DELTA SAFETY TRAINING

DELTA heeft als doel om “veilig werken” voor iedereen bereikbaar te maken door trainingen te ontwikkelen en te verzorgen op ieder niveau.

DELTA aims to make “safe working” practices accessible to all, by developing and providing training packages at every level.

Praktijkgerichte opleidingen voor operationele medewerkers en hun leidinggevenden

Practical training for operational personnel and their immediate supervisors

Rigging & Slinging

Rev 1 Jun 2019

1 Introduction

When on an offshore mining installation crane operations are undertaken, we have to make sure that it will be done in a safe way, therefore the people and machines involved with these operations are trained and in a good condition.
Material handling activities have been a type of work involved within most of the industrial operation of any scale.

The activity introduces risks and hazards that are possible to eliminate under a proper sequence of operation, combined with sufficient technical knowledge and competences of involved personnel.

A pre-requisite for users of this publication is the accomplishment of Rigging and Slinging. This publication aims to help banksman during the learning process of a proper material handling operation (specifically in lifting activities) requirements, and as well as comprehending the safe use of riggings. A proper learning result shall cover the basic needed competencies needed for a competent banksman in an off-shore material handling operation.

Banksman in action

Index

2 Laws and regulations.

The workers in the offshore and on-board of ships about working conditions under the occupational health and Safety Law from 1 January 2007. In the Working Conditions Act of 01-01-2007 article 7 and the working conditions regulation, we find the principal regulations for the crane driver.
In the Working Conditions Act issues regarding safety, health and welfare regulated. The aim of this law is, to provide legislative provisions in which the safety of the employee and the related health has to be controlled, which also looks at dealing with the General environment. However, the Working Conditions Act is also a special law, it is a so-called "framework law" which means that there are little specific actions are described. The Working Conditions Act refers more to other documents, as for example to the working conditions Decree, and health & safety policy, etc.
This makes it possible to react stay up to date by reacting technological developments because decisions and regulations easier and quicker to adapt than a law.
In addition to the Working Conditions Act, we also have to do with, for example, the commodities Act Decree machines in which the (Safety) requirements to which machines, tools etc. Also, we find in the commodities Act Decree machines takes place the legislation the verification requirements of machines and tools. However, in order to elaborate extensively on this issue in this short training, we must keep it short.

2.1 Responsibilities

In the Working Condition Act rights and obligations for both employees and employers are stated. The Working Conditions Act assumes that both the employer and the employee are responsible for good working conditions. This is a joint responsibility to ensure good working conditions in concert. The Working Condition Act states that, within reason, primarily the employer is responsible for the prevention of incidents and accidents. Thus laying down (provding) a legal and clear base for the prevention of incidents and accidents for all parties involved.

Employer: anyone who let's do another labour under his authority.

Employee: anyone under the authority works. The occupational health and Safety Ordinance no difference whether you get paid for that work.

Nowadays, there are more legal entities possible, for example, the well-known form of a self-employed without staff also known as free-lancer. Often there is some misunderstanding regarding what this person´s legal status is with regards to liability and accountability.

2.2 Responsibilities of employers

In short, Health and Safety regulatons force the employer to take measures aimed at the safety and health of its staff. That means he:

- performs a risk analysis and adresses the posible riks;
- provides his staf with safe and well-maintained machines;
- trains and instructs his staff for the work to be carried out;
- to provides all the necessary tools and personal protective equipment its employees and explains what risks are involved and how to mitigate them.
- supervises and checks if instructions are lived up to and adhered to..

2.3 Responsibilities of employees

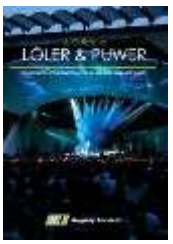
Employees also have responsibilities. From an employee, it is to be expected that he will work with caution and care. Not only cause an incident for themselves, but also to prevent danger to others or to avoid unnecessary damage to someone else's property. This means that employees:

- should use machine and appield protections in the proper way
- have to use PPE provided for their tasks
- to collaborate on instruction and information
- have to follow safety instructions and rules of conduct
- to report dangerous work situations.

2.4 LOLER and PUWER

In addition to the laws of the Netherlands, you can also face foreign legislation. One of the most important laws should be considered is English law. LOLER 1998 (Lifting Operations and Lifting Equipment Regulations) is considered the governing standard for the maritime and offshore sector. Besides that we have to follow up on the PUWER (Provision and Use of Working Equipment Regulation) and the L113 LOLER – ACOP (Approved Code of Practice)

What is LOLER 1998
The Regulations aim to reduce risks to people’s health and safety from lifting equipment provided for use at work. In addition to the requirements of LOLER, lifting equipment is also subject to the requirements of the Provision and Use of Work Equipment Regulations 1998 (PUWER).



What does LOLER do?

Generally, the Regulations require that lifting equipment provided for use at work is:

- strong and stable enough for the use and marked to indicate safe working loads;
- positioned and installed to minimize any risks;
- used safely, i.e. the work is planned, organized and performed by competent people;
- subject to ongoing thorough examination and, where appropriate, inspection by competent people.

What equipment is covered by the LOLER Regulations?

The definition also includes lifting accessories such as chains, slings, eyebolts etc.
If you allow employees to provide their own lifting equipment, then this too is covered by the Regulations.

The actual depth and reach of these regulations is far bigger than we can describe here. However, one thing is clear when we compare Dutch and English laws, the same goals are being pursued and mitigated.

2.5 Definitions

As part of ISO 12480, the definitions are given in ISO 4306-1, ISO 4306-2 and ISO 4306-3 and the following definitions, apply

Appointed person: One competent person who has overall control of the crane operation and acts on behalf of the management of the organization requiring the load to be moved (the employing organization).

Competent person: Person who has the necessary practical and theoretical knowledge and the necessary experience of the crane and equipment used in the hoisting operation to carry out the function satisfactorily.

Crane driver (Operator): Person who is operating the crane for positioning loads and erecting or dismantling the crane.

Lifting supervisor: Persons having sufficient experience and training to lead hoisting operations in a professional manner.

Banksman: Person who can connect ore disconnected the load on the crane hook, communicate with the crane operator and trained for his job.

Load handler: Person who connect or disconnect the load on the crane hook, controlled by the Banksman.

Employing organization; Employer: Person or organization requiring the lifting operation to take place.

Rated capacity: Maximum permitted load that can be lifted by the crane under conditions specified by the manufacturer.

In service: Condition in which the crane is handling loads up to the rated capacity in permissible wind speed and in other conditions as specified by standards and/or the manufacturer.

Out-of-service: Condition in which the crane is out of use, without a load on the load-lifting attachment and in conditions as specified by standards and/or the manufacturer.

Centre of gravity: Point at which the total mass of a body may be regarded as being concentrated, or about which the parts of a body exactly balance each other.

Use: Any operation with or on the crane, e.g. transportation, erection, dismantling, maintenance, movement of the load.

User organization: user: Competent person or organization which has direct control over the lifting operation

(ISO 12480-1)

3 Safety

3.1 Risk assessment

To prevent accidents and damage, as well as near misses, it is important that an assessment is made of the risks involved in a lifting task or maintenance activity.

The risks of lifting operations may be categorised as follows:

- the work itself:
- the location of work
- the complexity of the work
- the circumstances of the work.

Preparation is necessary before any task is commenced. The elements of preparation are:

- technical preparation or lifting plan
- practical preparation.

The following questions should be answered in the technical preparation:

- what equipment is required?
- what tools are required?
- what information is required?

The following questions should be answered in the practical preparation:

- is a satisfactory working method to be used?
- is this the safest working method?
- how much time is required to carry out this work in a safe and efficient manner?

This approach will produce a well thought out workable situation taking account of:

- safety
- health and welfare
- the environment
- efficiency.

Setting down procedures for different activities is a useful aid in ensuring that these points are addressed.

3.2 Risk assessment in practice

To assess risks, you should ask yourself the following questions before starting work:

- are activities involved which could result in injuries, fire and explosion or damage?
- are the applicable rules, stipulations and protective measures understood and in place?
- is the correct personal protective equipment available and is it being used properly?

So, what does this mean in practice?

