum (no load) (inches)			6 by 19 (lb./ft.)	8 by 19 (lb./ft.)	6 by 19 (lb./ft.)	8 by 19 (lb./ft.)
3/16	13/64			9/16	1 9/32	0.06	0.05
1/4	17/64	3/4	1 11/16	0.10	0.09	2,200	1,800
5/16	21/64	1	2 1/8	0.16	0.14	3,200	2,900
3/8	13/32	1 1/8	2 17/32	0.23	0.20	5,000	4,200
7/16	15/32	1 3/8	2 31/32	0.31	0.28	6,400	5,600
1/2	17/32	1 5/8	3 3/8	0.40	0.36	8,400	7,200
9/16	19/32	1 3/4	3 13/16	0.51	0.46	10,600	9,200
5/8	21/32	2	4 7/32	0.63	0.57	12,800	11,200
3/4	25/32	2 3/8	5 1/16	0.90	0.82	18,200	16,000
7/8	29/32	2 3/4	5 29/32	1.23	1.11	24,800	21,400
1	1 1/32	3 1/8	6 3/4	1.60	1.45	32,000	28,000

TABLE XXVI. Type III, marine (cables), class I, 6 by 6, deck lashing ropes, improved plow steel, fiber core.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inch)	Maximum (inches)		Uncoated (inches)	Galvanized (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
3/8	0.394	1 1/8	2 17/32	2 23/32	0.18	9,960	9,720	8,960	8,740
7/16	0.459	1 3/8	2 31/32	3 3/16	0.25	13,480	13,140	12,140	11,840
1/2	0.525	1 5/8	3 3/8	3 5/8	0.33	17,520	17,080	15,760	15,360
9/16	0.591	1 3/4	3 13/16	4 1/16	0.42	22,000	21,400	19,800	19,300
5/8	0.656	2	4 7/32	4 17/32	0.51	27,000	26,400	24,400	23,800
3/4	0.788	2 3/8	5 1/16	5 7/16	0.73	38,600	37,600	34,800	34,000
7/8	0.919	2 3/4	5 29/32	6 11/32	1.00	52,200	50,800	47,000	45,800
1	1.050	3 1/8	6 3/4	7 1/4	1.30	67,600	66,000	60,800	59,200

TABLE XXVII. Type III, marine (cables), class 2, 6 by 12, running ropes, improved plow steel, fiber cores, galvanized.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inches)	Maximum (inches)					
1/4	0.265	3/4	1 13/16	0.07	3,020	2,940
1 1/16	1.116	3 3/8	7 11/16	1.19	51,800	50,600
1 1/8	1.181	3 1/2	8 5/32	1.33	58,000	56,600
1 3/16	1.247	3 3/4	8 19/32	1.48	64,400	62,800
1 1/4	1.313	3 7/8	9 1/16	1.64	71,200	69,400
1 3/8	1.444	4 3/8	9 31/32	1.99	85,600	83,400
1 7/16	1.509	4 1/2	10 13/32	2.17	93,400	91,000
1 1/2	1.575	4 3/4	10 7/8	2.36	101,400	98,800
1 5/8	1.706	5 1/8	11 25/32	2.77	118,400	115,400
1 11/16	1.772	5 1/4	12 1/4	2.99	127,200	124,000
1 3/4	1.838	5 1/2	12 11/16	3.22	136,600	133,200
1 13/16	1.903	5 3/4	13 1/8	3.45	146,000	142,400
1 15/16	2.034	6 1/8	14 1/16	3.94	166,000	161,800
2	2.100	6 1/4	14 1/2	4.20	176,400	172,000
2 1/16	2.166	6 1/2	14 15/16	4.47	187,200	182,600

TABLE XXVIII. Type III, marine (cables), class 2, 6 by 12, running ropes, phosphor bronze, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal breaking strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inch)	Maximum (inch)					
1/4	0.265	3/4	1 13/16	0.075	1,470	1,440
5/16	0.331	1	2 9/32	0.115	2,260	2,200
3/8	0.394	1 1/8	2 23/32	0.168	3,220	3,140
7/16	0.459	1 3/8	3 3/16	0.227	4,380	4,280
1/2	0.525	1 5/8	3 5/8	0.295	5,640	5,500
9/16	0.591	1 3/4	4 1/16	0.370	7,100	6,920
5/8	0.656	2	4 17/32	0.460	8,740	8,520
3/4	0.788	2 3/8	5 7/16	0.660	12,240	11,940
13/16	0.853	2 1/2	5 29/32	0.766	14,300	13,940
7/8	0.919	2 3/4	6 11/32	0.895	16,600	16,180

TABLE XXIX. Type III, marine (cables), class 3, 6 by 24, mooring lines, improved plow steel, fiber cores, (galvanized).

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal breaking strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inches)	Maximum (inches)					
2	2.100	6 1/4	14 1/2	5.52	252,000	246,000
2 1/16	2.166	6 1/2	14 15/16	5.87	268,000	262,000

TABLE XXX. Type III, marine (cables), class 4, 6 by 3 by 7, spring lay, and class 5, 6 by 3 by 19, galvanized.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal breaking strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inches)	Maximum (inches)					
Class 4 - 6 by 3 by 7						
1/2	0.525	1 5/8	3 5/8	0.22	8,940	8,720
9/16	0.591	1 3/4	4 1/16	0.28	11,280	11,000
5/8	0.656	2	4 17/32	0.34	13,900	13,560
3/4	0.788	2 3/8	5 7/16	0.49	19,920	19,420
Class 5 - 6 by 3 by 19						
7/8	0.919	2 3/4	6 11/32	0.63	27,000	26,400
1	1.050	3 1/8	7 1/4	0.88	35,000	34,200
1 1/8	1.181	3 1/2	8 5/32	1.14	44,200	43,000
1 1/4	1.313	3 7/8	9 1/16	1.36	54,400	53,000
1 3/8	1.444	4 3/8	9 31/32	1.66	65,600	64,000
1 1/2	1.575	4 3/4	10 7/8	1.97	77,800	75,800
1 5/8	1.706	5 1/8	11 25/32	2.28	91,200	89,000
1 3/4	1.838	5 1/2	12 11/16	2.67	105,400	102,800
1 7/8	1.969	5 7/8	13 19/32	3.09	120,600	117,600
2	2.100	6 1/4	14 1/2	3.53	137,000	133,600
2 1/4	2.363	7 1/8	16 5/16	4.56	172,600	168,200
2 1/2	2.625	7 7/8	18 1/8	5.44	212,000	206,000

