

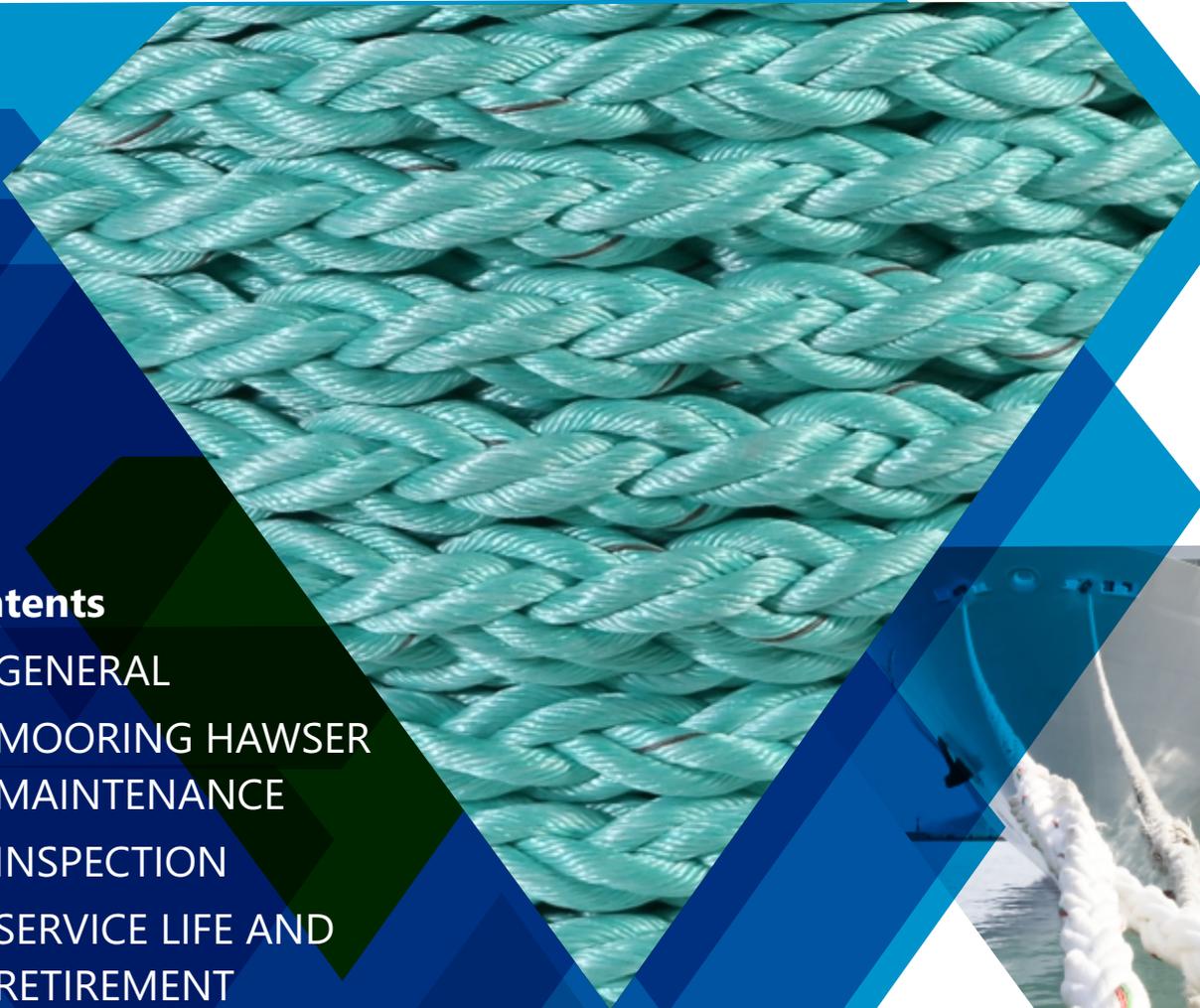
## MOORING ROPES

# USER MANUAL

CARE & MAINTENANCE GUIDE

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Thanks for choosing Kohinoor ropes Pvt. Ltd. which are manufactured in most advanced manufacturing infrastructure and facility are offered after stringent inspection in accordance with new Guidelines from OCIMF "Mooring Equipment Guideline" (MEG 4).