Before beginning any lifting task, you should assess the following matters:

- What is the condition of the crane and lifting equipment? Is it still safe to use them? Or is it a question of replacement?
- What kind of material do we speak off which has to be lifted? Is it contained on the ship? Or do you have to lift the material off or onto a provisioning vessel?
- Are there dangerous goods among the cargo?
- What is the deck loading, i.e. the mass per m²?
- What are the weather conditions? Is it only the wind that needs to be considered (because the lift will take place entirely on the ship), or is the sea state factor to be included because something needs to be lifted off or onto a provisioning vessel?
- How many load handlers will be required and who will control them?
- What equipment is required to lift the load in question?
- Is the operations leader (Supervisor) aware of the suitability of the lifting equipment and the methods of communication?
- Is the lift in full view and clearly visible to the crane operator(s)? Or is it partially performed outside the crane operator´s view? (a so called “blind” lift)

On the next page, you will find a document which will assist you in doing a safe hoisting job. This document is a standard risk inventory. It will guide you through the hoisting operation step-by-step. When you fill in the form properly, all risk factors should be addressed.

3.3 Lift plan

A provision of the European legislation gives the obligation to that prior to all lifting activities that will be implemented, plans should be defined and that risk assessments should be carried out, whereby an important improvement in terms of safety should be realized. The level of planning and risk assessment increases as the complexity of the hoisting and lifting activities increases. The same applies to the level of supervision.

All lifting operations include the same four process steps:

1. Act
2. Plan
3. Do
4. Check.

LIFTPLAN Part 1 (to be completed by the competent person)

Installation/ship/barge/other:	Location (main deck, back deck, quayside etc.):	
Permit to work no:	Risk assessment no:	Lift plan no.
The weight of the load, actual of assessed (delete if not applicable):		

Description of lifting operation.

Possible considerations (not exhaustive)

☐ **weight not verified**	☐ **lifting of chemicals**	☐ **conflicting tasks in the area**
☐ **high centre of gravity**	☐ **load on pallet requires securing**	☐ **dynamic factors involved**
☐ **stability of load**	☐ **sea fastening removed**	☐ **hazards to personnel in the area**
☐ **awkward size/shape/sharp edges**	☐ **restricted headroom or confined work area**	☐ **communication requirements**
☐ **no dedicated lifting points on the load**	☐ **no lifting point directly above the load**	☐ **adequate lighting and visibility**
☐ **no certified suspension points for the lifting equipment**	☐ **appropriate and correctly installed lifting equipment and accessories**	☐ **is the use of tag lines required? Then consider personnel positioning**

The route to be travelled and laydown area

If you can't answer the following, please fill in the step-by-step 'section	yes	no
1) **is the route and lay down area clear of obstructions?**	☐	☐
2) **is the laydown/landing area adequate in terms of size and load-bearing ability**	☐	☐
3) **is suitable packing available for protection of the load, lifting equipment, slings etc.**	☐	☐
4) **are barriers positioned to prevent access by unauthorised personnel?**	☐	☐
5) **have you confirmed that the laydown area is within the operation limits/radius of the equipment**	☐	☐
6) **are environmental conditions been considered with regards to the safety of the lifting operation?**	☐	☐
7) **will the lifting equipment operator be able to see the Banksman throughout the operation, or has another suitable, risk-assessed means of communication been checked and made available (e.g. radios)?**	☐	☐
7) **are there hazardous process plant or materials in the area?**	☐	☐

Step-by-step details of the lifting operation	Person responsible

LIFT PLAN part 2 (to be completed by the competent person) sketch with details regarding the rigging of the lifting equipment and lifting accessories
Lifting equipment and lifting accessories to be used. Specify type and SWL
Debrief and learning points. Did the lifting operation go as planned or are changes to the lift plan require changes?

Competent person	Print name:	Signature:	Date:

3.4 Cargo manifest

VRACHTBRIEF
MANIFEST

CLYDE PETROLEUM
Poolbase
Eendrachtstraat 55
1951 AZ
Velzen - Noord
Netherlands

Verzonden per / Dispatched by	ENERGY EXPRESS
Naar / To	SHOREBASE (Poolbase)
Datum / Date	September 23th 2000

448/96A

Receiver to sign and return copy

Ref No	Type	Omschrijving van goederen / Description of goods	Gewicht in KG / Weight in KG	Geadresseerde / Consigned to	Opmerkingen / Remarks	UN nummer
HAKU810542-1	8FT	FOOD CONTAINER	1200KG			
HAKU810356-3	8FT	FOOD CONTAINER	1200KG			
NO. 3107	10FT	HHOT BASKET Inhoud:	4000kg			
		1. Scrap metal grating				
		2. Radiator per 8221. for repair				
AMA 537	5FT	SHUTTLE CONTAINER Inhoud:	2500KG			
		1. Een doosje gereedschap, per 8198				
		2. Een doosje solar exhoust cover				
		3. Empty jerrycan of ryzolin				IMO-FREE
		4. Drum of glass				
		5. Drum kookvet				IMO-FREE
		6. Drum waste oil + rags			IMO-ITEM	UN 1650
		7. 5 empty drums of DTE light oil				IMO-FREE
		8. Empty drum of pegassus oil				IMO-FREE
		9. 3 empty drums of petrolite				IMO-FREE
NO. 327	8FT	TRASHSKIP	3000KG			
NO. 4		BOTTLE RACK	400KG			
NO. 590	8FT	METALSKIP	2000KG			
CV 85	8FT	TRASHSKIP	1500KG			
NO. 240	8FT	TRASHSKIP	3000KG			
KG 640	8FT	FOODCONTAINER	1200KG			

Before we can start unloading a supply boat it is use full to know what is coming our way. The “MatCo” (Material Coordinator Offshore) knows exactly what is coming to the platform, he can arrange a cargo manifest even before the boot arrives.
First we want to know the weights of the cargo, and secondly are there dangerous goods to unload or load.

Cargo (containers) whit a weight greater than 4,5 ton are recognizable by a heavy load sticker on the top sling of the container. This allows you to determine, together with the crane operator, the order of discharging or loading of the supply boat.

Notice

4 Utilisation factors

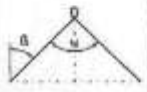
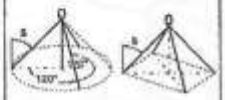
The permitted WLL of a chain, wire rope and textile sling assemblies always depend on:

- the method of attachment
- the number of parts
- the exterior angles
- the strength of each individual part
- symmetrical or asymmetrical distribution of the load.

The symmetrical or asymmetrical distribution of the load has consequences for the working load on the lifting gear. Where the load is distributed asymmetrically, a lower working load limit is assumed. Asymmetry in a load is revealed through the large differences in the angles of the legs from the perpendicular.
If the working load limit is calculated according to the tables, you should multiply the utilisation factor by the strength of the single parts.

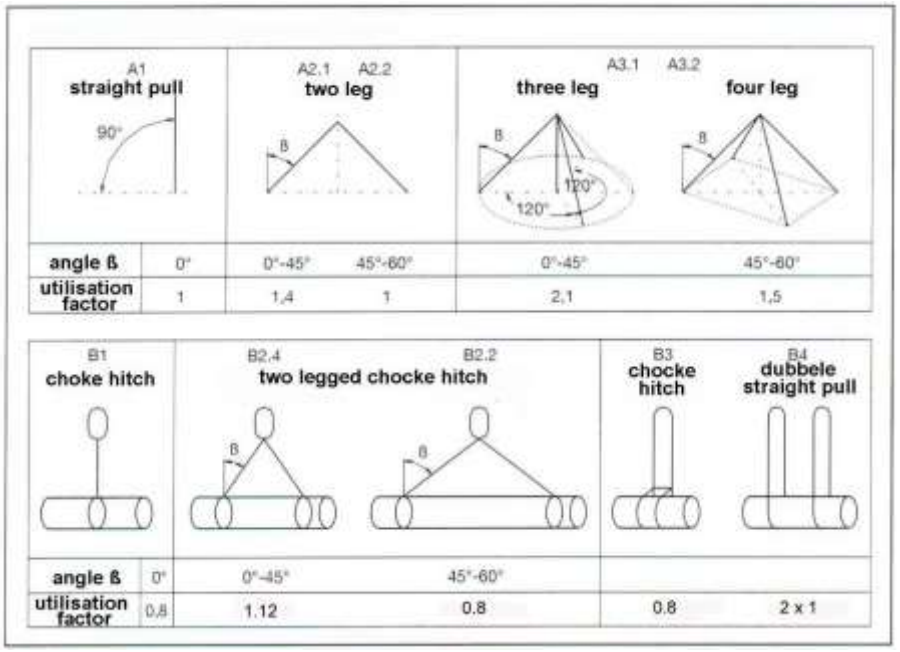
4.1 Symmetrical attachment

working load limit table for chains assemblies

manner of attachement	straight pull	choke hitch	choke hitch	two leg		three leg and four leg	
							
exterior angle (bu) β				0° - 45°	45° - 60°	0° - 45°	45° - 60°
included angle (bi) α				0° - 90°	90° - 120°	0° - 90°	90° - 120°
utilisation factor	1	0,8	0,8	1,4	1	2,1	1,5

angles β > 60° are forbidden

Working load limits applying to symmetrical load attachments.