TABLE XXXI. Type III, marine (cables), class 6, 6 by 42, tiller or hand control, improved plow steel.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length		Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inch)	Maximum (inch)		Uncoated (inches)	Galvanized (inches)		Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
3/16	0.201	5/8	1 9/32	1 13/32	0.039	1,710	1,660	1,540	1,500
1/4	0.265	3/4	1 11/16	1 13/16	0.07	3,020	2,940	2,720	2,650
5/16	0.331	1	2 1/8	2 8/32	0.11	4,700	4,580	4,230	4,120
3/8	0.394	1 1/8	2 17/32	2 23/32	0.16	6,740	6,580	6,060	5,900
7/16	0.459	1 3/8	2 31/32	3 3/16	0.21	9,160	8,940	8,240	8,040
1/2	0.525	1 5/8	3 3/8	3 5/8	0.28	11,920	11,620	10,720	10,460
9/16	0.591	1 3/4	3 13/16	4 3/32	0.35	15,020	14,640	13,520	13,180
5/8	0.656	2	4 7/32	4 17/32	0.43	18,500	18,040	16,600	16,240

TABLE XXXII. Type III, marine (cables), class 6, 6 by 42 tiller or hand control, phosphor bronze, fiber cores.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal breaking strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (maximum) (inch)	Maximum (inch)					
3/16	0.201	5/8	1 9/32	0.04	760	740
1/4	0.265	3/4	1 11/16	0.08	1,350	1,320
5/16	0.331	1	2 3/32	0.12	2,070	2,020
3/8	0.394	1 1/8	2 17/32	0.17	2,960	2,880
7/16	0.459	1 3/8	2 31/32	0.24	4,020	3,920
1/2	0.525	1 5/8	3 3/8	0.31	5,190	5,060
9/16	0.591	1 3/4	3 13/16	0.39	6,500	6,340
5/8	0.656	2	4 7/32	0.48	8,000	7,800
3/4	0.788	2 3/8	5 1/16	0.69	11,400	11,120

TABLE XXXIII. Type IV, miscellaneous, class 1, 5 by 19 marline-clad, improved plow steel, fiber cores.

Nominal diameter			Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Nominal breaking strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Before serving (inches)	After serving (minimum) (inches)	Maximum diameter after serving (inches)					
1/4	9/16	5/8	1 3/4	3 25/32	0.21	4,980	4,860
5/16	5/8	11/16	2	4 7/32	0.28	7,740	7,540
3/8	11/16	3/4	2 1/8	4 5/8	0.36	11,100	10,820
7/16	3/4	13/16	2 3/8	5 1/16	0.42	15,020	14,640
1/2	13/16	7/8	2 1/2	5 15/32	0.51	19,540	19,040
9/16	7/8	15/16	2 3/4	5 29/32	0.62	24,600	24,000
5/8	1	1 1/16	3 1/8	6 3/4	0.81	30,200	29,400
3/4	1 1/8	1 3/16	3 1/2	7 19/32	1.10	43,200	42,200
7/8	1 1/4	1 5/16	3 7/8	8 7/16	1.32	58,600	57,200
1	1 3/8	1 7/16	4 3/8	9 9/32	1.70	76,000	74,100
1 1/8	1 1/2	1 9/16	4 3/4	10 1/8	2.12	95,600	93,200
1 1/4	1 5/8	1 11/16	5 1/8	10 31/32	2.58	117,400	114,400
1 3/8	1 3/4	1 13/16	5 1/2	11 13/16	3.14	141,200	137,600

TABLE XXXIV. Type IV, miscellaneous, class 2, 18 by 7, rotation resistant, improved plow steel, fiber core or wire stand core.

Rope diameter		Approximate circumference (inches)		Maximum rope lay length		Approximate weight		Uncoated		Galvanized	
								Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inches)	1 5/8	5 1/8	7 5/16	11 25/32	4.80	196,800	191,800	177,200	172,800		
	1 3/4	5 1/2	7 7/8	12 11/16	5.30	228,000	222,000	206,000	200,000		

TABLE XXXV. Type IV, miscellaneous, class 2, 18 by 7, rotation resistant, extra improved plow steel, fiber core or wire stand core.

Rope diameter		Approximate circumference (inches)		Maximum rope lay length		Approximate weight		Uncoated		Galvanized	
								Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inches)	1 5/8	5 1/8	7 5/16	11 25/32	4.80	216,000	210,000	194,400	189,600		
	1 3/4	5 1/2	7 7/8	12 11/16	5.30	250,000	244,000	225,000	220,000		

TABLE XXXVI. Type IV, miscellaneous, class 3, flattened strand, construction 1, 6 by 25, style B; construction 2, 6 by 30, style G; construction 3, 6 by 27, style H; construction 4, 6 by 31, style V; improved plow steel, fiber cores.

Rope diameter		Approximate circumference (inches)	Approximate rope lay length (inches)	Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)				Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
3/8 ¹	0.394	1 1/8	3	0.25	13,420	13,080	12,080	11,780
2 1/2	2.625	7 7/8	20	11.20	538,000	524,000	484,000	472,000
2 3/4	2.888	8 5/8	22	13.60	642,000	626,000	578,000	564,000

¹Applies to construction 1, style B only.

TABLE XXXVII. Type IV, miscellaneous, class 3, flattened strand, construction 1, 6 by 25, style B; construction 2, 6 by 30, style G, construction 3, 6 by 27, style H; construction 4, 6 by 31, style V; improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Approximate rope lay length (inches)	Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)				Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
3/8 ¹	0.394	1 1/8	3	0.26	14,420	14,060	12,980	12,660
2 1/2	2.625	7 7/8	20	11.80	578,000	564,000	520,000	508,000
2 3/4	2.888	8 5/8	22	14.30	690,000	672,000	621,000	606,000

¹Applies to construction 1, style B only.

TABLE XXXVIII. Type IV, miscellaneous, class 3, flattened strand, construction 1, 6 by 25, style B; construction 2, 6 by 30, style G; construction 3, 6 by 27, style H; construction 4, 6 by 31, style V; extra improved plow steel, wire strand core or IWRC.

Rope diameter		Approximate circumference (inches)	Approximate rope lay length (inches)	Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (ordered) (minimum) (inches)	Maximum (inches)				Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
3/8 ¹	0.394	1 1/8	3	0.26	15,880	15,480	14,300	13,940
2 1/2	2.625	7 7/8	20	11.80	636,000	620,000	572,000	558,000
2 3/4	2.888	8 5/8	22	14.30	762,000	742,000	686,000	668,000

¹Applies to construction 1, style B only.

TABLE XXXIX. Type IV, miscellaneous, class 4, 8 by 19, rotation resistant, improved plow steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (inches)	Maximum (inches)				Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	0.12	5,160	5,040	4,640	4,520
5/16	0.331	1	2 1/8	0.18	8,020	7,820	7,220	7,040
3/8	0.394	1 1/8	2 17/32	0.26	11,520	11,240	10,360	10,100
7/16	0.459	1 3/8	2 31/32	0.36	15,600	15,220	14,040	13,680

TABLE XL. Type IV, miscellaneous, class 4, 8 by 19, rotation resistant, extra improved plow steel, IWRC.

