HELI-VAC™ FAST ROPE®

HELICOPTER INFILTRATION / EXTRACTION SYSTEMS

SPECIFICATION & MAINTENANCE MANUAL

Columbian's HELI-VAC™ FAST ROPE® SYSTEMS provide efficient and safe methods for infiltrating and evacuating special operation personnel to and from point targets. A special low stretch, abrasion resistant fiber, Dacron M/P Type 77* and Columbian's Pli-Moor® construction eliminate rope hockling or kinking, resist heat buildup during use, and afford fast, fully controlled descent and safe, sure assent.

The FAST ROPE® SYSTEMS were developed in the U.S. during the mid 1980's by The Columbian Rope Company in a coordinated effort with our nation's military and law enforcement services. In 1990, Columbian along with the U.S. Army Natick RD Center in Natick, MA authored and developed the only FAST ROPE® mil-spec which is still in use today, Military Specification MIL-F-44422 Fiber Rope Assembly, Insertion/Extraction.

The origins of Columbian Specialty Products lay in the distant past with the Columbian Rope Company and Plymouth Cordage Company, once the worlds largest producer of exceptionally high quality rope and twine products.

Columbian Specialty Products continues today with the long-standing tradition of quality products manufactured with pride of workmanship. The formula for our success Is simple; quality materials combined with dedicated, knowledgeable workmanship equaling quality products.

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PLEASE NOTE:
ALL ROPE SPECIFICATIONS PRESENTED ARE BASED ON NEW, UNUSED ROPE.

*MULTIPLEX™ DACRON® are registered Trade Marks of Performance Fibers

1. SCOPE

1.1 Scope. This specification covers a fiber rope assembly for the intended use of quick evacuation of military personnel from rotary wing aircraft, (Infiltration Type), or quick Extraction from a ground location by rotary wing aircraft at various elevations.

1.2 Classification. The rope assembly's are classified as the following types:

HELI-VAC™ FAST ROPE® HELICOPTER INFILTRATION & EXTRACTION SYSTEMS (OLIVE DRAB) 8 STRAND PLIMOOR®

M/P TYPE 1 INFILTRATION SYSTEM

P/N 3316662 M/P Type I Heli-Vac System w/ High Tech Hardware Termination, 50 feet long (±10%, -0%)

P/N 3316660 M/P Type I Heli-Vac System w/ High Tech Hardware Termination, 60 feet long (±10%, -0%) NSN: 4020-01-352-2728

P/N 3316661 M/P Type I Heli-Vac System w/ High Tech Hardware Termination, 90 feet long (±10%, -0%) NSN: 4020-01-352-2729

P/N 3316663 M/P Type I Heli-Vac System w/ High Tech Hardware Termination, 120 feet long (±10%, -0%) NSN: 4020-01-352-2730

M/P TYPE 2 INFILTRATION / EXTRACTION SYSTEM

P/N 3326682 M/P Type 2 Heli-Vac System w/ High Tech Hardware Termination & Extraction Component, 50 feet long (±10%, -0%)

P/N 3326680 M/P Type 2 Heli-Vac System w/ High Tech Hardware Termination & Extraction Component, 60 feet long (±10%, -0%)

P/N 3326681 M/P Type 2 Heli-Vac System w/ High Tech Hardware Termination & Extraction Component, 90 feet long (±10%, -0%)

P/N 3326683 M/P Type 2 Heli-Vac System w/ High Tech Hardware Termination & Extraction Component, 120 feet long (±10%, -0%)

1.2 Classification *(Continued)*.

M/P TYPE 3 INFILTRATION SYSTEM

P/N 3336672 M/P Type 3 Heli-Vac System w/ Eye Splice Termination, 50 feet long (±10%, -0%)

P/N 3336670 M/P Type 3 Heli-Vac System w/ Eye Splice Termination, 60 feet long (±10%, -0%)

P/N 3336671 M/P Type 3 Heli-Vac System w/ Eye Splice Termination, 90 feet long (±10%, -0%)

P/N 3336673 M/P Type 3 Heli-Vac System w/ Eye Splice Termination, 120 feet long (±10%, -0%)

P/N 3336681 M/P Type 3 Heli-Vac System w/ Special Eye Splice Termination & Oval Ring Components, 30 feet long (±10%, -0%)

P/N 3336680 M/P Type 3 Heli-Vac System w/ Special Eye Splice Termination & Oval Ring Components, 60 feet long (±10%, -0%) MARSYSCOM MODEL NSN: 4020-01-500-5765