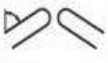
Working load limits applying to steel wire slings, symmetrically attached.

4.2 Utilisation factor textile webbing slings

Working load limit webbing slings

	straight pull	choke hitch	basket hitch parallel				
			till 7°	above 7° till 45°	above 45° till 60°	till 45°	above 45° till 60°
way of attaching							
utilisation factor	1,0	0,8	2,0	1,4	1,0	0,7	0,5

working load limit flat double slings + sling assemblies

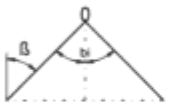
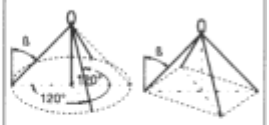
	exterior angle						
	direct till 45°	choke hitch till 45°	direct above 45° till 60°	choke hitch 45° till 60°	straight pull	two leg	four leg
way of attachement							
utilisation factor	1,4	1,12	1,0	0,8	1,0	0-45° = 1,4 45-60° = 1,0	0-45° = 2,1 45-60° = 1,5

External angles >60° are forbidden

Working load limits applying for use webbing slings

4.3 Asymmetrical attachment

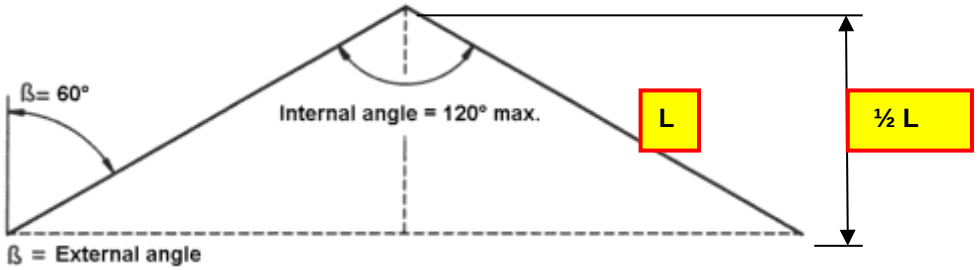
If a load is attached asymmetrically, meaning that the length of the legs are not equal, then we need to apply another working load table.

	straight pull	choke hitch	two leg		three or four leg	
Way of attaching						
External angle β	--	--	0° - 45°	45° - 60°	0° - 45°	45° - 60°
Internal angle α	n.v.t.	n.v.t.	0° - 90°	90° - 120°	0° - 90°	90° - 120°
Utilisation factor	1	0,8	1	1	1,5	1

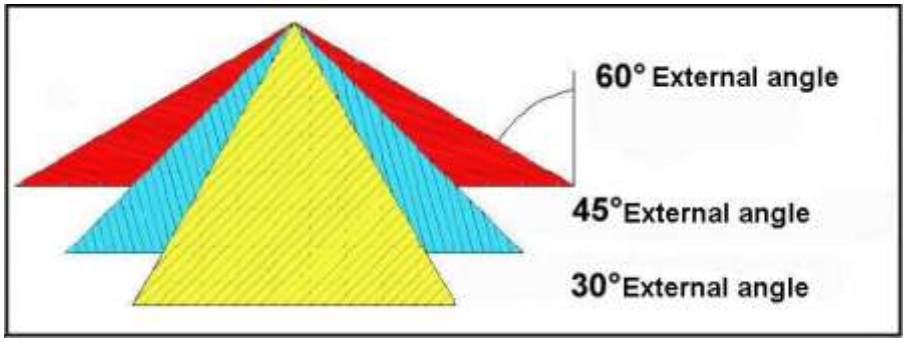
Working load limits applying to asymmetrical load attachments.

This table quickly reveals that the advantages of a favourable exterior angle (ß-angle) which may be applied for a symmetrical attachment, does not apply here.

4.4 Exterior angle of a sling assembly



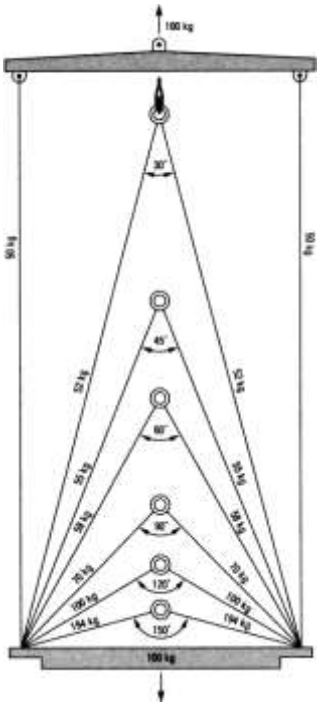
The height of a triangle with this included angle at the top is half of the hypotenuse.



Excluded angle	Length of the sling	Distance attaching points	Included angle
60°	1,7 x L	L	120°
45°	1,4 x L	L	90°
30°	1 x L	L	60°

A relationship between distance attaching points and the length of the slings

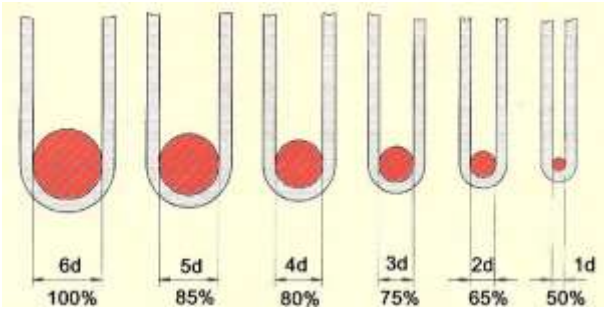
The exterior angle of a sling assembly may not exceed 60°. If the angle does exceed 60°, then the forces on the sling become unacceptably large. The illustration shows what happens as the exterior angle changes:



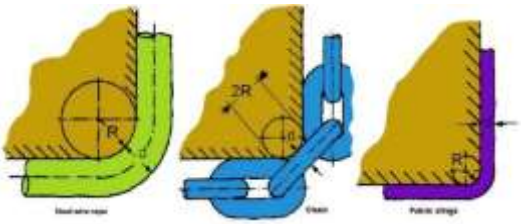
- consider a load of 100 kg: with two slings loaded purely in the vertical direction, the force on each sling is 50 kg
- with an included angle of 120°, the force in each leg has already increased to 100 kg.
- at 150°, the force has increased up to 194 kg.

This shows that the exterior angle told you actually more than the internal angle. In summary, we can say that when the internal angle 120° is, the exterior angle so must not exceed 60°.

4.5 Reduction factor at sharp edges



Reduction by steel wire ropes D over d.



Reduction by steel wire ropes, chain and webbing slings

A solution could be

5 Hoisting equipment

5.1 Definitions

5.1.1 Hoisting tools

Previously we have already talked about hoisting tools. This is the connection medium which is used between the lifting hook of the crane and the load which we want to move. Hoisting equipment may differ in material, we know for example chain work, steel rope wire slings, textile slings and special lifting equipment, we will address these subjects later. But first, we need to recognize several concepts, such as;

5.1.2 Breaking force

The force at which fracture occurs; do you call breaking force. There is a difference between the calculated breaking force and the actual breaking force. The calculated breaking force is the theoretical value at which the lifting tools are likely to succumb. The actual circumstances in day to day lifting activities that lead to possible failure of the lifting tools, we call the actual breaking force. The unit of the breaking force is N. (Newton)

5.1.3 Working coefficient

You should, of course, never overload lifting tools to a point where they break or fail. You should have a wide safety margin. The ratio between the breaking strength and the maximum working load limit of a lifting tool we call the usage factor or so called working coefficient. A working coefficient of 5 means, that the WLL does not exceed 1/5 of the breaking force. Because the WLL is a mass, it is expressed in Newton's.
How big the number of working coefficients is depending on the type of tool and sometimes the WLL.
The working coefficient of a chain and chain assemblies is in General: 4.
The working coefficient of steel wire ropes is in General: 5.
The working coefficient of a webbing sling is in General: 7.
The working coefficient of special hoisting tools is in General: 4.
In the next chapters, we will elaborate.

5.1.4 Working load limit

Lifting equipment has a certain working load limit (WLL). If you exceed the permissible load, there is a possibility that the lifting tool breaks. The maximum permissible load you may hoist you call working load limit. With the latter we mean the payload, the mass that remains after subtraction of the mass of the lifting tools, crane hook or the lifting cable. To measure the WLL you use kilograms (kg) or tonnes (t). In the maritime world the term SWL is also still in use, this means Safe Working Load and has the same meaning as WLL.