Rope diameter		Approximate circumference (inches)	Maximum rope lay length (inches)	Approximate weight (lb./ft.)	Uncoated		Galvanized	
Nominal (inches)	Maximum (inches)				Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)	Nominal strength (force) (lb.)	Minimum breaking strength (force) (lb.)
1/4	0.265	3/4	1 11/16	0.12	5,940	5,800	5,340	5,200
5/16	0.331	1	2 1/8	0.18	9,240	9,000	8,320	8,120
3/8	0.394	1 1/8	2 17/32	0.26	13,260	12,920	11,940	11,640
7/16	0.459	1 3/8	2 31/32	0.36	17,940	17,500	16,140	15,740

TABLE XLI. Type V, auxiliary wire strands, class 1, 1 by 7, seizing strand, iron, annealed steel, or corrosion-resistant steel.

Strand diameter		Approximate diameter of wires (inch)	Maximum pitch (inches)	Approximate length of strand on reel (ft.)	Approximate weight		Nominal and minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inch)	Maximum (inch)				Per foot (lb.)	Per reel (lb.)	
1/16	5/64	0.022	3/4	5,000	0.010	50	140
3/32	7/64	0.032	1 1/8	2,500	0.020	50	300
1/8	9/64	0.042	1 1/2	1,500	0.033	50	530
5/32	11/64	0.052	1 7/8	1,000	0.050	50	810

TABLE XLII. Type V, auxiliary wire strands, class 2, 1 by 19, seizing strand (2 operations), iron or annealed steel.

Strand diameter		Approximate diameter of wires (inch)	Maximum pitch (inches)	Approximate length of strand on reel (ft.)	Approximate weight		Nominal and minimum breaking strength (force) (lb.)
Nominal (ordered) (minimum) (inch)	Maximum (inch)				Per foot (lb.)	Per reel (lb.)	
3/16	13/64	0.039	2 1/4	1,200	0.080	100	1,100
1/4	17/64	0.052	3	750	0.133	100	1,900

TABLE XLIII. Type VI, small cords, class 1, class 2, and class 3, carbon steel, galvanized, and corrosion-resistant steel, wire strand core (class 2 and 3 only)¹.

Rope diameter		Class	Construction	Approximate circumference (inches)	Allowable increase at cut end (inch)	Rope lay length		Nominal and minimum breaking strength (force)	
Nominal (ordered) (minimum) (inch)	Maximum (inch)					Min. (inches)	Max. (inches)	Drawn galvanized high carbon steel (lb.)	Corrosion-resistant steel (lb.)
1/32 ²	0.037	1	3 by 7	3/32	0.006	5/32	7/32	110	110
3/64	0.055	1	3 by 7	9/64	0.008	15/64	21/64	230	230
3/64	0.055	2	7 by 7	9/64	0.008	9/32	3/8	270	270
1/16	0.073	2	7 by 7	13/64	0.009	3/8	1/2	480	480
3/32	0.106	2	7 by 7	19/64	0.010	9/16	3/4	920	920
1/16	0.073	3	7 by 19	13/64	0.009	3/8	1/2	480	480
3/32	0.106	3	7 by 19	19/64	0.010	9/16	3/4	1,000	920
1/8	0.139	3	7 by 19	25/64	0.011	3/4	1	2,000	1,760
5/32	0.172	3	7 by 19	1/2	0.017	15/16	1 1/4	2,800	2,400
3/16	0.206	3	7 by 19	9/16	0.019	1 1/8	1 1/2	4,200	3,700
7/32	0.237	3	7 by 19	11/16	0.020	1 5/16	1 3/4	5,600	5,000
1/4	0.268	3	7 by 19	3/4	0.021	1 1/2	2	7,000	6,400
9/32	0.301	3	7 by 19	7/8	0.023	1 11/16	2 1/4	8,000	7,800
5/16	0.335	3	7 by 19	1	0.024	1 7/8	2 1/2	9,800	9,000
3/8	0.401	3	7 by 19	1 1/8	0.027	2 1/4	3	14,400	12,000

¹ This type not intended for use in aircraft control system. For such wire rope, see MIL-DTL-83420.

² Use ASTM A 1023/A 1023A for carbon steel in this size.

TABLE XLIV. Differences in diameter.

Diameter before seizing is removed (inches)	Increase in diameter after seizing removed (inch)
0 to 3/4	1/32
13/16 to 1 1/8	3/64
1 3/16 to 1 1/2	1/16
1 9/16 to 2 1/4	3/32
2 5/16 and larger	1/8

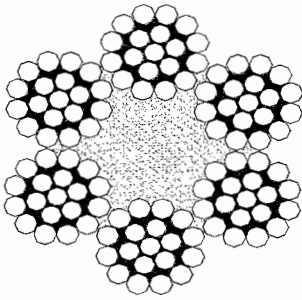


FIGURE 1. Fiber core.

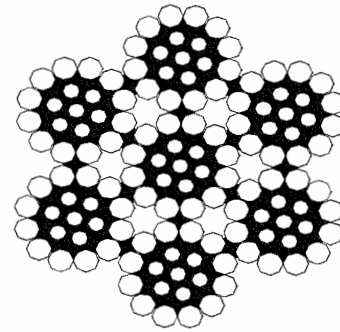


FIGURE 2. Wire strand core.

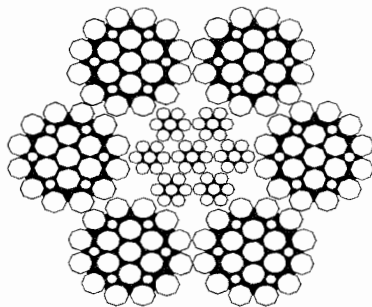
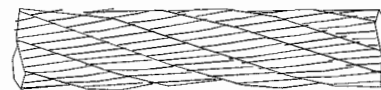
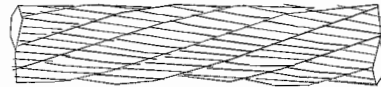


FIGURE 3. Independent wire-rope core (IWRC).



RIGHT REGULAR LAY



LEFT REGUALR LAY



RIGHT LANG LAY



LEFT LANG LAY

FIGURE 4. Lays in wire rope.

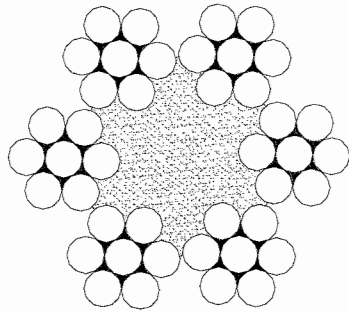


FIGURE 5. Type I, general purpose, class 1, 6 by 7.

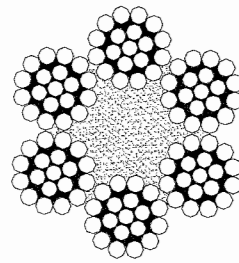


FIGURE 6. Type I, general purpose, class 2, construction 1, 6 by 19 (2 operations).

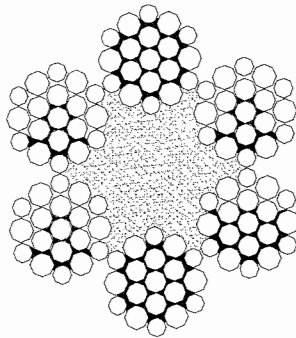


FIGURE 7. Type I, general purpose, class 2, construction 2, 6 by 19 (Warrington), and type II, elevator, class 1, construction 1, 6 by 19 (Warrington).