The safety of the personnel working in the vicinity of the mooring lines under tension is always at a high risk. Hence the condition of the ropes has to be periodically inspected to assess the continuance of the use of the installed ropes.

Fiber ropes are employed in a large variety of applications that differ greatly in the severity of use. In some applications, ropes can serve for many years. In more severe applications or under different conditions, the same rope may degrade rapidly. Also, ropes of different size, construction or material can show substantial differences in longevity in the same application. For each specific fibre rope application the user must establish a basis for retirement that considers conditions of use, experience with the application and the degree of risk present

Following pages are of importance as far as the Installation, Maintenance, Inspection and Retirement of Mooring Hawsers is concerned.

As per the new MEG 4 guide lines following factors have been listed which can affect the performance of the rope such as,

- UV degradation
- Creep
- Abrasion External
- Abrasion Internal
- Cut Resistance
- Induced Twist
- Dynamic loading
- Chemical exposure

These factors can affect the performance of the ropes in various degrees and hence periodic inspection by a competent person can ascertain the continual use of the Mooring ropes and if not fit should be discarded with a conservative approach as safety of the people on deck is of utmost importance.

# 02

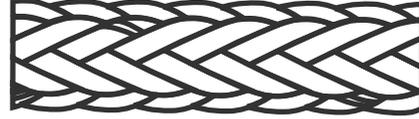
## MOORING HAWSER INSTALLATION AND MAINTENANCE

### Different Types of the ropes

#### 8 Strand Mooring Hawsers



#### 12 strand Ropes



#### Double Braided Ropes



#### 3 strand Ropes



### Depending on applications the Ropes are of following materials

#### 1 Polysteel (Polypropylene):

Regular strength **TECHPLUS<sup>®</sup>** & High strength **PROTECH**

Techplus and high strength Protech

- **Specific gravity 0.91**
- **Floats on water**
- **Melting point 165 Degrees**

Being the lighter material is ideal for mooring applications as does not entangle with the submerged moving part of the ship has reasonably good Cyclic loading and has got average abrasion resistance and moderate UV resistance.

#### 2 Polyamide (Nylon 6 or Nylon 66 ) **NYLOTECH<sup>®</sup>**

- **Specific gravity 1.14 to 1.17**
- **Does not float in water**
- **Melting point 220 to 280 Degrees centigrade depending on grade of Nylon**

These ropes are generally used for towing applications due to the fact that the elongation property as well as memory recovery of the ropes is of great advantage for towing and pulling tail applications . Generally not recommended for mooring due to high elongation as well as being heavier than water Kohinoor Ropes offers Nylon ropes under Nylotech brand

### 3 Polyester - Polytech:**POLYTECH**<sup>®</sup>

- **Specific gravity 1.36 to 1.38**
- **Does not float on water**
- **Melting point 250 to 260 C**

Polyester ropes have high strength both in dry and wet conditions and does not loose strength due to cyclic loading. Specific gravity being on much higher Side ropes are having higher weight for same size Polypropylene ropes.

### 4 Polypropylene / Polyester Blended Ropes : **TECHFLEX**<sup>®</sup> & **TECHFLEX**<sup>®</sup> LIGHT

It is very common now a days to have dual fiber ropes for mooring with blend of Polypropylene and Polyester in few different mixes 60:40 and 50:50 all the ropes are popular in shipping industry. The behavior of the ropes does differ with different percentage of mix. Due to the synergic effect of the blend the resultant ropes exhibits higher strength than both the material individually

- **Specific gravity 60:40**
- **variety 1.09 50:50**
- **Variety 1.14**
- **Both the varieties sink in water**

# Installation of Mooring Hawser

## BEFORE INSTALLATION

### Storage

Ropes should preferably be stored in their polythene lined packing assuming they received in good condition, and are clean and dry internally. The rope coils should be stored under cover out of direct sunlight and away from extreme temperatures.

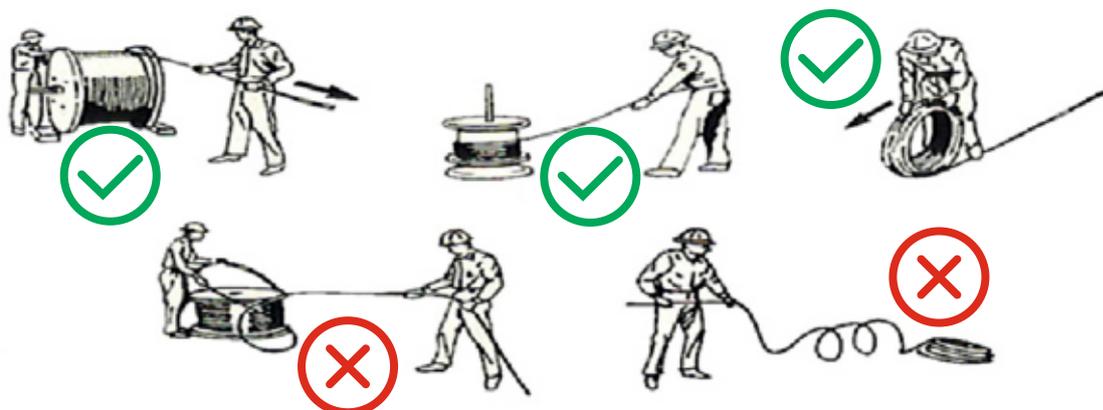
### Unpacking

When unpacking from the coil always use the lifting sling and do not drag the hawser over rough ground. Dirt and grit picked up by the rope can work into the strands cutting the inside fibers during cyclic loading.

### Mooring line installation

Before installation ensure that the surface of the drum and contact points are cleaned and all dirt paint flakes bur etc are removed so as to avoid damage to the rope. Ensure there are no sharp edges in the contact area. While uncoiling the rope ensure that no unnecessary twist are added to the rope. Following images will give idea of right and wrong way of uncoiling the rope

Care should be take to ensure that the rope is not unnecessarily Damaged during installation

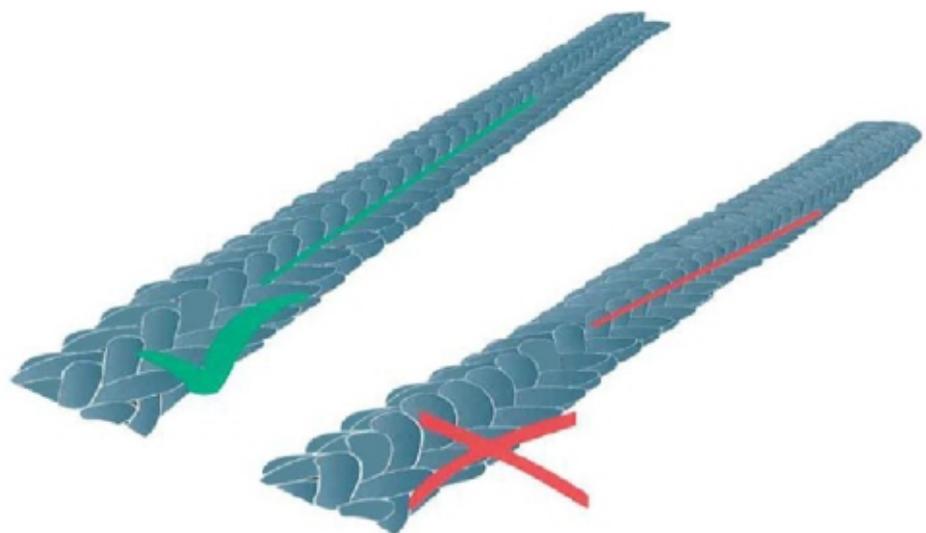


Conventional lines should be stored in a clean, dry area. Lines should be stored out of direct sunlight and away from extreme ambient temperatures in accordance with the manufacturer's guidance and the operator's LMP. prevent contamination from chemicals, by placing the coils on pallets or on supported reels. Ropes should be inspected periodically and ship personnel should inspect lines for damage before deploying them from storage into service. Mooring lines installed on winches should be covered with suitable water proof tarpaulins or other suitable coverings when not in use.

Ropes installed on winches should have a moderate, safely applied, back-tension and the drum packed carefully to avoid burying into lower layers on the drum. Where split drum winches are used, the design should allow for sufficient turns to be maintained on the tension side of the winch drum to avoid load transfer across the dividing flange. A minimum of six turns for conventional fiber mooring ropes are recommended.

### Twist removal

Induced twist may reduce a mooring rope's strength. Measures should be taken to minimize induced twist in a deployed line. Such measures include storing lines properly on their drums and avoiding connecting lines with tails of dissimilar constructions. Excessive turns can cause kinking in any rope. Braided and plaited ropes cannot be hockled as their inter locking strand construction prevents unlaying. Strands run in both directions creating a torque-free thus eliminating any inherent tendency towards twist or rotation. Excessive turns (kinking) in a rope should be removed by "counter rotating" the rope in a relaxed condition as soon as possible Marking a straight line along the pitch of the rope in relaxed condition can help in Reducing the instances of twist in ropes.



### D/d Ratio

The D/d ratio is the diameter of the bend divided by the diameter of the mooring line. Any bending of the line will immediately reduce its breaking strength. Repeated bending will reduce the service life of the mooring line. The D/d ratio should be as large as possible to maximize mooring line strength and working life. It is recommended that designers of mooring arrangements aim for mooring fitting designs that result in a D/d of at least 15. This will ensure the performance reduction due to bending is kept to a minimum. The D/d resulting from deck equipment design is only one of the factors affecting the condition and service life of mooring lines, but it is a fundamental consideration in the process of assessing the strength and prospective service life of mooring lines

### Wear Management

The mooring ropes are subject to get wear and tear due to rubbing on the abrading surfaces. In general it is difficult to avoid abrasion of the rope best way is to take care of the deck equipment . The worn out fair leads , Panama eyes can cause sever damage due to constant friction.



Suitable sleeves can be used for the areas with constant rubbing

Panama eye covers can reduce the abrasion to greater extent.

## 03 Rope Inspection

### **Purpose**

Careful and frequent inspection of fiber rope, using procedures contained in this document, reflects prudent safety management required to protect personnel and property. This Guideline provides information and procedures to inspect ropes and to establish criteria for evaluation.

This document provides inspectors with help to make reasonable decisions regarding retirement or continued use, including repairing or downgrading .

The user is responsible to establish a program for inspection and retirement that considers conditions of use and degree of risk for the particular application. A program should include:

Assignment of supervisory responsibility. The user should assign an individual responsible for establishing the program, for training and qualifying inspectors and preserving records.

- Written procedures (LMP)
- Training
- Record keeping
- Establishment of retirement criteria for each application.
- Schedule for inspections.

The inspection should be carried out by a qualified person refers to someone who, by extensive knowledge, training, and experience, has demonstrated the ability to solve or resolve problems related to the use of mooring Lines their continual usage and their retirement.

The Inspection should be carried out to asses the effects of Internal and external abrasion, cuts UV degradation, dynamic or shock loading , exposure to temperature and chemicals etc.

### **Method of inspection**

The rope should be laid on the deck where larger lengths at a time is visible. The inspecting person should inspect meter by meter length of rope by holding in hands and rotating the same so as to see the rope all around..

The area for consideration should be suitably marked by inserting a marker yarn so that the affected area can be critically reviewed for re working, splicing or for discarding the rope.

### Abrasion external

Let us see what US Naval Ships Technical Manual Chapter 582 Mooring and Towing “ says on the fuzz formation

**Abrasion. 582-4.4.3 MOORING LINE ABRASION. Abrasion occurs when the rope contacts and passes across rough surfaces. The outer filaments of the rope break to form a fuzzy surface appearance and texture. This fuzzy surface forms a protective cushion and shields the fibres underneath. This, in turn, tends to help retard further abrasion and damage to the sub-surface fibres. With very rough surfaces excessive abrasion and cutting will take place and line strength will be lost. Always use chafing gear where the line passes through chocks and in the eye of the line.**

It is very important to know whether the abrasion is normal and there is no loss of yarns by sever cuts in the strand resulting in the drop in the retained strength of rope. If reasonable amount of yarn cuts to the extent of 10% then the rope should be retired. Without hesitation.

Normal Abrasion

Excessive abrasion

Internal Abrasion :- due to cyclic loading the yarns in side the rope are constantly rubbing on each other and a powder formation takes place which also can create a drop in strength and should be assessed every time at periodic inspection.

### **UV Degradation**

Due to continues exposure to sun light rope external surfaces Start showing powder formation which are the signs of Degradation of rope due to effect of Ultra violet rays. Normally rope should be protected from un necessary exposure to sun light by covering the same when not in use. A simple cover by tarpaulin also can help in reducing the UV effect.

### **Different diameters**

While inspecting the rope if there is sudden change in the diameter of the rope as well as if the rope has become excessive hard in some areas then it is due to sudden shock loads in some areas and can reduce the breaking strength of the rope in the particular area. The rope should be re spliced after cutting the damaged area if otherwise found fit for the use.

### **Glazing Marks and localized fusing**

Due to constant rubbing on the deck equipment the rope gets heated locally and is evident by the localized fusing of the yarns or excessive glazing of the rope surface in the affected area. If the amount of the fusing is more it is recommended either re splicing of the rope or retiring of the rope.

### **Chemical attack**

If any discoloration has taken place it may be due to exposure of the rope to certain hazardous chemicals and if it in may more areas suitable decision should be taken for the necessary action.

### **Retirement Criterion**

The competent person should asses the extent of damage to the rope and conservatively decide about repair, down grading and finally discarding the Hawser.

# 03

## RETIREMENT

AFTER INSPECTION THE REVIEW OF THE MARKED AREAS SHOULD BE DONE

Following check list should be used to take a decision of the retirement of the rope.

For your guidance, we have included an inspection checklist, as below.

### INSPECTION CHECK LIST

<b>A</b>	<b>CONDITION</b>	<b>DISCARD</b>
01	Rope diameter reduced by abrasion	✓
02	3 strand construction by 10%	✓
03	8 strand construction by <b>25%</b>	✓
04	12 strand construction by <b>25%</b>	✓
05	Double Braid construction Sheath by 50%	✓
06	Circular Braid construction sheath by 100%	✓
<b>B CUT STRANDS</b>		
01	3 strand one or more adjacent strand cuts	✓
02	8 strand one or more adjacent strand cuts	✓
03	12 strand two or more adjacent strand cuts	✓
04	Double Braid three or more adjacent strands	✓
05	Any visible damage to core element	✓
<b>C INCONSISTANT DIAMETER</b>		
01	Localized reduction in diameter	✓
02	Localized increases in diameter	✓
<b>D INCONSISTANT FLEXABILITY</b>		
01	Localized areas of stiffness	✓
<b>E HEAT FUSION</b>		
01	Extended areas of heat fusion	✓
<b>F DISCOLOURATION</b>		
01	Areas caused	✓

## **Introduction**

Manufacturer of high quality cordage for various applications, KOHINOOR ROPES is a name recognized in domestic & international markets. Operating since 1985, we have a long record for product excellence, strong R & D and diligent quality control.

We are supported by an experienced design & product development team. As an ISO 9001:2015 certified company, we have a well established quality management system functioning at every level. As a company, we strives for continual improvement to ensure customer delight at all times.



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