P/N 3336679 M/P Type 3 Heli-Vac System w/ Special Eye Splice Termination & Oval Ring Components, 90 feet long (±10%, -0%) MARSYSCOM MODEL NSN: 4020-01-500-5766

P/N 3336678 M/P Type 3 Heli-Vac System w/ Special Eye Splice Termination & Oval Ring Components, 120 feet long (±10%, -0%) MARSYSCOM MODEL NSN: 4020-01-500-5779

P/N 3336682 M/P Type 3 Heli-Vac System w/ 3" Soft Eye Splice Termination w/ Two(2) 4" Oval Rings, 70 feet long (±10%, -0%) USCG MODEL

M/P TYPE 4 INFILTRATION / EXTRACTION SYSTEM

P/N 3346692 M/P Type 4 Heli-Vac System w/ Eye Splice Termination & Extraction Component, 50 feet long (±10%, -0%)

P/N 3346690 M/P Type 4 Heli-Vac System w/ Eye Splice Termination & Extraction Component, 60 feet long (±10%, -0%) NSN: 4020-01-338-3307

P/N 3346691 M/P Type 4 Heli-Vac System w/ Eye Splice Termination & Extraction Component, 90 feet long (±10%, -0%) NSN: 4020-01-338-3308

P/N 3346693 M/P Type 4 Heli-Vac System w/ Eye Splice Termination & Extraction Component, 120 feet long (±10%, -0%) NSN: 4020-01-338-3309

1.2 Classification *(Continued)*.

M/P TYPE 5 INFILTRATION SYSTEM

P/N 3356682 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination, 50 feet long (±10%, -0%)

P/N 3356683 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination, 60 feet long (±10%, -0%) NSN: 4020-01-338-3307

P/N 3356684 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination, 90 feet long (±10%, -0%) NSN: 4020-01-338-3308

P/N 3356685 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination, 120 feet long (±10%, -0%) NSN: 4020-01-338-3309

M/P TYPE 5 INFILTRATION / EXTRACTION SYSTEM

P/N 3356692 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination & Extraction Component, 50 feet long (±10%, -0%)

P/N 3356693 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination & Extraction Component, 60 feet long (±10%, -0%) NSN: 4020-01-338-3307

P/N 3356694 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination & Extraction Component, 90 feet long (±10%, -0%) NSN: 4020-01-338-3308

P/N 3356695 M/P Type 5 Heli-Vac System w/ Spectra 8/S Fiber Termination & Extraction Component, 120 feet long (±10%, -0%) NSN: 4020-01-338-3309

2.0 SPECIFICATIONS

2.1 Materials.

2.1.1 Main Line. The main rope line shall be fabricated from virgin continuous filament, Performance Fibers, (formally DuPont™) Type 77 Mulitplex™ Dacron Polyester constructed of heat and light resistant polyethylene terephthalate type polyester with a staple wrap. The rope shall be dyed green to approximate any color in the range indicated by color chips 34052, 34079, 34086, 34092, 34096, 34097, 34098, 34102, 34108, and 34128 of U.S. FED-STD-595.

2.1.2 Main Line Construction.

The rope shall be constructed of eight strands arranged in four pairs, where one individual strand shall be laid adjacent to the second strand in each pair, and shall conform to the requirements specified herein and in table I. Individual strands shall be made of one size of singles yarn and shall have an equal number of yarns. The yarn shall be 45000 denier, with a minimum breaking strength of 620 lbs. and shall be "S" and "Z" twist. The rope shall be constructed without knots or splices in the strands of the rope. However, knots will be permitted in the singles yarn. In preparation of the constituent rope strands, the pattern "S", (or "Z"), shall be employed in the twisting of the yarns and the individual strands of the two pairs while the components of the remaining pairs shall be twisted in the "S", (or "Z"), pattern. The finished rope shall be so constructed that in the interweaving procedure, pairs of strands of the former structure shall be twisted in the "Z" direction, while alternating pairs of the latter shall be twisted simultaneously in the "S" direction. Heat setting of the rope or any portion of its components shall not be permitted. The physical requirements of the Main Line rope are listed in table 1.

