



Technical bulletin bending losses

Explanation of bending losses with the use of a doubled sling or -grommet

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1 Introduction

Everybody at United Offshore Services strives for high quality and durability of products. This is reflected in our production processes and our handling methods but we strive to extend this even further. Through consultancy and training programs we do our utmost to instruct users on proper treatment of their lifting equipment. Proper handling and usage can significantly increase the efficiency of operations, the safety for workers and the lifespan of the equipment. This technical bulletin is part of our effort into providing proper usage instructions.

The subject of this bulletin is the reduction of the Working Load Limit (WLL) caused by bending a wire rope over a lift point or crane hook. More specifically, the bending loss of a grommet or sling that is used doubled. The loss factor is a well-known phenomenon and has been for decades. Significant research into the subject has been conducted in the 1980's and 1990's by several parties, amongst which: Drahtseile Gebrüder Henschel GmbH, United Ropes, the German governments' Health and Safety department and the United States army corps of engineers. Such studies have served as a source for guidance notes concerning the use of steel cables. A contemporary example of such a guideline is the IMCA M179. IMCA stands for International Marine Contractors Association. This association publishes technical guidelines for maritime and offshore operations. The M 179 is intended to replace a guidance note from the UK Health & Safety Executive namely the PM (Plant

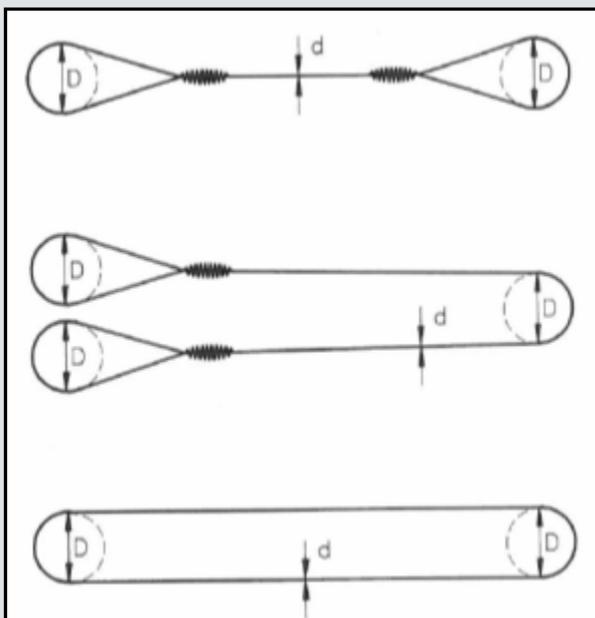


Figure 1: single used sling, double used sling and the use of a grommet (which can also be doubled).

and Machinery) 20. The M 179 provides guidance on good practice in the use of cable-laid slings and grommets. United Offshore Services is part of the revision group of the IMCA and complies with the guidance notes. The guidance note concerning bending loss (note M 179 5.4) is used in this technical bulletin, along with results from the earlier named studies. The slings and grommet usages that are subject in this bulletin are represented in figure 1.

2 Bending losses calculation IMCA M179

This chapter will describe the calculation of the bending factor as mentioned in the IMCA M179 document. The document concerns cable-laid slings but the same applies to single-laid slings.

When a cable-laid grommet or when a sling (cable-laid or single-laid) is utilised as a doubled sling with the sling body bent over a lift point or crane hook, the WLL of the sling shall be reduced by a bending factor (also defined as E_B). This bending factor will also be applicable for the bend of a sling eye. This will often not be governing as the sling load will be divided over the two sides of the eye. The bending factor shall be calculated according to the formula:

$$E_b = 1 - \frac{0,5}{\sqrt{D/d}}$$

Where:

D = the minimum diameter over which the sling body is bent when doubled

d = the sling diameter

Note 1: The efficiency of the termination (the end of a sling) defined as K_T and E_B are not additive. If E_B is lower than K_T , E_B must be used instead of K_T when defining the Calculated Sling Breaking Load (CSBL) for single- or cable-laid slings.

Note 2: If the sling eye is bent over a diameter less than d then de-rating in accordance with the above formula is recommended.

Note 3: **Under no circumstances** should the sling body be bent over any surface smaller than the sling diameter.

Please beware of the distinction between the terms sling eye and sling body. Bending a sling eye or body over a pin diameter which is too small does not only diminish the CSBL but it can also cause permanent damage or deformation to the sling.

3 Disclaimer

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