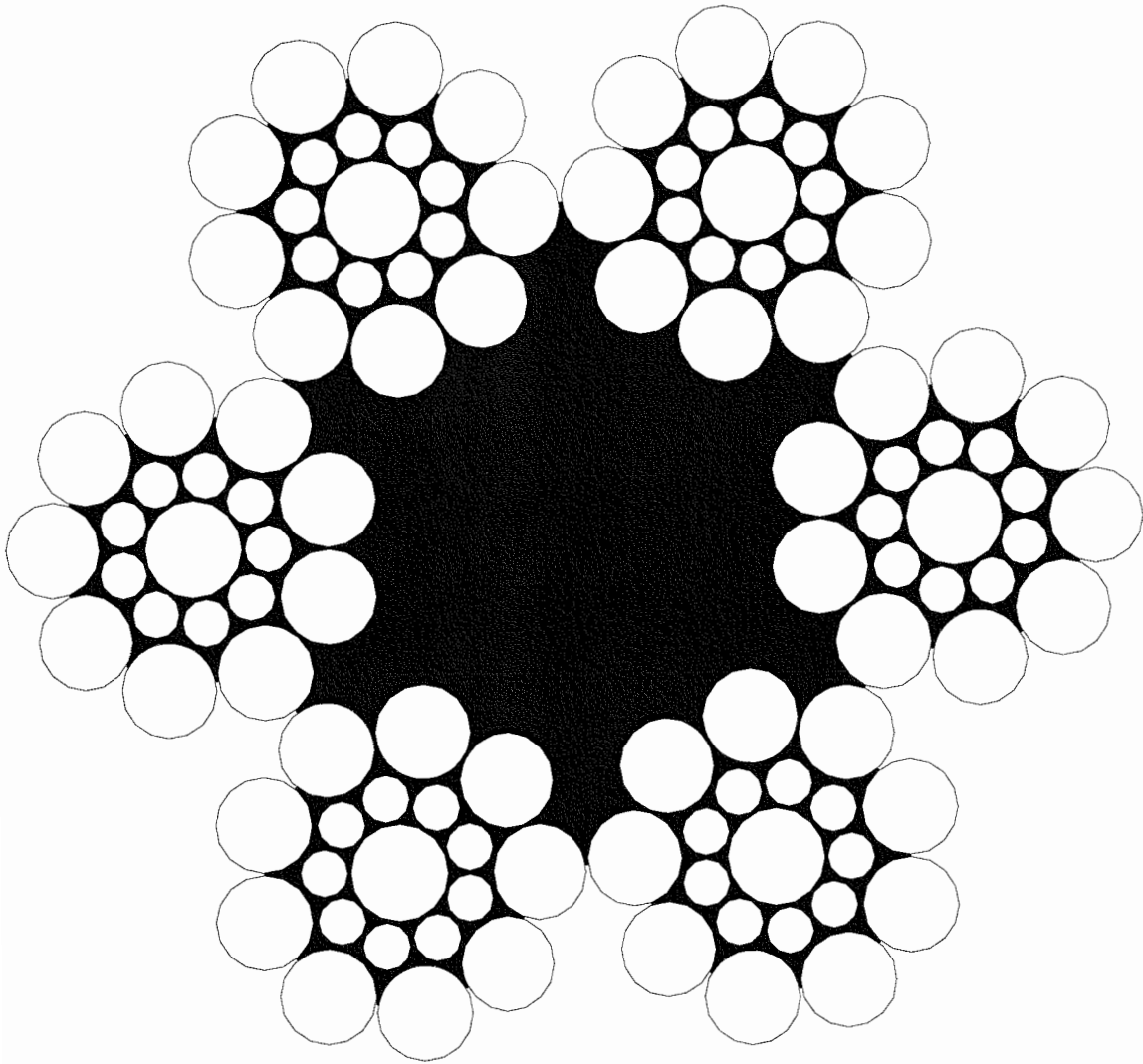


FIGURE 8. Type I, general purpose, class 2, construction 3, 6 by 19 (Seale).