2.1.3 White Nylon extraction loops rope & Black Nylon Safety line rope.

The rope shall be constructed of eight strands arranged in four pairs, where one individual strand shall be laid adjacent to the second strand in each pair and shall conform to the requirements specified herein and in table I. Individual strands shall be made of one size of balanced 3-ply yarns and shall have equal numbers of plied yarns. The singles yarn shall be 4000 to 10000 denier. The rope shall be constructed without knots or splices in the singles yarn, 3-ply yarns, strands, or rope. Knots in the single filaments are acceptable. In the preparation of the constituent rope strands, the pattern "SZS" twist shall be employed in the twisting of the singles yarns, the 3-ply yarns and the individual strands of two pairs, while the components of the remaining pairs shall be twisted in the "ZSZ" pattern. The finished rope shall be so constructed that in the interweaving procedure, pairs of strands of the former structure shall be twisted in the "Z" direction, while alternating pairs of the latter structure shall be twisted simultaneously in the "S" direction. The finished rope shall be heat set. Dry heat setting is prohibited.

2.1.4 2.1.4 Spectra Fiber termination loops.

The rope shall be constructed of eight strands arranged in four pairs. Individual strands shall be made of one size of balanced single yarns. The rope shall be constructed without knots or splices in the singles yarn, strands, or rope. In the preparation of the constituent rope strands, the pattern "SZS" twist shall be employed in the twisting of the singles yarns, the 3-ply yarns and the individual strands of two pairs, while the components of the remaining pairs shall be twisted in the "ZSZ" pattern. The finished rope shall be so constructed that in the interweaving procedure, pairs of strands of the former structure shall be twisted in the "Z" direction, while alternating pairs of the latter structure shall be twisted simultaneously in the "S" direction. The finished rope shall be coated with a polyurethane overlay finish and the assembly protected in a BTU thimble chaff guard.

TABLE I. Physical Requirements

CHARACTERISTIC	REQUIREMENT
Main Line Diameter in inches 1/	1-3/4”
White Nylon Extraction Line & Black Nylon Safety Line Diameter in inches 1/	9/16”
Main Line Circumference in inches at load “P” 2/	5-1/2 ± ¼”
White Nylon Extraction Line & Black Nylon Safety Line Circumference in inches at load “P” 2/	1-3/4 ± 1/8”
Main Line Load “P” (pounds) 2/	610 lbs.
White Nylon Extraction Line & Black Nylon Safety Line Load “P” (pounds) 2/	65 lbs.
Main Line Rope Breaking strength minimum	35,000 lbs.
White Nylon Extraction Line & Black Nylon Safety Line Breaking strength minimum	9,000 lbs.
High Tech Hardware termination minimum failure strength (pull out of main line weave)	9,000 lbs.
Spectra 8/S Fiber termination minimum failure strength	17,000 lbs.
Main Line Hardness minimum/maximum (pounds)	325 lbs. to 450 lbs.
White Nylon Extraction Line Hardness minimum/maximum	4 lbs. / 12 lbs.
Black Nylon Safety Line Hardness minimum/maximum	30 lbs. / 60 lbs.
Main Line Feet per pound at load “P” 2/	1.23 Ft per Pound ± 5%
White Nylon Extraction Line Feet per pound at load “P” 2/	10.79 Ft per Pound ± 5%
Black Nylon Safety Line Feet per pound at load “P” 2/	10.34 Ft per Pound ± 5%
Elongation maximum (percent) (*Main Line Only*)	59%
Loss in breaking strength after heat aging, not exceeding (percent) *Requirement Applies to All Lines*	10%
Moisture content maximum (percent) *Requirement Applies to All Lines*	5%
Extractable matter maximum (percent) *Requirement Applies to All Lines*	4%

1/ Not a specification requirement; included for information only.

2/ The load “P” (pounds) shall be equal to 200 times the square of the nominal diameter of the rope in inches ($P = 200D^2$).

3.0 **M/P TYPE 1 & M/P TYPE 2 HARDWARE TERMINATION COMPONENTS**

3.1 The physical requirements of the High Tech Hardware Termination assembly are listed in table 2.

TABLE 2. High Tech Hardware Physical Requirements

COMPONENT	REQUIREMENT
6” Steel Sleeve, Clevis, Pins	Electroless / Cadmium / Plating IAW Mil-QQP-416
Aluminum End Cap	Electroless / Cadmium / Plating IAW Mil-QQP-416
Oval-Ring Alloy Grade 4140 A.Q.	Plaiting ASTM B 633 CL FEZN 12 Yellow
Mounting Ring Strength	12,000 Pound Proof Test
Safety Cable	Stainless Steel 3/16” Diameter, 7 x 19 Construction
Safety Cable	Minimum failure strength 1,000 lbs.

