BOOK 3

HANDBOOK FOR SLINGERS

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Section 5-4 Regulations in regard to safety signs and signals

Use of safety signs and signals shall be planned in such a manner that

a) Other signs or other sources of light and sound are placed in such a manner that they do not impair the visibility or audibility of signs and signals covered by this regulation.

m) If the **hearing or eyesight** of the employee in question **is limited**, for instance by use of **PPE,** countermeasures to **supplement or replace** the signs and signals are required.

Section 5-7 Safety signs to be used

Examples of safety signs from the various groups:

1. **No entry signs**
2. **Danger signs**
3. **Mandatory signs**
4. **Emergency signs**
5. **Fire hazard prevention signs**

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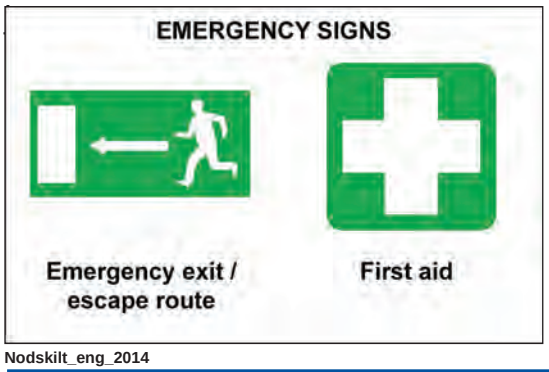
Fareskilt_eng_2014



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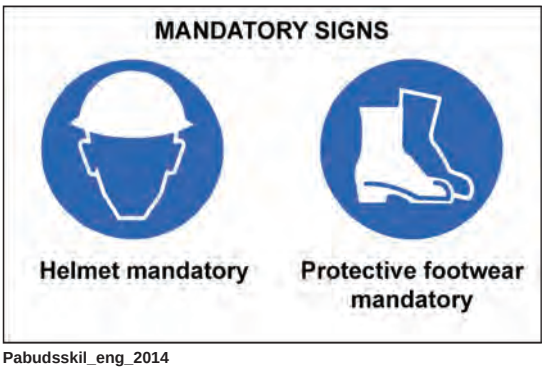

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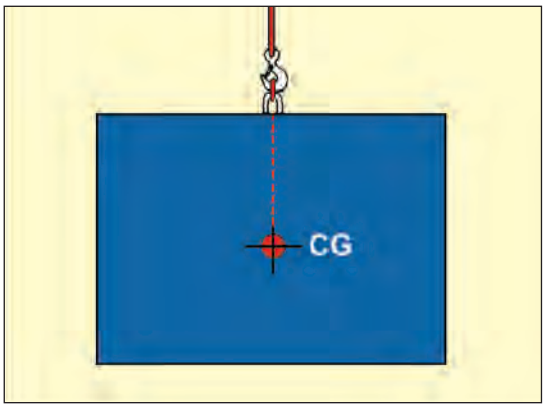

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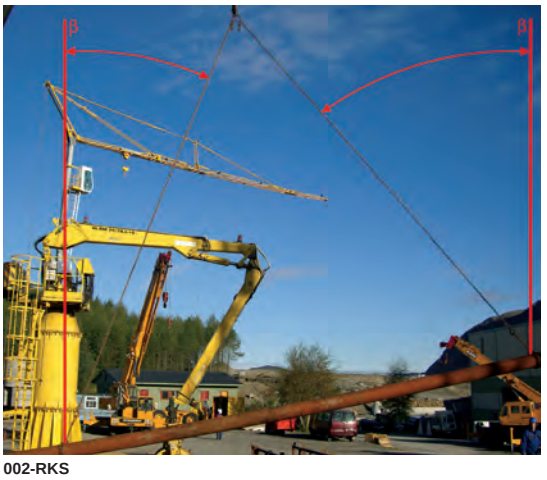

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6. Slinging, center of gravity, working angles and lifting tables

A significant number of all lifting related accidents are caused by various mistakes made in regard to the lifting gear.

Mistakes as selecting inappropriate lifting gear, lack of information on weight of load, center of gravity and symmetry, lack of knowledge of which strains the lifting gears are subjected to at various angles have resulted in fatalities.

Correct choice of lifting gear depends on the following information:

1. Weight of load

The weight of the load must either be provided prior to the lifting operation or be calculated. Be aware the weight marked on objects to be lifted may not be correct.

2. Working angles

Working angle is the angle measured between an imaginary vertical line and a leg of multi-legged lifting gear. The angle is often noted as “beta-angle”.

3. Center of gravity (CG)

The center of gravity of the load will always be located somewhere along an imaginary vertical line below the hook. On some types of load the center of gravity is indicated directly on the load or packaging.

4. Symmetrical or asymmetrical lifting

When the load is slung so that two legs have the same working angle the lift is considered to be symmetrical.

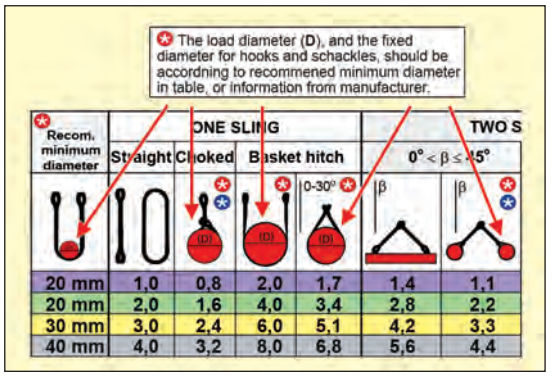
If the load is slung so that the working angles are unequal the lift is considered asymmetrical and the legs will suffer unequal strain.

5. Slinging/attachment points

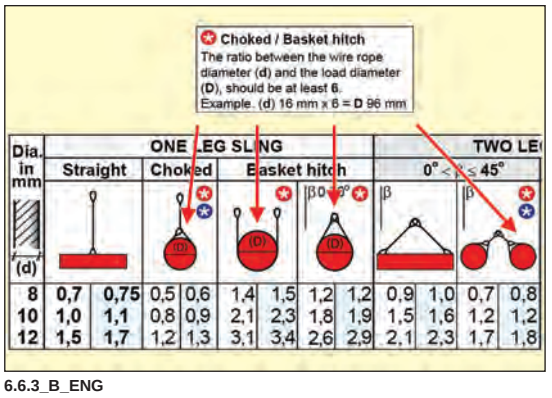
At the points where the load is to be slung one must always assess if the lifting gear might be damaged by sharp edges, friction and heat.

6. Recommended minimum bending diameter

When wrapping lifting gears of chain, fiber and wire rope around a load as for instance tubulars or axels on must consider the minimum recommended bending diameter for the lifting gear.



6.6.3_A_ENG



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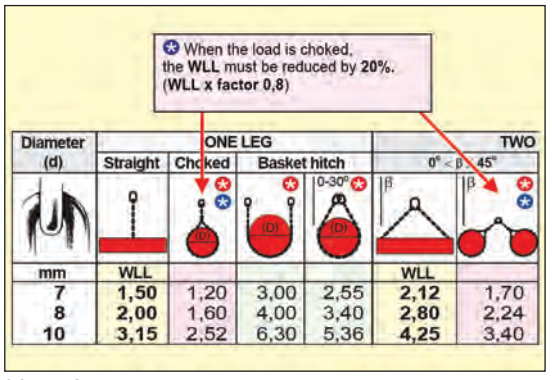

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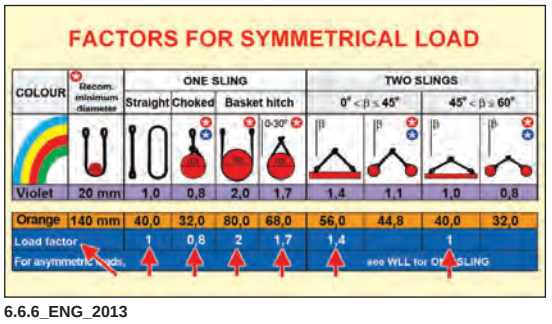

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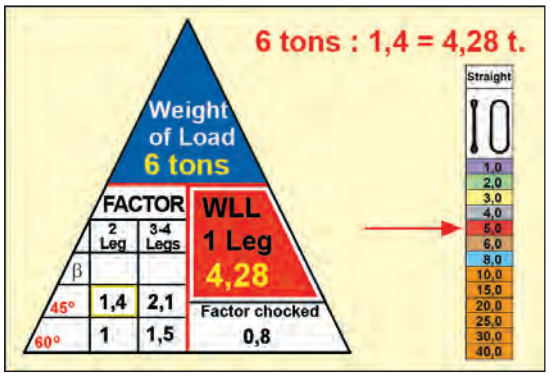


4.3.1 Beregning av kap._eng

6.10 Diameter of load (D)

When a lifting gear is placed around a load or at a slinging point with a «small diameter» the lifting capacity must be reduced.

Fiber slings

In the excerpt of the lifting table for fiber slings there is a separate column showing “Recommended minimum diameter” in mm, without reduction of WLL, for different slings.

Wire rope slings and lifting gears of chain

For wire rope slings and gears of chain one can compare the diameter of the wire rope and chain (d) with the diameter of the load/slinging point (D).

The table for **wire rope slings** states that the D is to be at least **6** x d

For **lifting gear of chain** the relation is required to be at least **9** x d.

6.10.1 Choked load

When lifting gears of chain, fiber or wire rope are used for choking the lifting capacity is to be reduced by 20%.

In the columns for choked load in the lifting tables the values have been reduced by 20%. (WLL without choking has been multiplied by choking factor 0,8)

6.11 Factors for symmetrical load

In the bottom section of the lifting tables there is a blue row stating the various factors used when calculating the capacities stated in the table.

As an alternative to reading the values directly in the table on can calculate the capacity for number of legs, angles and slinging method by multiplying WLL for **one straight leg** by the corresponding factor.

Example: Green sling 2 tons x factor 1,4 = Lifting capacity 2,8 tons for two legs 0° - 45°

Conversely one can calculate required capacity by starting with weight of load and dividing by factor for angle in question.

Example: Weight of load 6 tons / factor 1,4 = 4,28 tons
Each sling must at least have a WLL of 4,28 tons, and the closest higher WLL is 5 tons (red)

01 ABB_fiber

03 ABB_fiber

04 ABB_fiber

06 ABB_fiber

7.9.3 Shortening / balancing METHOD A.

The picture shows a shortening technique which is suitable when the need arises for adjustment of the length of the sling.

This method can not shorten the sling more than half the original length of the sling.

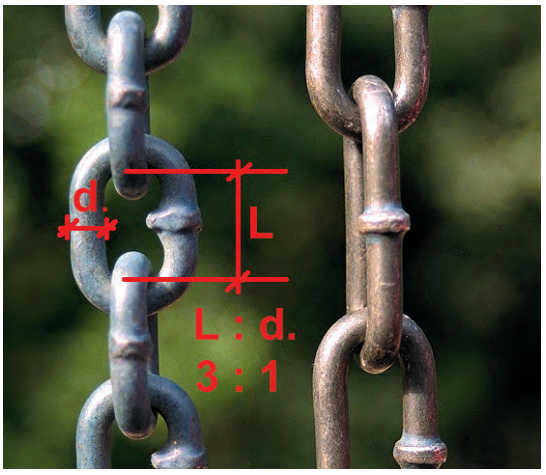
This shortening is suitable for round slings with WLL up to 5 tons.

NOTE!
WLL is reduced by 20% when shortening

1. The slings are brought together as shown in the picture.

2. The length of the shortening, thus the effective length of the sling, is regulated by pulling the loops until the sling has the required length.

07 ABB_fiber



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8.1.5 Length of links

In general two different types of chain are available: chains with short links and chains with long links.

Short linked chain is made of links where the inside length of the link is 3 x diameter of the link.

Long linked chain is made of links where the inside length of the link is 4 x diameter of the link, or larger.

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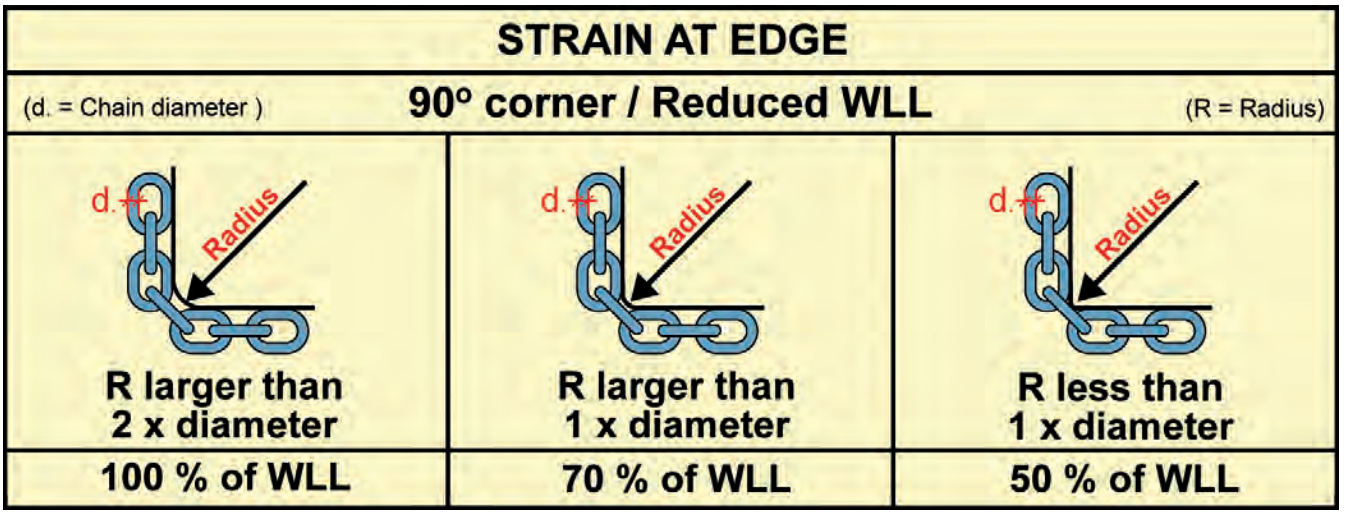
8.1.6 Only short linked chain for lifting!

Only short linked chains are allowed used in lifting gears. Long linked chain is very prone to damage and deformation when used.

A short linked chain may be applied **around a 90° edge** without damaging the chain, but the contact radius **should be** greater than **2 x the chain diameter** when calculating full loading capacity of the chain.
(See illustration below.)



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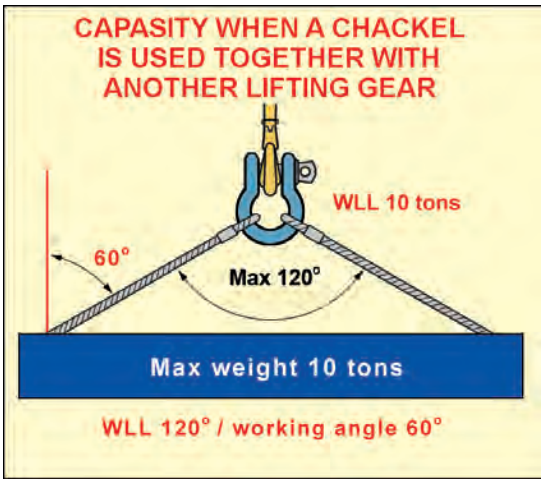
8.1.7 Chain with long links

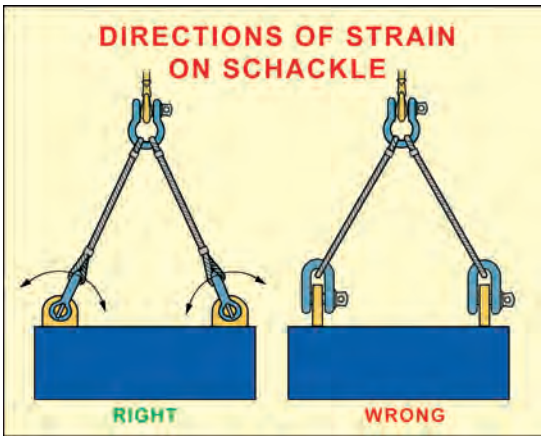
NOTE!

Chains with long links are not to be used in lifting gears!

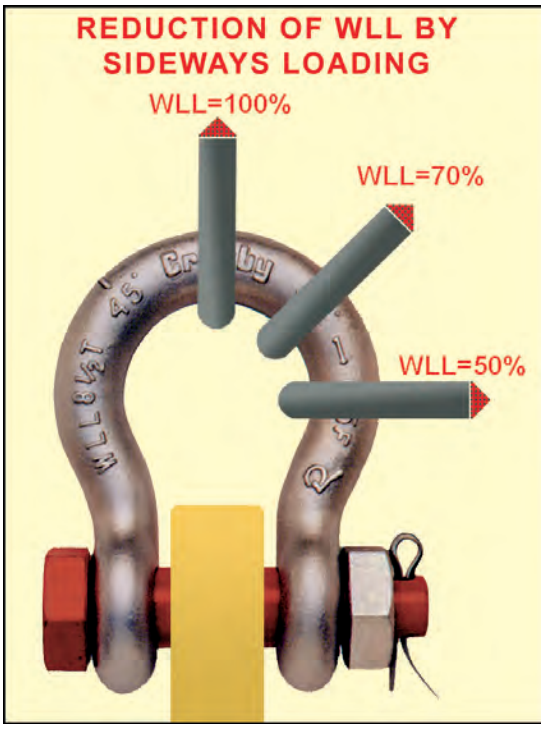
This because the links are easily deformed when the chain is applied around corners as shown in the picture.



10.4.1 Kapasitet på sjakler_ENG_2



10.4.1 Kapasitet på sjakler_ENG_1



10.4.1 Kapasitet på sjakler_ENG_3

12.4 Capacity of shackles / bolts

12.4.1 Capacity of shackles

Shackles are designed to be loaded at the bolt and at the bottom of the loop.

When several legs are used at angles a curved shackle should be used.

In general the WLL of the shackle is given for a top angle of the legs less than 120° (working angle less than **60°**)

Maximum working angle without reduction of WLL will in some cases vary from manufacturer to manufacturer, and it is important to use the shackle in accordance with the manual supplied by the manufacturer.

12.4.2 Directions of strain on shackle

The illustration shows correct and incorrect use of shackles in regard to direction of strain.

Varying working angles will subject the shackle to varying tensile strains, and it is important to take this in to consideration.

Lateral straining of shackles should be avoided, as this will reduce capacity and this practice can damage the connecting lug.

Lateral strain

In cases where lateral loading is unavoidable the following reductions of WLL are to be applied.

Angle 0° WLL = 100%
Angle 45° WLL = 70%
Angle 90° WLL = 50%

(Information supplied by the manufacturers Crosby and Van Beest)

12.4.3 Point loading of shackle bolt and loop

Point loading is to be avoided if possible, but when unavoidable the following guidelines may be followed.

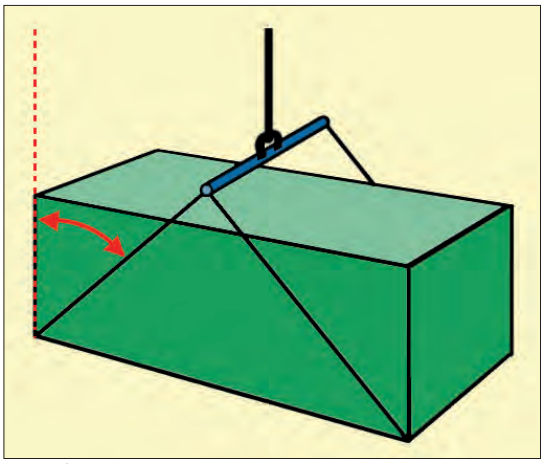
Shackle bolt:

Point loading of the shackle bolt can be accepted if the load is centred on the bolt.

An evenly loaded bolt over 80% of the shackle mouth is considered to be optimal.

Loop:

Components coupled to the loop should have the same, or larger, diameter as the loop.



12.10.8 Åk Containeråk_v2

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4. Lifting at bottom using slings and spreader frame

The illustration shows a container that can be lifted fully loaded, with spreader frame and slings attached to the bottom of the container using lift fixtures.

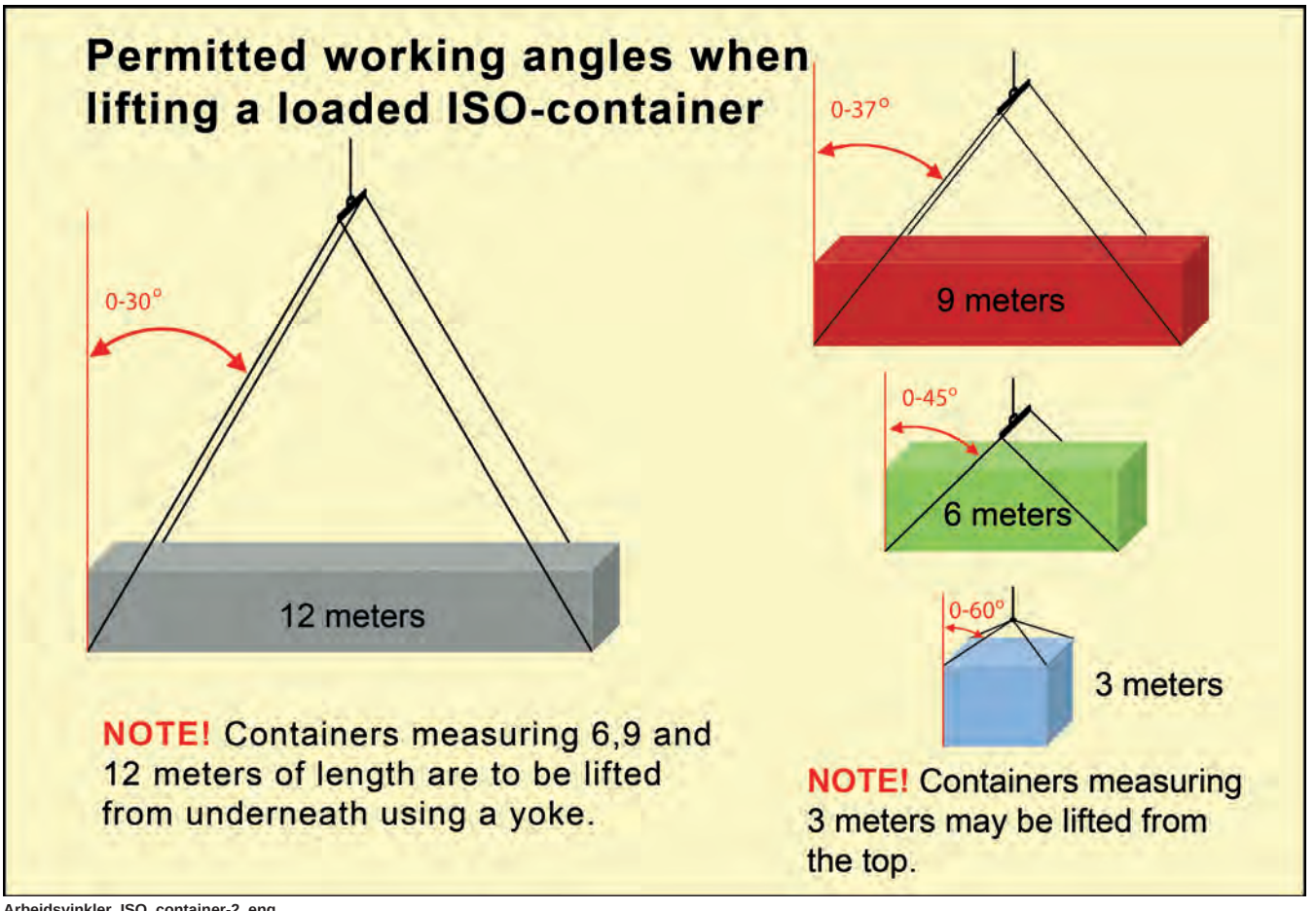
NOTE!

Working angle for slings

The following working angles are given for different lengths of ISO containers in accordance with the standard **NS-ISO 3874.**

Working angles for loaded containers	
Length of container	**Working angle for slings**
12 meters (40”)	**0 - 30°**
9 meters (30”)	**0 - 37°**
6 meters (20”)	**0 - 45°**
3 meters (10”)	**0 - 60°**

NOTE! A wide range of containers, lifting gears and lifting tools are available in the market, and therefore it is important that the supplied manuals and lifting instructions are followed.



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