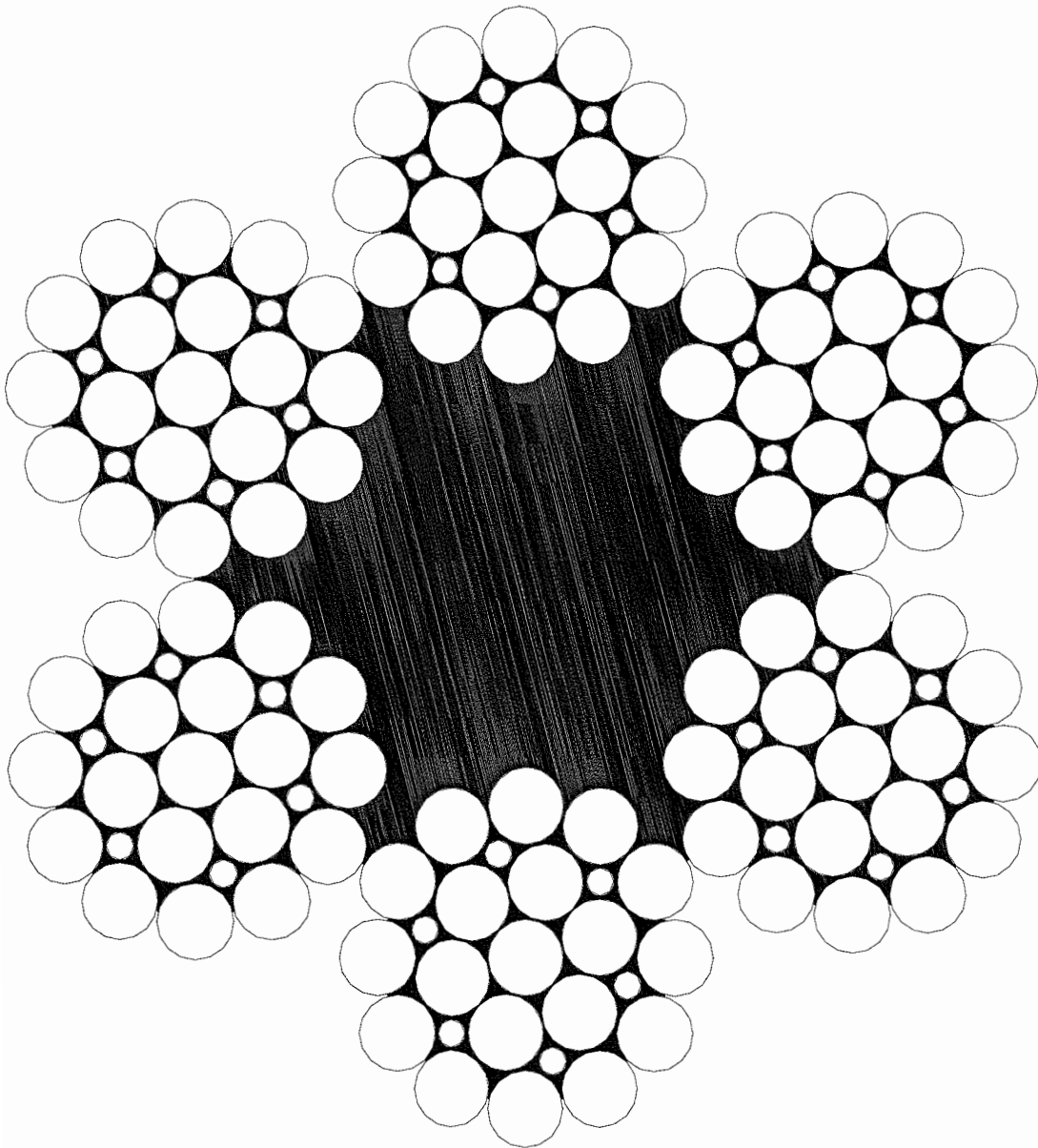


FIGURE 9. Type I, general purpose, class 2, construction 4, 6 by 19 (Filler wire), and type II, elevator, class 1, construction 2, 6 by 19 (Filler wire).

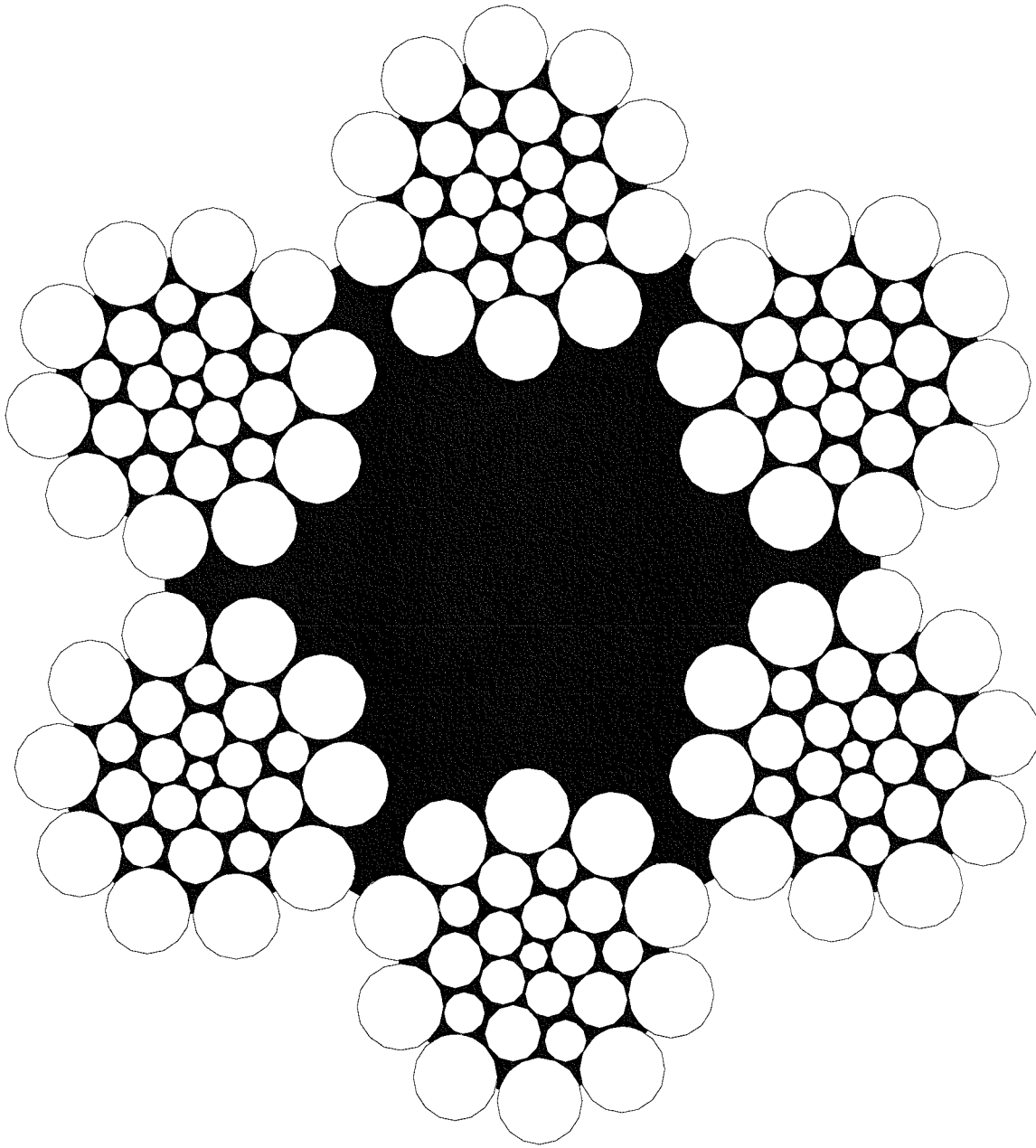


FIGURE 10. Type I, general purpose, class 2, construction 5, 6 by 19 (Warrington-Seale), and type II, elevator, class 1, construction 3, 6 by 19 (Warrington-Seale).

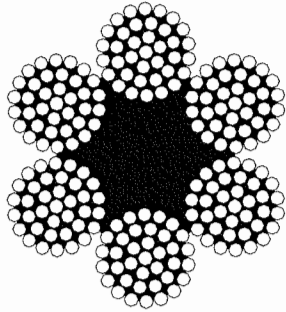


FIGURE 11. Type I, general purpose, class 3, construction 1, 6 by 37 (3 operations).

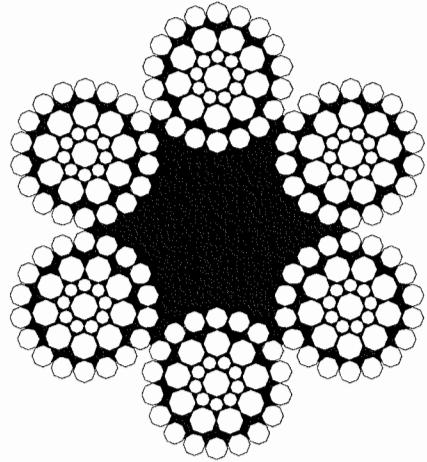


FIGURE 12. Type I, general purpose, class 3, construction 2, 6 by 37 (2 operations).

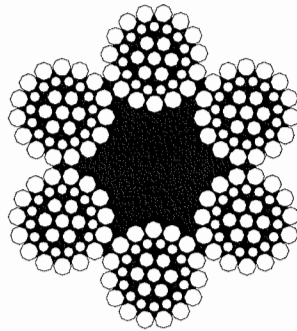


FIGURE 13. Type I, general purpose, class 3, construction 3, 6 by 37 (Seale) (2 operations).