4.0 **M/P TYPE 3 & TYPE 4 OVAL RING COMPONENT DATA (MARSYSCOM MODEL)**

4.1 The physical requirements of the oval ring assembly are listed in table 3.

TABLE 3. Physical Requirements

COMPONENT	REQUIREMENT
14 mm OVAL LINK Alloy Steel BHN: 320 Min. AISI Spec & Grade – Classified Serialization required. All Specifications I/A/W w/ PLYMKRAFT CSP DWG 0130 CHG 3 rev 03	INORGANIC ZINC PRIMER, Color Gray WLL: 6000 lbs./ Minimum Ultimate Load at four times WLL Individual Proof Test and 100% Ultrasonic Test required for each ring. All rings are certified to Charpy Impact Test as outlined in CSP Dwg 0130 CHG 3 rev 03

5.0 **M/P TYPE 3 OVAL RING COMPONENT DATA**

5.1 The physical requirements of the oval ring assembly used on P/N 3336682, M/P Type 3, Heli-Vac Fast Rope w/ Two(2) 4” Oval Rings in 3” Soft Eye, 70 Ft. Overall Length are listed in table 4.

TABLE 4. Physical Requirements

COMPONENT	REQUIREMENT
Oval-Ring Alloy Grade 4140 A.Q.	Plaiting ASTM B 633 CL FEZN 12 Yellow
Mounting Ring Strength	12,000 Pound Proof Test

6.0 INSPECTION and MAINTENANCE PROCEDURES

6.1 Suggested inspection procedures. Examine the main line for any visual defects. If possible, lay out the entire length of line for inspection. Minor defects may be acceptable at the discretion of the inspector. Critical defects require repair and/or replacement as recommended by the manufacturer.

Reference Table 5 for inspection components and defect classification.

TABLE 5. Inspection Elements

EXAMINE	DEFECT	DEFECT CLASSIFICATION	
		MINOR	CRITICAL
Main Line Rope, Extract Loops, & Safety Line			
	Abraded Yarns	X	
	Burns		X
	Cut Yarns		X
	Stand Kinking		X
	Whipped End Loose at bitter end of rope	X	
	Whipped End missing & line unraveling		X
High Tech Hardware Termination			
	Excessive wear, ring assembly		X
	Missing screws		X
	Rope pulling out of 6” metal sleeve		X
	Safety cable slightly frayed	X	
	Safety cable strand broken		X
	Safety cable strands separated		X
	Safety cable eye-splice clamp is loose		X
Spectra 8/S Fiber Termination			
	Visible Abraded Yarns		X
	Burns in BTU cover or whipping		X
	Burns in rope strand		X
	Cut Yarns		X
	Cuts in BTU cover or whipping		X
	Stand Kinking		X
	Whipped End Loose		X
	Whipped End missing & line unraveling		X

6.2 Suggested maintenance. During routine inspection the following repairs can be performed.

A. Safety Cable eye splice may be repaired by replacement of swag block by any qualified rigging shop. The swag block should be equal in quality to the original, Nicropress Oval Sleeve No. 168-6-VP for 3/16" Stainless Steel Cable.
B. Loose screws may be tightened by the user. Be sure to use the proper equipment and lock threads with a thread locking compound equal to Loctite® 262 HIGH STRENGTH THREADLOCKER, P/N 26241
C. Loose whipped ends on the lines bitter end (the end of the rope) may be re-whipped by a qualified rope splicer.

ALL OTHER REPAIRS MUST BE PERFORMED BY THE MANUFACTURER

6.3 Storage Procedures

1) If the line is wet, hang the line full length and allow drying before storage. Seawater will not harm the fiber, but the line should not be stored wet.
2) Clean the line with an artificial or natural hair bristle brush only. Do not use cleaning fluids or water.
3) Coil the line using no less than an 18 inch coil.
4) Store the line in a dry area and not in contact with the ground.
5) If the line is not used for an extended length of time, after 6 months of storage uncoil the line and allow the line to hang full length for 24 hours.
6) Re-store the line using the steps above in steps 3 and 4.

Reference Table 2 Abrasion Assessment

Damage Description	**REPAIR**	**DOWNGRADE**	**RETIRE**
10% loss of fiber cross-section in whole rope or in an individual strand cross-section. Crowns of strands badly worn reducing strand diameter 10%	NO	POSSIBLE	BEST ACTION
Localized hard or burn areas more than 15% of rope or fiber termination or fiber termination protective BTU cover circumference, (.825") in width; or in length in excess of 4 of the 8 strands; and penetration more than 5% of rope diameter, (.0875")	NO	NO	YES
Localized hard, or burn areas, area less than 15% of rope circumference, (.825") in width; penetration less than 5% of rope diameter, (.0875").	NO	POSSIBLE	BEST ACTION

NOTES: