

General user manual for D12 Rope, made with Dyneema®

1. Rope selection: *We advise our customers to consult us to determine the rope specifications.*

Make sure the fiber properties and rope construction are suitable for your application. Before choosing the rope, it is necessary to determine the requirements regarding:

- Safe Working Load and design factor / safety factor
- Tension tension fatigue
- Bending fatigue
- Wear and tear
- UV resistance
- Terminations and end connections



2. General rope handling and care:

At all times when handling D12 ropes avoid likely causes of damage:

- Mechanical abrasion and cutting (rough surfaces, sharp edges, dirt, etc.)
- High temperatures (welding, weld splash, torches, etc.)
- Chemicals
- Avoidable prolonged exposure to direct sunlight

Packaging material should be removed without cutting or damaging the rope.

Reels weighing more than 30 kg must be lifted using a special lifting arrangement for reels. Reels must not be rolled on the floor when loaded with rope.

When empty, reels should not be rolled unless absolutely essential and only on flat clear ground where the rolling can be controlled.

For **storage**, please see our Storage recommendations.

3. Installation & general use

- **Uncoiling:** When removing a rope from a coil, start with the end from the inside. The rope should run out counter-clockwise. If the rope is pulled out clockwise, kinks will occur. If that happens, re-place the length of rope back into the coil, turn the coil over and pull from the centre again. Now the rope should run out counter-clockwise and thus kink-free.

An even better way of uncoiling is by using a turntable. The rope can now be uncoiled from the outside end, as shown in Figure a).

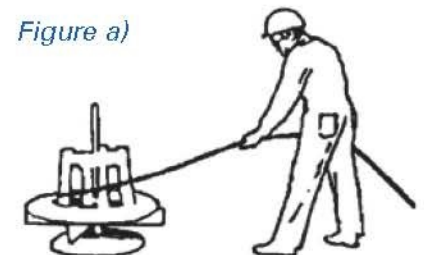


Figure b)

A short length of rope can also be rolled out over the ground as shown in Figure b).

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3. Installation & general use (cont.)

- **Temperature resistance:** The melting temperature of Dyneema is $\pm 150^{\circ}\text{C}$, although, under prolonged exposure, the mechanical properties start to deteriorate above 80°C . It is important to keep a D12 rope away from any heat source like an open fire, exhaust pipes, welding, etc. Do not store these ropes in the vicinity of a boiler or heater or against bulkheads or on decks which may reach high temperatures.
- **Lifetime:** The lifetime of a rope is strongly influenced by its construction, the environment it is used in and the type of application. It is recommended to keep a log of the working life and plan inspections depending on the use. See our **Inspection criteria**.

References:

- VBG Storage Recommendations
- VBG Drum winch instruction
- VBG Inspection criteria
- VBG Repairing a cover



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3. Installation & general use (cont.)

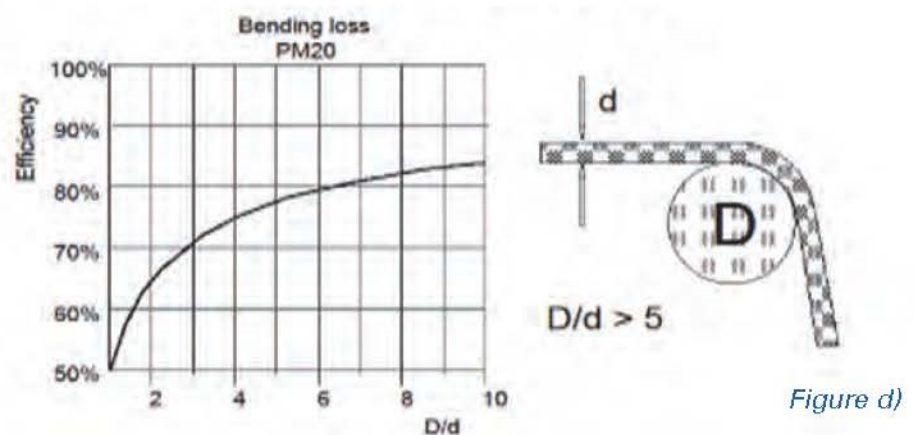
- Influence of **bending radius** on break strength: The break strength will be reduced when bent over a fixed pin, bollard, etc. According to the HSE PM20 / IMCA M 179 rule the bend loss can be calculated using the following formula:

$$E_b \approx 1 - 0.5 / \sqrt{(D/d)}$$

Where E_b stands for the break strength efficiency of the sling/grommet/rope as function of the D/d ratio (D = diameter pin, d = diameter rope). Figure d) shows the line calculated with this formula, being the minimum value to pass this guidance note.

D12 ropes with Dyneema® generally show equal or higher efficiencies than the formula. Also, there are D12 types available that have a bending optimized finish.

A minimum D/d ratio of 2 is advised. Otherwise the pin over which the rope is bent may bend or break, or cut through the rope.

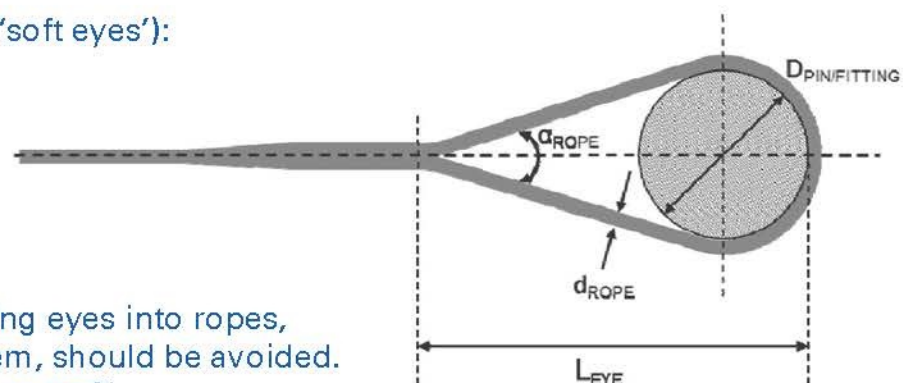


- General rules for **Spliced eyes** ('soft eyes'):

$$D_{\text{PIN/BOLLARD/FITTING}} / d_{\text{ROPE}} \geq 2$$

$$L_{\text{EYE}} / D_{\text{PIN/BOLLARD/FITTING}} \geq 5$$

$$\alpha_{\text{ROPE}} \leq 30^\circ$$



- No knots:** The practice of knotting eyes into ropes, or knotting ropes to shorten them, should be avoided. Knots may weaken ropes by up to 75 %.
- Abrasion resistance:** D12, with or without protective cover, has not been designed to withstand excessive external abrasion. Thus it is recommended to use smooth, clean fairleads, bitts, etc. If abrasion does occur initially the rope or the cover becomes fuzzy and if measures are not taken immediately then fibers will fail. This exposes the inner cores and they, in turn, will also start to abrade. Regular inspection is recommended. See our **Inspection criteria**.

3. Installation & general use (cont.)

- **Unreeling:** When rope is removed from a reel, the reel itself should be free to rotate. This can easily be accomplished by passing a pipe through the reel centre, as shown in Figure c).

Never remove rope from a reel lying on its side.

Avoid side contact between the rope and the flanges of the reel or winch when spooling. Keep the fleet angle to a minimum.

Figure c)



- **Drum winch:** For installing D12 on a drum, please see our drum winch instruction.
- **Avoid twisting** the rope. Crossover points in the braid of the rope, or a marker pattern if present, can help to determine the level of twist.
- Check all potential **contact surfaces** to ensure there are no areas that may damage the rope. All rolling surfaces should be free-turning and smooth.
- If a **cover** of the rope is damaged during installation, it should be repaired as per our instructions prior to proceeding with the installation (See our instruction *repairing a cover*).

- **Safe Working Load:** When no SWL is specified for HMPE ropes, it is recommended to use a Safe Working Load similar to that of steel wire. Tabel 1) shows a few examples of Safety Factors.

Table 1)

Application	Safety Factor
Lifting (gen.)	5 - 7 (EU)
Ship mooring	3 - 4
Harbour towing	2.5 - 3
Emergency towing	2
Coupling system	1.5

- **Bending fatigue:** D12 ropes should be used with a sheave/rope diameter greater than 10/1. The grooves in the sheave should have a diameter 10-15% larger than the rope diameter. All contact surfaces should be smooth and clean. The groove shape should be in the form of a "U". Standard wire rope "V" shaped grooves should not be used. Also, the sheave should be able to rotate easily.

These measures will help ensure a very long service life which, at normal working loads, will be at least as long as that of wire ropes.

