8.0 - Environmental Considerations

8.1 When not in use, synthetic slings should be stored in a clean dry place. Heat sources and non-ventilated places should be avoided.

8.2 Chemically active environments can affect the strength of synthetic lifting slings. Different chemicals will react with different exposure to Covermax® bulked nylon, polyester, aramids, and Olefins. Please see the enclosed tables for reactions of specific chemicals.

Aramids are resistant to most ketones, alcohols, dry cleaning solvents and many other organic solvents. Its acid resistance is superior to that of nylon but is not as good as that of polyester. Aramids show good resistance to alkalis at room temperature, but is degraded by strong alkalis at higher temperatures.

Aramids are compatible with fluorine-containing elastomers, resins, and refrigerants at high temperatures, and is resistant to fluorine compounds in concentrations usually encountered in stack gases from metallurgical and rock-processing operations.

The resistance of aramids to oxides of sulphur at temperatures above the acid dew point is superior to that of polyester. Below the dew point, concentrated sulphuric acid may condense on the fiber and cause a progressive loss in strength.

In moderate to strong acid or alkali environments, evaluation of aramids should be made to ensure that the yarn will perform acceptably before use.

Polyester and nylon are not significantly affected by most compounds of the following classes:

Alcohols
Dry Cleaning Solvents
Halogenated Hydrocarbons
Ketones
Soaps and Synthetic Detergents
Water (Including Sea Water)

Polyester also shows good to excellent resistance to:

- Aqueous solutions of most weak acids at the boil, and to most strong acids at room temperature, but is disintegrated by concentrated (95%) sulphuric acid at room temperature.
- Aqueous solutions of strong alkalis at room temperature, but is degraded at the boil.
- Oxidizing agents, and is not degraded by bleaching treatments ordinarily used for textiles.

Nylon is not significantly affected by most aldehydes, alkalis, ethers, or hydrocarbons, but is deteriorated by dilute acids (e.g., hydrochloric acid and sulphuric acid in 10% concentrations at room temperature cause a noticeable loss in breaking strength in 10 hours).

Solvents for nylon includes:

Concentrated formic acid
Phenolic compounds at room temperature
Calcium chloride in methanol at room temperature

Hot solutions of calcium chloride in:
- Glacial Acetic Acid
- Ethylene Chlorohydrin
- Ethylene Glycol

Hot solutions of zinc chloride in methanol
Benzyl alcohol at the boil

Aramids are resistant to most weak acids and alkalis, ketones, alcohols, hydrocarbons, oils and dry cleaning solvents. Strong acids and bases and sodium hypo-chlorite bleach attack aramids, particularly at high temperatures of high concentrations.

K-Spec® core yarn strength retention is based on test results of components at 65°C/150°F (or less) for 6 months. K-Spec® has a 100% strength retention when exposed to: Age, 10% detergent solution, rot and mildew, sunlight and Toluene; 99% strength retention when exposed to: acetic acid, gasoline, hydrochloric acid 1m, hydraulic fluid, kerosene, and sea water; 98% retention when exposed to: 25% ammonium hydroxide, 10% hypophosphite solution, and 40% phosphoric acid; 97% retention when exposed to 5m sodium hydroxide; 95% retention when exposed to Portland cement and sulfuric acid; and 88% retention when exposed to Clorox®, and nitric acid.

9.0 - Fiber Characteristics

(Using Nylon as a basis of 1.0)

Generic Fiber Type	Nylon	Polyester	Polypro-Pylene	HDPE Olefin	Aramid	K-Spec
Bulk Strength[1]	1.0	.9 - 1.1	.55	2.8	2.7	2.75
Weight	1.0	1.21	.80	.85	1.26	1.01
Working[2] Elastic Elongation	1.0	.60	.80	.10	.10	.10
Co-efficient[3] of Friction	.10 - .12	.12 - .15	.15 - .22	.08	.10 - .12	.10
Melting Point	460°F	480°F	330°F	297°F	Chars at 800°F	Chars at 297°F
Critical[4] Temperature	180°F	180°F	180°F	150°F	300°F	180°F
Specific Gravity	1.14	1.38	.91	.97	1.44	1.2
Cold-Flow (Creep)	Negligible	Negligible	Negligible to High	Negligible to High	Negligible	Negligible

[1]Bulk Strength is defined as strength per circumference squared.

[2]Working is defined as rope actually in use under a cycling load.

[3]Co-efficient of friction is based on reluctance to slip or slide.

[4]Critical temperature is defined as the point at which degradation is caused by temperature alone.

Cold-Flow (Creep) is defined as fiber deformation (elongation) due to molecular slippage under a constant steady static loading situation. Fibers that have this inherent characteristic will display extremely low or negligible creep if minor fluctuations occur in the rate and/or frequency of load levels. In rope form, this would apply to polypropylene, polyethylene, and HDPE Olefin fibers.

Section 5.3 Environmental Considerations

5.3.1 Slings should be stored in a cool, dry and dark place, and should not be exposed to sunlight, to prevent mechanical or chemical damage when not in use.

5.3.2 Chemically active environments can effect the strength of synthetic web sling in varying degrees ranging from none to total degradation. The sling manufacturer should be consulted before sling are used in chemically active environments.

a. **ACIDS**
   1. Nylon is subject to degradation in acids, ranging from none to total degradation.
   2. Polyester is resistant to many acids, but is subject to degradation, ranging from none to moderate in some acids.
   3. Each application shall be evaluated, taking into consideration the following:
      i. Type of Acid
      ii. Exposure conditions
      iii. Concentration
      iv. Temperature

b. **ALKALIS**
   1. Polyester is subject to degradation in alkalis, ranging from none to total degradation.
   2. Nylon is resistant to many alkalis, but is subject to degradation ranging from none to moderate in some alkalis.
   3. Each application shall be evaluated, taking into consideration the following:
      i. Type of Alkali
      ii. Exposure conditions
      iii. Concentration
      iv. Temperature

5.3.3 Nylon and polyester slings shall not be used at temperatures in excess of 180°F (85°C), however, they may be used in temperatures as low as –40°F (–40°C).

5.3.4 Slings incorporating aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of alkalis and/or acids are present.

5.3.5 Environments in which synthetic webbing slings are continuously exposed to ultra-violet light can affect the strength of synthetic webbing slings in varying degrees ranging from slight to total degradation.

a. Factors which affect the degree of strength loss are:
   1. Length of time of continuous exposure
   2. Sling construction and design
   3. Other environmental factors such as weather conditions and geographic location.

b. Suggested procedures to minimize the effects of ultra-violet light.
   1. Store slings in a cool, dry and dark place when not being used for prolonged periods of time
   2. Inspect slings weekly or more often depending on frequency of sling use.

c. Visual indications of ultra-violet degradation are:
   1. Bleaching out of sling color
   2. Increased stiffness of sling material
   3. Surface abrasion in areas not normally in contact with the load.

d. Proof-Testing — Slings used in environments where they are subject to continuous exposure to ultra-violet light should be proof tested to two times rated capacity annually, or more frequently depending on severity of exposure.