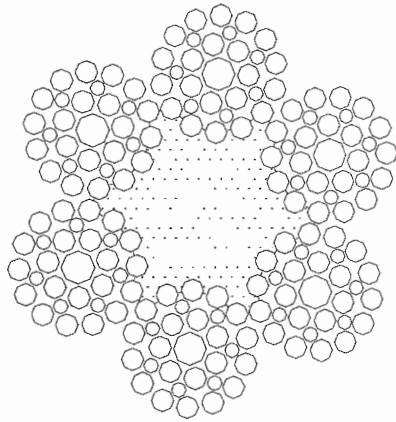


FIGURE 14. Type I, general purpose, class 3, construction 4, 6 by 36 (Filler wire).

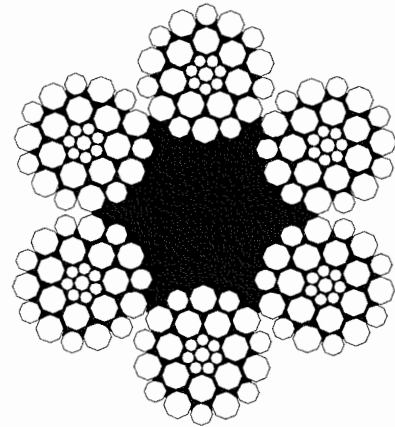


FIGURE 15. Type I, general purpose, class 3, construction 5, 6 by 36 (Seale-Warrington).

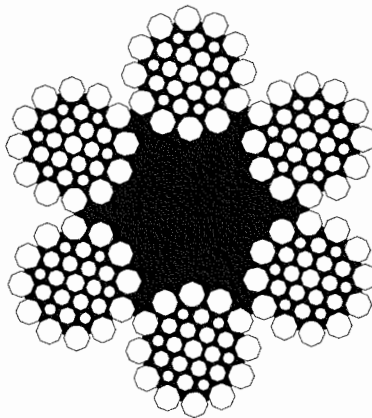


FIGURE 16. Type I, general purpose, class 3, construction 6, 6 by 36 (Warrington-Seale).

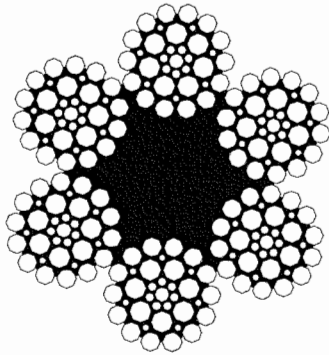


FIGURE 17. Type I, general purpose, class 3, construction 7, 6 by 36 (Seale-Filler wire).

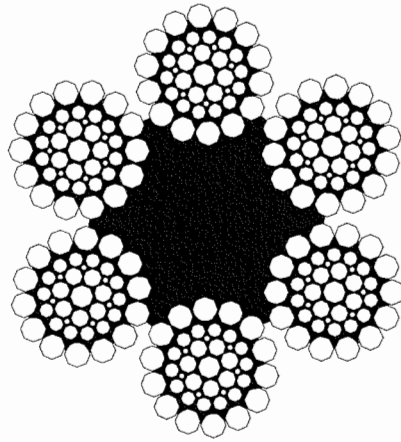


FIGURE 18. Type I, general purpose, class 3, construction 8, 6 by 36 (Filler wire-Seale).

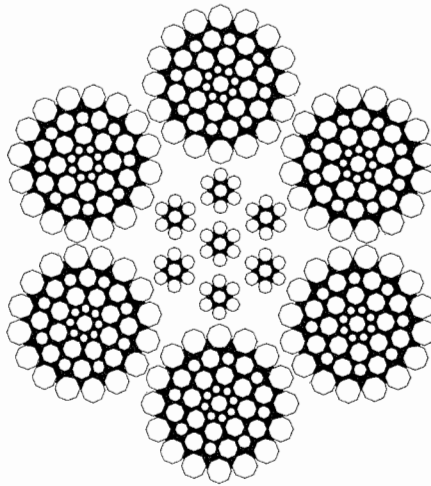


FIGURE 19. Type I, general purpose, class 3, construction 9, 6 by 36 (Seale-Warrington-Seale).

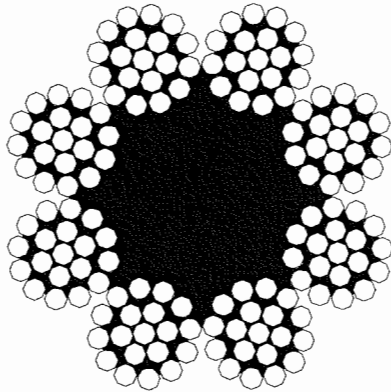


FIGURE 20. Type I, general purpose, class 4, construction 1, 8 by 19 (2 operations), and type II, elevator, class 2, construction 1, 8 by 19 (2 operations).

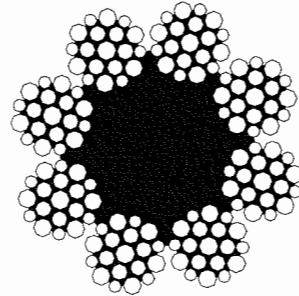


FIGURE 21. Type I, general purpose, class 4, construction 2, 8 by 19 (Warrington), and type II, elevator, class 2, construction 2, 8 by 19 (Warrington).

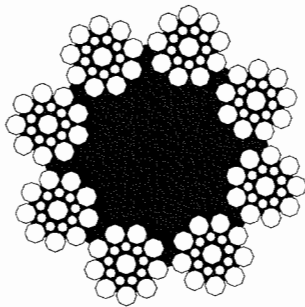


FIGURE 22. Type I, general purpose, class 4, construction 3, 8 by 19 (Seale), and type II, elevator, class 2, construction 3, 8 by 19 (Seale).

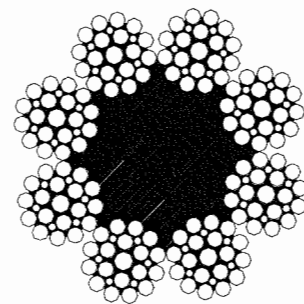


FIGURE 23. Type I, general purpose, class 4, construction 4, 8 by 19 (Filler wire), and type II, elevator, class 2, construction 4, 8 by 19 (Filler wire).

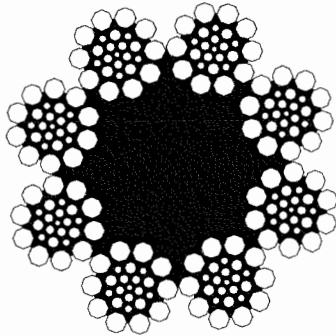


FIGURE 24. Type I, general purpose, class 4, construction 5, 8 by 19 (Warrington-Seale), and type II, elevator, class 2, construction 5, 8 by 19 (Warrington-Seale).

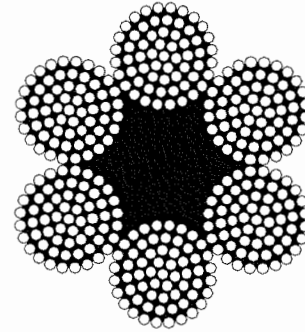


FIGURE 25. Type I, general purpose, class 5, 6 by 61.

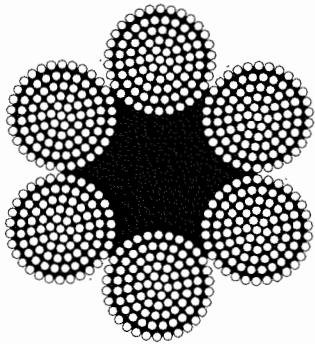


FIGURE 26. Type I, general purpose, class 6, 6 by 91.

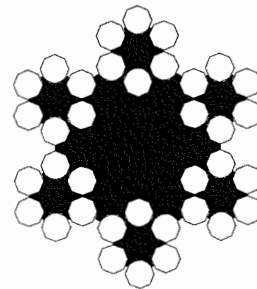


FIGURE 27. Type III, marine (cables), class 1, 6 by 6, (deck lashing ropes).

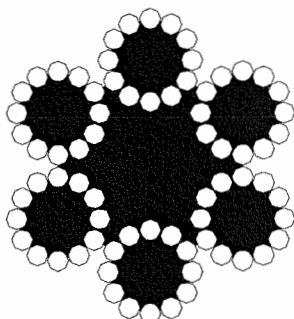


FIGURE 28. Type III, marine (cables), class 2, 6 by 12, (running ropes).

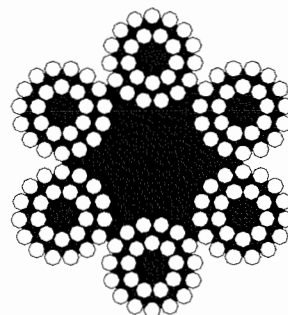


FIGURE 29. Type III, marine (cables), class 3, 6 by 24, (mooring lines), construction 1, (2 operations).

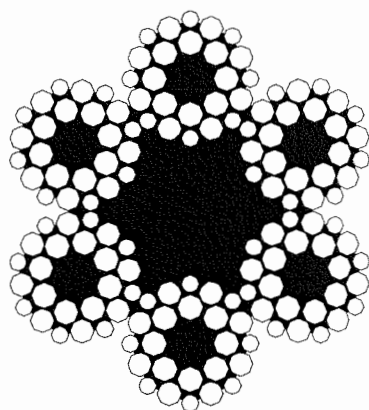


FIGURE 30. Type III, marine (cables), class 3, 6 by 24, (mooring lines), construction 2, (Warrington).

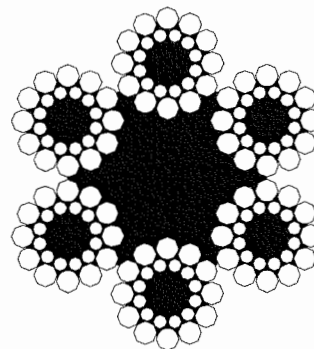


FIGURE 31. Type III, marine (cables), class 3, 6 by 24, (mooring lines), construction 3, (Seale).

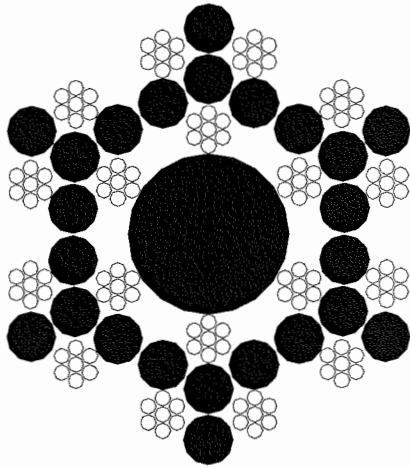


FIGURE 32. Type III, marine (cables), class 4, 6 by 3 by 7 spring lay.

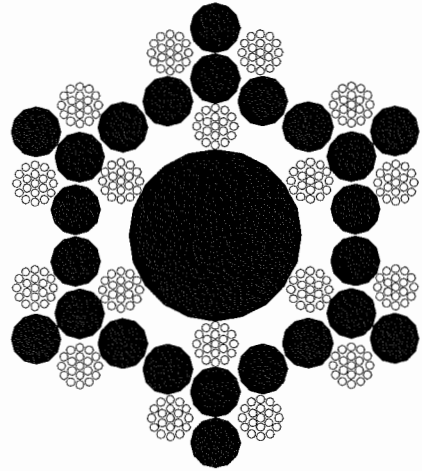


FIGURE 33. Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 1, (2 operations).

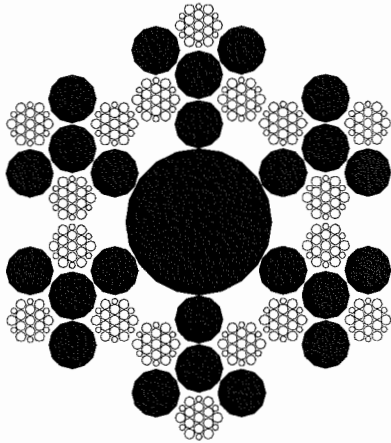


FIGURE 34. Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 2, (Warrington).

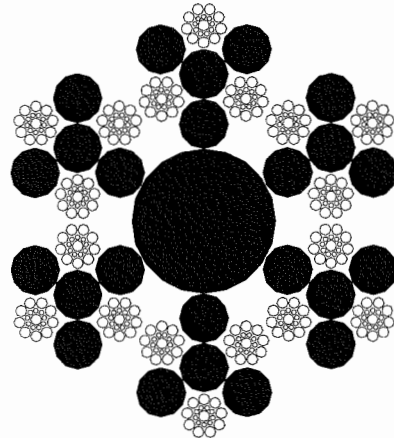


FIGURE 35. Type III, marine (cables), class 5, 6 by 3 by 19 spring lay, construction 3, (Seale).

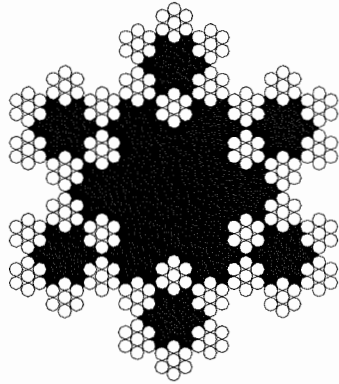


FIGURE 36. Type III, marine (cables), class 6, 6 by 42 tiller or hand control ropes.

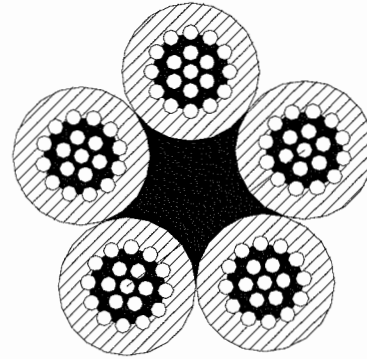


FIGURE 37. Type IV, miscellaneous, class 1, 5 by 19 (marline-clad), construction 1, (2 operations).

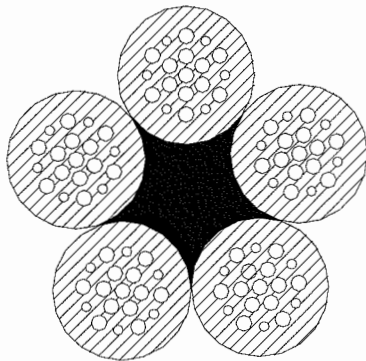


FIGURE 38. Type IV, miscellaneous, class 1, 5 by 19 (marline-clad), construction 2, (Warrington).

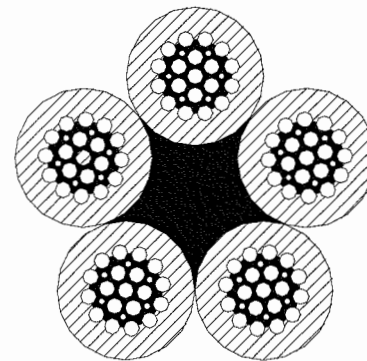


FIGURE 39. Type IV, miscellaneous, class 1, 5 by 19 (marline-clad), construction 3, (Filler wire).

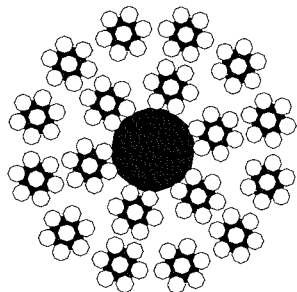


FIGURE 40. Type IV, miscellaneous,
class 2, 18 by 7
rotation resistant.

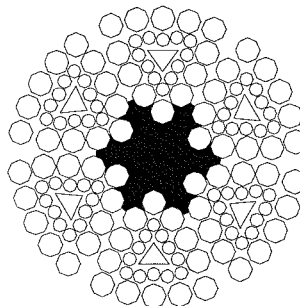


FIGURE 41. Type IV, miscellaneous,
class 3, flattened strand
construction 1, 6 by 25,
style B.

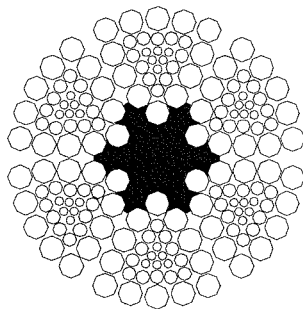


FIGURE 42. Type IV, miscellaneous,
class 3, flattened strand
construction 2, 6 by 30,
style G.

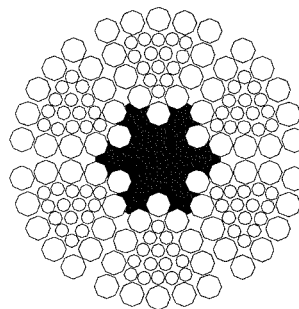


FIGURE 43. Type IV, miscellaneous,
class 3, flattened strand
construction 3, 6 by 27,
style H.

RR-W-410F

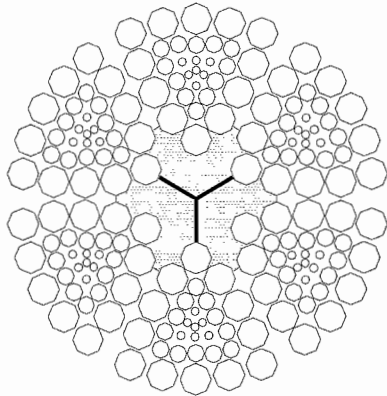


FIGURE 44. Type IV, miscellaneous, class 3, flattened strand, construction 4, 6 by 31, style V.

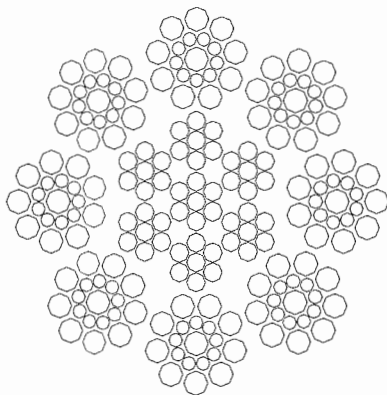


FIGURE 45. Type IV, miscellaneous, class 4, construction 1, 8 by 19 rotation resistant (Seale).

RR-W-410F

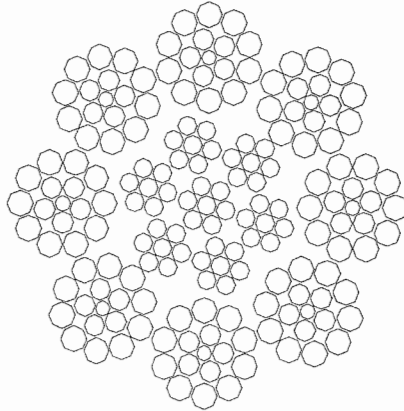


FIGURE 46. Type IV, miscellaneous, class 4, construction 2, 8 by 19 rotation resistant (Filler wire).

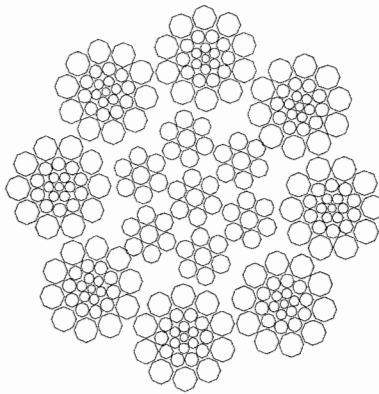


FIGURE 47. Type IV, miscellaneous, class 4, construction 3, 8 by 19 rotation resistant (Warrington-Seale).

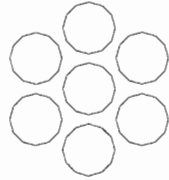


FIGURE 48. Type V, auxiliary wire strands, class 1, 1 by 7 seizing strand.

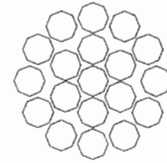


FIGURE 49. Type V, auxiliary wire strands, class 2, 1 by 19 seizing strand (2 operations).

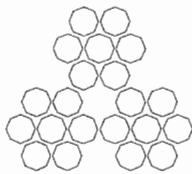


FIGURE 50. Type VI, small cords, class 1, 3 by 7.



FIGURE 51. Type VI, small cords, class 2, 7 by 7.

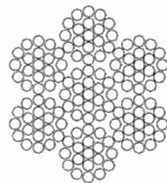


FIGURE 52. Type VI, small cords, class 3 7 by 19 (2 operations).

MILITARY INTERESTS:

Custodians:

Navy - SH
Air Force - 99

Review Activities:

Navy - YD
Air Force - 71

**CIVIL AGENCY
COORDINATING ACTIVITY:**

GSA - FSS

Preparing Activity:

DLA - GS5

(Project 4010-2007-001)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST database at <http://assist.daps.dla.mil/>