5.1.5 Proof load

The proof load (PL) is the force at which the lifting tools, are tested. Testing is required to ensure that a hoisting tool can do the job safely. The testing is done on a test stand or with a test weight. The unity of the PL is kN. The test load value is stated on the corresponding certificate of the appropriate lifting tools.

For fixed crane these values are as follows:

WLL < 20-ton test load	: 125% of the WLL
WLL 20 to 50 tons	: + 5-ton test load WLL
WLL > 50-ton test load	: 110%

(Source NEN-EN-2024 / NEN-EN-292-3, ILO and Lloyds Regulations)

5.1.6 Lifting equipment

All newly delivered lifting equipment must be outfitted with certain safety requirements according to the latest standards. In practice, safety must be guaranteed. Therefore, you must perform regular maintenance, inspections on lifting equipment. We discuss, in the following order:

- machinery directive
- statements and certificates
- user's manual
- identification and marks
- chain assemblies
- storage
- checks, inspection and testing
- maintenance
- lifting tools

5.1.7 Machinery directive

To promote the safety of machines, producers are required to meet certain minimum requirements. These requirements are stated in the machinery directive take effect from the 1st of January 1995. The most current version is called 2006/42/EC and has taken effect the 29st of December 2009. Machines that meet these guidelines get a CE mark. The letters CE stand for the French words "Conformité Européenne", which means European uniformity or European similarity.

CE-logo

The machinery directive states the requirements for safety, environmental and health protection. For example, the requirements for design, safety devices, checks, maintenance and operating manual. Lifting equipment is covered by the machinery directive and is equated with machines. They must, therefore, comply with the requirements of the machinery directive to machinery.

On lifting, tools must be a CE mark

5.1.8 Declaration and certificates

In the machinery directive mentions that for specific products an EC declaration of conformity is required. This statement shows to which guidelines and standards the product complies. There are several declarations of conformity, tailored to the category of machinery for which they were intended. For lifting tools, the IIA-declaration often addressed as CE Declaration.

Manufacturers often use their own certificates. This dates from the time that for each hoisting tool a certified certificate was required.

5.1.9 CE declaration

On the certificate is stated what type of EC declaration of conformity applies. For lifting tools this is also known as the 2A (IIA)-declaration. Furthermore, a product description and the working load limit. The certificates are often combined with test certificates. Certificates should always be present at the workplace during the work

KENHAR PRODUCTS LTD.

CE-CERTIFICATE OF CONFORMITY

The Declaration of conformity must be present whit lifting equipment.

5.1.10 Equipment certificate

endenburg b.v.
nijverheidsstraat 4-6 - 2802 al gouda
postbus 252 - 2800 ag gouda
t.+31 (0)182 51 55 44 - f.+31 (0)182 51 79 00
handelsregisternummer 29002362 gouda
btw nr nl001709864b01

endenburg b.v.
steelwire ropes
sales of lifting, hoisting and towing equipment

CERTIFICAAT HIJSMIDDELEN
CERTIFICATE HOISTING EQUIPMENT

Ondergetekende verklaart namens zijn firma, dat onderstaande gegevens juist zijn en dat het omschreven hijsmiddel of het hijsmiddel samenstel overeenkomt met de bepalingen van de EG Machine Richtlijn 98/37/EG Bijlage IIa. Het samenstellen, het onderzoek en de beproeving is uitgevoerd door een bevoegd persoon onder zijn toezicht, volgens de EKH-Werkvoorschriften.
The undersigned certifies on behalf of his company, that below particulars are correct and that the described hoisting equipment is according to the regulations of the EG Machinery Directive 98/37/EG Appendix IIa. The assembling, examination and test was carried out under his supervision by a competent person, according to the EKH-Code of practice.

Documentnummer: 372784 *Document number*	**Eigenaar:** Van Oord Ship Management BV Postbus 8574 3009 AN Rotterdam *Owner*
Opdrachtnummer: HQ189151 *Order number* 161975	**Referentie klant:** *Reference customer*
Registratie merk (label): EG3.09.1975.1 *Registration mark (label)*	**Naam:** 4-LEG CHAINSLING WLL 22.5 TON *Name*

Aantal *Count*	: 1
Afmetingen *Dimensions*	: DIA 22 MM WORKINGLENGTH 8.0 MTR ONE END TA 3/4 22MM WITH 4X G 22/8 OTHER END HOOKS EKN 22/8 WITH 4X G 22/8
Opmerkingen / veranderingen *Remarks / changes*	:
Materiaal *Material*	: GRADE 80
Warmtebehandeling *Heath treatment*	: *** NIET GLOEIEN *** *** *ANNEALING NOT ALLOWED* ***
Sterkte *Strength* — **Proefbelasting** *Proofload applied*	PL : 441,45 kN /per ketting/each chain
Werklast *Working load limit*	WLL : 33,75 ton(metric)
Datum beproeving *Date of test*	:
Herkeuring aanbevolen voor *Re-examination suggested before*	: 23-03-2013
Toepassing *Application*	: CHAINSLING
Hijsmiddel vervaardigd volgens norm *Hoisting Equipment manufactured according standard*	: EN 818-4
Naam en adres fabrikant *Name and address of manufacturer*	: Theile, Gunnebo

WLL 45°-60° buitenhoek/outside angle = WLL ketting/chain x 1.5 = 33750 kg.
WLL 0°-45° buitenhoek/outside angle = WLL ketting/chain x 2.1 = 47250 kg.
Alle berekeningen volgens Europese norm/All calculations according to European standard NEN-EN 818-4

Datum geprint *Date printed*	Naam en adres leverancier *Name and address of supplier*	Gegevens betreffende levering *Note of delivery*	Handtekening deskundige *Signature of competent person*
-03-2009	Endenburg Gouda Nijverheidsstraat 4-6 2802 AL Gouda		

Endenburg B.V.

702001

All lifting equipment must have a certificate.

5.1.11 User´s manual

Lifting equipment also need a user's manual. The manual gives at least the following information:

- normal terms of use,
- instructions for use, assembly and maintenance
- rejection measures.

Suppliers are required to provide instructions in the language of the country where the lifting tools are delivered. Suppliers should provide those instructions of hoisting equipment in a catalogue.

5.1.12 Identification and marking

Hoisting equipment must be identifiable. The tool or equipment must be marked with the following information:

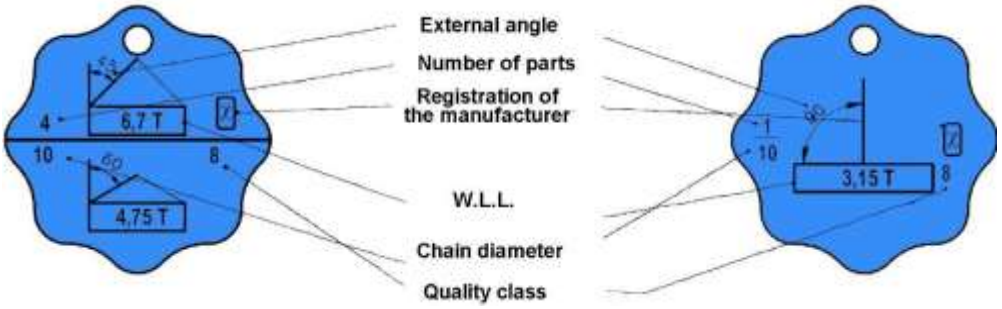
- name of the manufacturer
- registration number.

Usually, the information is on the lifting equipment itself. If that is not possible, it's on a tag plate. This tag-plate is firmly attached to the tool. The information must be clearly legible and so fitted that the information may not weaken the lifting equipment. Next to the name of the manufacturer and the registration number you'll find more details about the lifting equipment, for example:

- working load (WLL)
- date of manufacture or the last examination date
- CE marking
- Own mass (if 100 kg or more).

5.1.13 Chains and chain assemblies

On chains and chain assemblies the mark of the manufacturer and the material quality or grade class should also be mentioned. On chains this data should be punched in at least once per meter. On chain slings and chain assemblies this data should be punched in on at least one master link.



Type plate (tag-plate) for lifting tools.

5.1.14 Storage

The service life of lifting equipment will be reduced if they come into contact with a lot of pollution and moisture. Therefore, the equipment should be stored in a dry, and well-ventilated storage space, free from aggressive vapours and liquids. In a hoisting-locker, you should store lifting equipment in an orderly way. You make a subdivision in:

- chain assemblies
- steel wire ropes,
- nylon slings and ropes
- lifting blocks and rope sheaves
- special lifting tools.

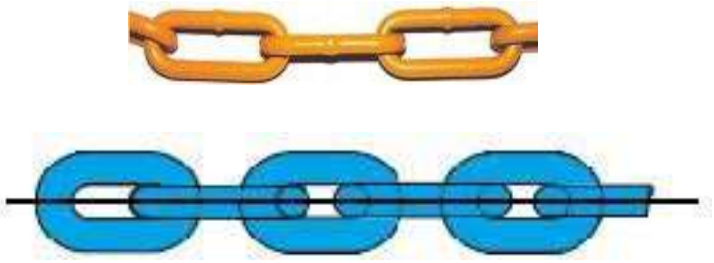
The storage protects your ropes and textile webbing slings from direct sunlight. Sunlight contains UV-radiation that causes ageing. Wet ropes should never be dried in direct sunlight.

Storage in the open air should avoided as much as possible. However, if it is unavoidable, ensure that the lifting equipment remains dry. Cover them with a tarpaulin.

Storage of lifting tools

5.2 Chain and chain-assembly

For lifting operations, we should only use short link chains. The long link chains should never be used for lifting purposes. The explanation for this is simple, the long link chain will damage much more during the use of a short link chain.



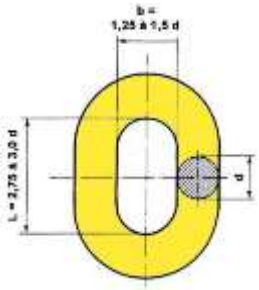
The upper chain is a long link chain, the bottom is a short link chain.

You may therefore only use a short link chain lifting chain. The links of these chains are short and strong. Long link chains are lighter and cheaper than short link chains, you see them often used for lashing of loads on board of ships or trucks

5.2.1 Chain

Lifting chains have the following dimensions in relation to the material thickness (d).

internal link length (pitch)	2.75 to 3 times d
internal link width	1.25 to 1, 5 times d



Dimensions of links have fixed ratios.

5.2.2 Chain assemblies

Chain assemblies are parts fixed to each other as links, rings and hooks. All parts are made of the same material. Of course, these assemblies often have specific names, as in technical jargon;

Chain sling (Single leg)

Double chain sling (Two-leg)

Triple chain sling (Three-leg)

Quad chain sling (Four-leg)

5.2.3 Chain tackle

Chain tackles are not only used to do hoisting work. They are also used when an irregular part has to be hoisted. When it is not possible to get the slings on the right length you can use a chain tackle. Make sure the tackle has the right colour code and is undamaged.

5.2.4 Ratchet Lever Hoist

The simplest model of a hand chain hoist or, Ratchet Lever Chain Hoist

The feature of this hoist equipment is that it has a separate manually operated part and a hoisting part. Both parts are coupled to each other through mechanical transmission. A small (human) force is transformed into a large hoisting force through this transmission.

Please pay attention: Not every Ratchet is suitable for hoisting work. They are only suitable for hoisting work when the manufacturer specifically indicates this in his user's manual.

5.2.5 Shackles

Shackles are brackets that you use to an attach chain or rope to an object. The bracket is conducted with a bolt so that the chain or rope is locked. There are two types:

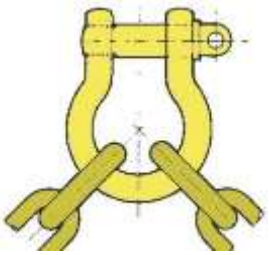
- D-shackles according to EN-13889
- Anchor- or bow-shackles according to EN-13889

Shackles come in different forms and can be made of different materials.

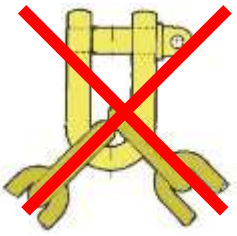
Anchor or bow shackle.

D-shackle,

D-shackles used to connect single-lifting equipment together. Bow shackles are used to connect two or more lifting equipment together. Because of their shape bow shackles give more space to the lifting equipment so that they are not on top of each other. An example of an application is two chains which you attach to a bow shackle.



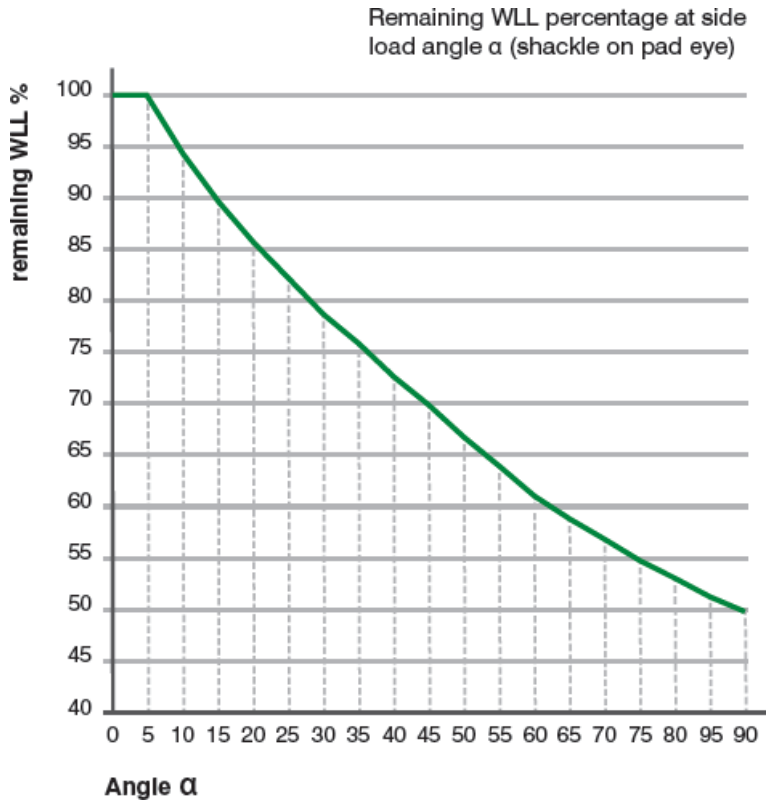
Anchor or bow shackle can be used under an angle

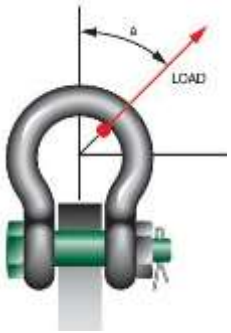


D-shackles may never be used in this way

5.2.6 Reducing of the WLL by side load

Side loads should be avoided, as the products are not designed for this purpose. If side loads cannot be avoided, the WLL of the shackle must be reduced:





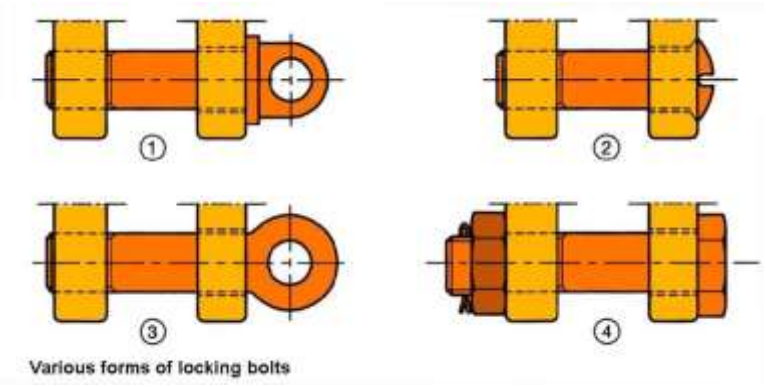
5.2.7 Wide body shackles

Wide-body shackle

Sometimes it may be necessary, especially in the heavy work, to use a "wide-body shackle". This shackle has a die-cut bracket which will damage the steel wire rope less quickly, because of the larger radius of the bracket.

5.2.8 Shackle Bolts

Shackles are different types of bolts.



Various forms of locking bolts

1 eye bolt with collar,
2 countersunk bolt,
3 eye bolt,
4 bolt, nut and safety pin.

Shackles with an eyebolt are used for connections that you often must loosen. Bolts with a countersunk head are meant for places where the head can be stuck. Shackles with a bolt, nut, split pin do you use especially when it is difficult to determine if a bolt is completely wound in. Secured with a split pin has the advantage that the nut cannot loosen unintentionally.

5.2.9 Eyebolts

Eyebolts may for example be used to lift an electromotor. Electromotors have a threaded hole above into which an eyebolt may be screwed. The threaded hole is provided above the centre of gravity, so that the motor will keep hanging straight during the lift.


Eyebolt


Eyenut


Rotating eye bolt from RUD

The maximal angle for eyebolts ore – nuts is 45°.

5.3 Steel wire ropes

5.3.1 Materials

Steel Wire ropes must meet many requirements, that's why they are made from high-quality steel. The steel contains little phosphorus, sulphur or other contaminants and has a regular structure. The alloy manganese is used to increases the wear. Wire ropes are made up of steel wires drawn through a drawing plate. Then the wires are bundled and then turned into each other. A large number of wires makes wire ropes so flexible that they bend easily and on wheels or drums. We look at some requirements the steel cables must meet and how to protect them against corrosion.

5.3.2 Requirements

Wire ropes for slings must resist:

- high temperatures
- acids
- high pressures
- corrosion
- rough treatment

Steel wire ropes have been developed to meet specific requirements in a wide range of applications.

5.3.3 Working coefficient

The working coefficient applied to steel wire ropes is the relationship between the actual breaking load and the Working Load Limit of the equipment. Steel wire ropes for lifting slings with a WLL up to 25 tonnes have a working coefficient of 5. With a higher WLL a working coefficient of 4 applies.

When we are using a steel wire rope as hoisting rope with a crane, then the working coefficient is put on 6.

5.3.4 Lays

In describing wire ropes a distinction is made between the type of lay, the direction of lay and pitch (or length of lay). We will discuss these concepts individually below. We will also look at preformed ropes and a non-rotation construction.

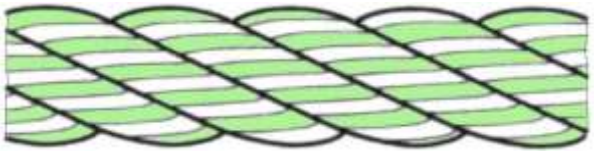
5.3.5 Type of lay

The strands of wire ropes can be twisted into a rope in the following ways:

- regular lay
- Lang’s lay.

5.3.6 Regular lay

Wire ropes with a regular lay are most common. In the regular lay, the direction of lay of the individual wires is to the opposite of the strands in the rope. Regular lay ropes are less inclined to unwind. Only regular lay ropes are used for lifting slings.



In the regular lay, the direction of lay of the wires is to the opposite of the strands.

5.3.7 Lang’s lay

The Lang’s lay is named after its inventor, the Englishman Mister Lang. In the Lang’s lay the wires and the strands are laid in the same direction.

In the Lang’s lay, the direction of lay of the individual wires is the same as that of the strands.

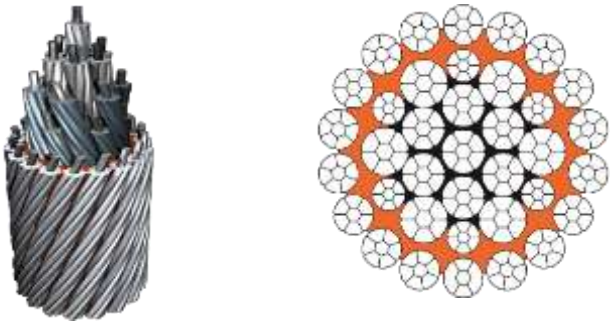
Wire ropes made using Lang's lay are suppler and less sensitive to wear than regular lay ropes. Their disadvantage is the tendency to unwind. This can be seen when a free load is taken up and begins to spin. Lang's lay wire ropes are therefore only suitable for guided loads, for example, counterweights, lifts and rammers. They are not used for lifting slings.

5.3.8 Direction of lay

The direction of lay refers to the way the strands are twisted together. The strands turn to the left in a left-hand lay and to the right in a right-hand lay. The right-hand lay is most common.

5.3.9 Non-rotating constructions

Non-rotating wire ropes consist of two or more layers of strands around a fibre or steel core. The inner layer or layers are laid opposite to the outer layer. When such wire ropes are loaded, the outer layer tends to open (lengthen) and the inner layers tend to close (shorten). Under load, a certain balance is achieved between the inner and outer layer. When equilibrium is reached the internal rotation of the rope ceases. A non-rotating construction has a higher working coefficient factor, most of the time it will be 6.



Source Verotop

The construction of a non-rotating rope consists of layers laid in opposite directions.

5.4 Terminations

Steel wire rope assemblies, like chain assemblies, are made on length and supplied with the necessary accessories. To attach loads to wire rope assemblies they must be fitted with hooks, eyes, thimbles and so on. This is achieved with the use of terminations. Two groups of these are distinguished:

- permanent
- temporary.

Temporary terminations may not be used in lifting or mooring. The permanent terminations used in steel wire rope assemblies will be discussed here. Two types of permanent terminations exist:

- Talurit
- Super Splice.

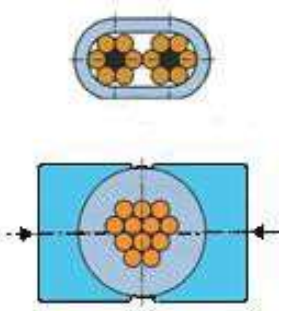
Permanent terminations may only be prepared by competent persons. We will look at the poured socket and the swaged socket, and finally, we will look briefly at one form of temporary termination, the wedge socket.

5.4.1 Talurit

A Talurit connection provides an eye without splicing. A light metal tube is pressed onto the rope after the eye has been formed.

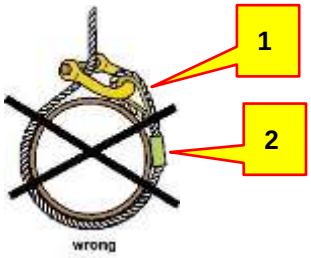
Eye using Talurit connection.

It fits tightly over the cable and the dead end. The end of the cable is cut off with an electric cutting machine. The wires fuse together during the cut and the rope cannot therefore unwind. The rope is passed through the clamp, the eye is formed, and the dead end is passed back through the clamp. The dead end should protrude slightly from the clamp to ensure that it is clamped over its full length. The hard, burned-off part is also better placed outside the clamp as this part of the rope is less easily compressed. A thimble is often used to prevent the bend in the eye becoming excessive.



Talurit connection before and after compression.

A disadvantage of the Talurit connection is that the force of the clamped part is not along the centreline of the rope but a little to one side. This reduces the strength of the connection. A Talurit connection reduces the breaking load of the cable by 10%.
Talurit connections may only be loaded in line with the axis of the rope. They are not suitable for bending forces as there is a high risk of them opening. So be careful with slings and make sure the terminations are not bent around round sections and corners. Talurit connections are not resistant to rough handling.



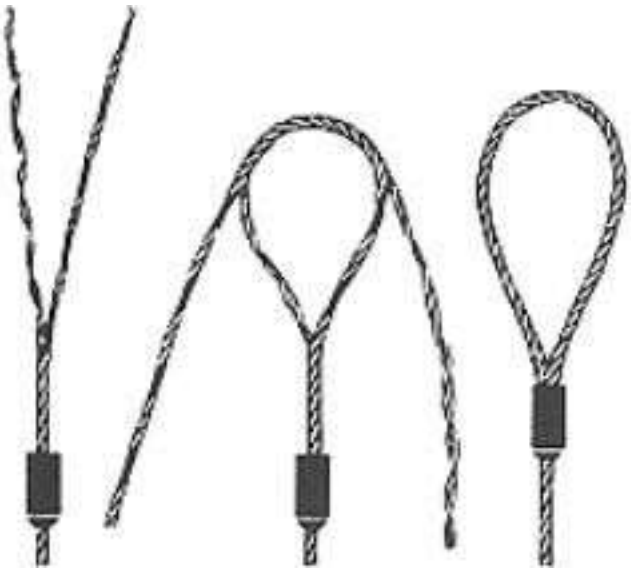
Two errors;

1 Shackle mounted upside down, and
2 Talurit clamp loaded on bending.

5.4.2 Super Splice

The Super Splice or Super loop connection closely resembles a Talurit connection. However, the clamp here is made from steel and the eye is prepared in a special way. The clamp is first slid onto the cable. Half of the rope strands are then unwound from the other half along a prescribed length. One half is then formed into an eye along with the rope core. The other strands are then wound around the eye in the opposite direction so that all the spaces between the strands are filled. This termination is called a Flemish eye. Finally, the clamp is pressed around the base of the eye.

Super Splice with a thimble.



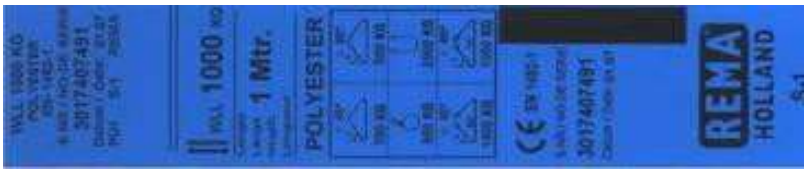
The way of making of a Super Splice

The breaking load of a Flemish eye without the compression clamp is only 35% of the rope's breaking load. A Flemish eye may therefore only be used with a clamp. When the clamp is used, the breaking load is equivalent to that of the cable.

5.5 Textile slings

Chain and wire rope slings are heavy and can damage loads, and so textile slings from man-made fibres are becoming increasingly common. Textile slings are light but still strong. They may be made from;

polyester (PES),	recognizable by a **blue label**	(is most common.)
polyamide (PA),	recognizable by a **green label**	
polypropylene (PP),	recognizable by a **brown label**	
Dyneema (HDPE).	recognizable by a **red label**	



A blue label of a polyester fabric sling

Textile slings are strong, but you can't always tell if they have been weakened during use. A working coefficient factor of 7 is therefore applied.

The colour of the label clearly says nothing about the WLL of the textile sling, but only about the material from which it was created. This means that the materials are resistant against different chemicals, such as;

The resistance of fabric slings made from:			
Substance	Blue Polyester	Green polyamide	Brown polypropylene
Battery acid	Good	Poor	Very good
Hydrochloric acid	Good	Poor	Very good
Rust remover	Good	Reasonable	Very good
Caustic soda	Reasonable	Good	Very good
Liquid bleach	Very good	Good	Very good
Creosote/crude oil	Good	**None**	Very good
Phenols crude tar	Good	Reasonable	Good
Diesel oil	Good	Good	Good
Synthetic detergents	Good	Good	Good
Chlorinated solvents: Trichloroethylene	Good	Reasonable	Poor
Other organic solvents	Good	Good	Good

Applicability of the different types of slings.

5.5.1 Woven slings

Many textile slings are woven. Weaving the man-made fibres provides strength. Woven lifting slings are called flat slings. There are two types, single and double and we will discuss each of these now.

5.5.2 Single flat fabric slings

A single flat textile sling consists of a single woven layer. These slings are available in widths of 30 mm upwards. The method of weaving prevents lateral tearing.

This single pattern has two ends with eyes or connectors. Flat endless slings are also found.

Flat fabric slings

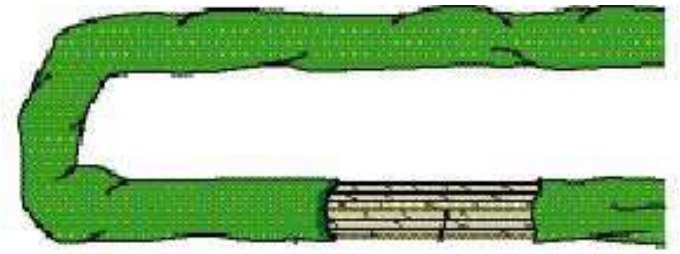
flat, endless sling

The eyes are often reinforced with leather and have a prescribed internal dimension. The seams at the eyes are stitched with threads of the same man-made fibre material as the sling. The ends of the sling are trimmed and fused together. This prevents the ends unravelling.

The eyes may be flat or twisted. Twisted eyes are covered on both sides and either side can, therefore, be used, increasing durability. The eyes may be doubled over, folded in half or to 1/3 of the breadth, with the advantage that the eye now presents a greater bearing surface to the crane hook.

5.5.3 Round Slings

In round slings, the man-made fibres are formed into endless strands. A Round-sling consists of numerous parallel endless strands side by side within a woven protective sleeve. The sleeve protects the strands and keeps them together. It has no effect on the strength of the sling.



A Round-sling has a woven polyester sleeve.

The sleeve must be a little longer than the sling itself since the fibres extend a little under load and an excessive force would otherwise be placed upon a short sleeve. The stitching would give way and the fibres would be exposed. A sling in that condition must no longer be used.

Round slings with protective slave

5.5.4 Sling assemblies

Round endless textile lifting slings can also be used as components in sling assemblies. A plastic sleeve is fitted to the sling, short enough to create eyes at the ends. The eyes are used to attach connecting links. Master links or hooks may then be attached. This assembly can then be used as a single leg sling or as part of a two-leg or four-leg sling. Sling assemblies are sometimes known as sling combinations.

A four-leg fabric sling, made up of two round endless slings, connecting links, hooks and a master link.

The metalwork in such assemblies must be made of steel which is not sensitive to ageing. The links and hooks are generally made from refined alloy steel of strength class T.

5.5.5 Colour coding

Fabric lifting slings have a colour coding which indicates the WWL. These codes are set down in a European standard. Some manufacturers have adopted their own systems, which makes it unsafe to rely entirely on the colour code. It is better to check the details on the label. The following table shows the standardised colour coding.

purple	1.000 kg
green	2.000 kg
yellow	3.000 kg
grey	4.000 kg
red	5.000 kg
brown	6.000 kg
blue	8.000 kg
orange : 10 ton > more	10.000 kg

5.6 Special lifting equipment

5.6.1 Introduction

A load may secure to the crane hook in a variety of ways, and the chosen method depends upon the circumstances of the lift. For one-off lift, you will use the available slings, chains, wire ropes and assemblies. But if the same types of load are lifted regularly, special lifting equipment may be introduced. The costs are quickly recovered as you work with improved efficiency as well as safety.

5.6.2 Lifting equipment

Special lifting equipment is taken to include the following:

- lifting beams
- lifting clamps
- special lifting hooks
- work platforms

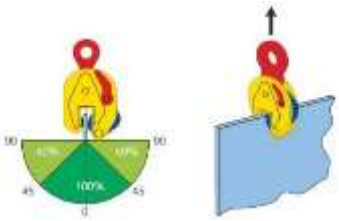
5.6.3 Lifting Beams

A lifting beam allows a large number of items to be lifted at the same time. Lifting beams can save a lot of time. There are various patterns, including for example a beam for lifting upright drums. These are not used offshore. Lifting beams are sometimes called spreaders or levellers.

A lifting beam, spreader or leveller.

5.6.4 Lifting Clamps

This hoisting equipment makes it possible to lift a load on the base of a clamping mechanism. The more weight is lifted, the more clamping force is developed.



5.6.5 Work platform

If we have to work on height regularly, we will use a work platform, but this is only allowed if you can do it on no another way with example a ladder, scaffold or cherry picker.
If you nevertheless decide to do the work with a work platform, this may not take longer than 4 hours.
The crane operator must also have inspected the hoisting cable in the last 3 months. And he has to reduces the capacity down to 25% of the original capacity by a mobile crane. If the crane is a fixed crane like an offshore crane is, than he has to reduces the capacity down to 75%.

The work platform self has to be exanimated every year.

The rules for hoisting people you can find them in the Working Conditions Act art: 7.18b and 7.23d

And the crane has to be certificated to make "**man raiding**" hoist, that means the crane has a second brake on the hoist drum

5.6.6 Personnel baskets

The applicable legislation requires that personnel baskets may be used exclusively for the transport of persons and their hand luggage.

Personnel basket or Billy Pugh

"Froge"

The "**FROGE"**, here the transferred persons can be sit-down and they get protection around the seat position.

5.7 Summary rejection standards of lifting tools

5.7.1 Rejection standard

General;

- W.L.L. and/or marks are missing or not readable,
- Inspection date > 1 year,
- no certificate presents
- there is no user's manual
- no CE-declaration available

Chain assemblies must be rejected if:

- Testing date > 4 years, (maritime 5 years)
- deformation or damage,
- wear more than 10% of the material thickness,
- there sintering caused by rust,
- the chain assembly is not complete according to the certificate,
- the safety latch does not work properly or is missing.

Textile sling must be rejected if:

- the sling is discoloured, turned into grey,
- the stitching of the protective cover is loose, (sling is overloaded)
- the treads are turned,
- the sling is tied,
- the sling is worn and is heavily polluted,
- the slings have been in contact with chemicals.

Steel wire ropes must be rejected if:

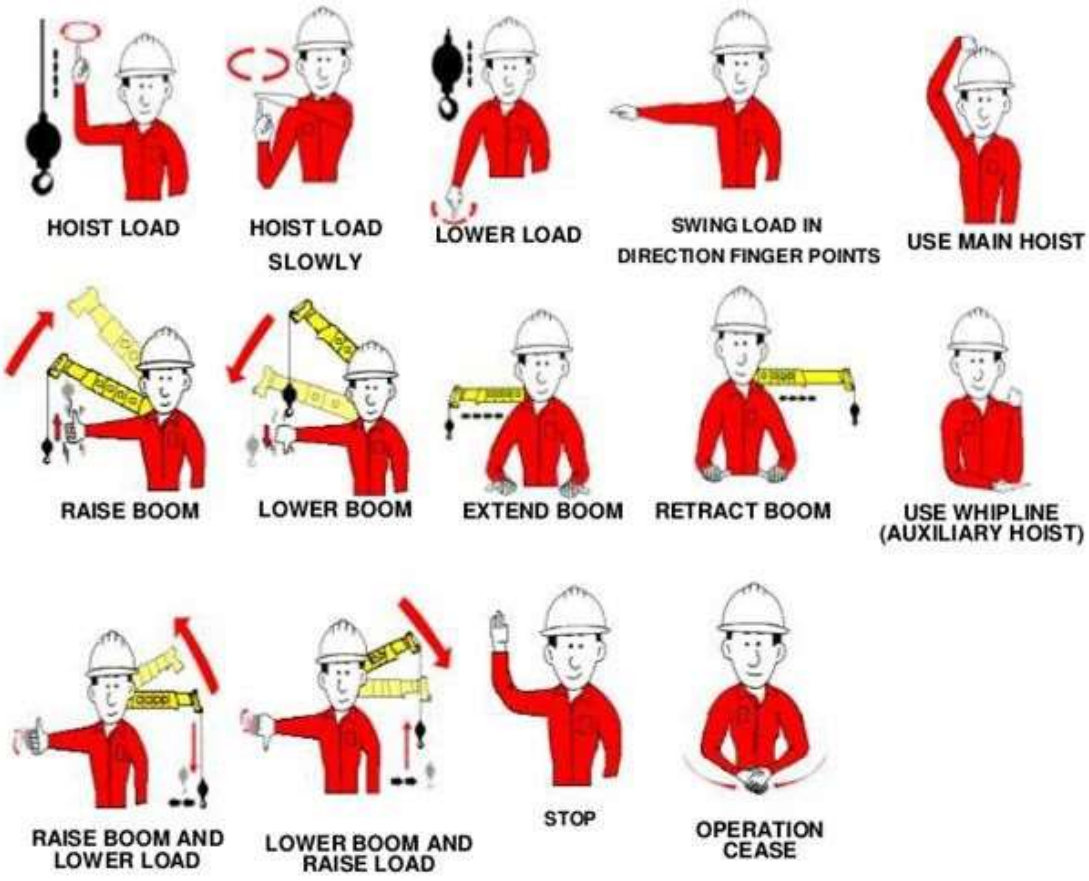
- there are broken wires,
  (more than 10% at a measurement distance of 30 times the diameter)
- there are wear and tear (40% of the diameter of the thin wires),
- the diameter of the cable has a reduction of more than 10%
- there sintering caused by rust,
- there are kinks or major damage.

* Hoist equipment must be inspected for defects each year (more often if needed) by an expert. If the manufacturer uses other terms, this should be followed.

6 Communications

6.1.1 Hand- and arm signals

Communications mean the exchange of information. The intention is to make something clear to another person so that they act in accordance with instructions. Arm and hand signals are helpful in giving instructions. Governmental agencies and training organisations do publish suggested hand and arm signals, but there are no mandatory rules. Where companies have good systems of their own, these will be accepted by safety inspectors. Hand and arm signals commonly used in the maritime world are shown below.



Standards British hand signals

To anticipate on confusion of the operator, a banksman must wear bright coloured clothing or a special coloured helmet to be easily recognized by the operator.

6.1.2 Communication by handheld radios

The following conditions apply to the use of these hand and arm signals:

- the Banksman can see the load;
- the Banksman can see the crane operator;
- the crane operator can see the Banksman.
- the arms must be kept at a clear distance from the body
- do not wear gloves when you are giving signals
- the Banksman chooses a position in which he does not bring himself in a dangerous situation, keep your back free.

Speak to one another with the call sign, speak clearly and concisely.

If these conditions cannot be met, a handheld radio must be used. To prevent confusion among other users of handheld radios, it must be clear who the message is intended for. You can do this by calling each other's names. In the case of hazardous lifting operations outside the view of the crane operator, the Banksman must remain in continuous contact with the crane operator.

The most used direction instructions could be for example:

On board of a ship
- Front side
- Starboard side
- Port side
- Stern or aft side

On an offshore installation:
- Go to the accommodation
- Go to the lifeboats
- Go to the compressor deck
- etc.

Do not use indication such as right, left, etc..

6.2 Safety

6.2.1 Personal protective equipment

It is self-evident that approved head protection should be worn during lifting operations.

A helmet is always worn during hoisting operations, as it is a steel construction with a risk of head injury.

The use of work gloves is necessary when working with lifting tackle.

Safety footwear is necessary to protect the feet against falling objects, impacts etc.

Hearing protection is required if the noise level is above 80 dB(A).

6.2.2 Wind force

In the wind force table, the first column shows the Beaufort scale, the second column shows the average value in nautical mph. 1 nautical mile per hour = 1 knot = 1852 metres per hour. The third column gives the highest value, the fourth gives the average value in m/s and column five shows the highest value in m/s. The remaining columns show the different descriptions in various European languages.

Scale number	Wind speed equivalent at 10 m in flat terrain				Name					Description of the visual effects of the wind-force on the surface of the sea. (Petersen scale)	Description of the visual effects of the wind-force on objects inland.
Beau-fort	Seamiles per hour (knots)				Nederlands		English	Français	Deutsch		
	average	limits	average	limits	boven zee	boven land					
0	0	< 1	0	0 - 0.2	Stilte	Stil	Calm	Calme	Stille	Sea like a sheet of glass.	Calm: smoke rises straight or nearly straight into the air.
1	2	1- 3	0.9	0.3- 1.5	Flauw en stil	Zwakke wind	Light air	Très légère brise	Leiser Zug	Little waves which make the sea look scaly. No forming of spume.	Wind-direction can be well recognized by plumes of smoke.
2	5	4- 6	2.4	1.6- 3.3	Flauwe koelte		Light breeze	Légère brise	Leichte Brise	Little, still short waves but better formed. Crests look glasslike and do not break.	Wind is noticed on face; leaves begin to rustle and weather-vanes may begin to move.
3	9	7-10	4.4	3.4- 5.4	Lichte koelte	Matige wind	Gentle breeze	Petite brise	Schwache Brise	Small waves: wave crests begin to break and the formed spume therefore looks glasslike while here and there only, white crests appear.	Leaves and twigs are moving continually.
4	13	11-16	6.7	5.5- 7.9	Matige koelte		Moderate breeze	Jolie brise	Mässige Brise	Small waves becoming longer. The white crests begin to appear in greater number.	Small branches begin to move. Dust and paper begin to flutter.
5	18	17-21	9.3	8.0-10.7	Frisse bries	Vrij krachtige wind	Fresh breeze	Bonne brise	Frische Brise	Moderate waves, of considerably greater length. Everywhere white crests are to be seen and here and there spume is blown up.	Small branches with leaves make swinging moves; crested waves form on lakes and canals.
6	24	22-27	12.3	10.8-13.8	Stijve bries	Krachtige wind	Strong breeze	Vent frais	Starker Wind	Bigger waves are forming: breaking crests make white spume spots everywhere (blown up spume is seen quite often).	Big branches move; umbrellas can be held with difficulty only.
7	30	28-33	15.5	13.9-17.1	Harde wind		Near gale	Grand frais	Steifer Wind	Waves become higher, and the white spume begins to develop into white stripes into the wind-direction.	Whole trees move; the wind is inconvenient especially when one walks against it.
8	37	34-40	18.9	17.2-20.7	Stormachtig		Gale	Coup de vent	Stürmischer Wind	Moderately high waves with considerably long crests: The wave-crests are blown off and form well developed spume stripes into the wind-direction.	Twigs break off; progress is hindered.
9	44	41-47	22.6	20.8-24.4	Storm		Strong gale	Fort coup de vent	Sturm	High waves: heavy stripes of spume into the wind-direction: the characteristic rollers begin to form; view may be influenced by blown up spume.	Small damage on buildings (chimney-tops and tiles are ripped off)
10	52	48-55	26.4	24.5-28.4	Zware storm		Storm	Tempète	Schwerer Sturm	Very high waves with long, crashing wave crests; big areas of spume are spread by the wind into white stripes thus the sea looks all white; heavy, crashing rollers; view has decreased by blown spume.	Uprooted trees; considerable damage on buildings, etc (occurs hardly on land).
11	60	56-63	30.5	28.5-32.6	Zeer zware storm		Violent storm	Violente tempète	Orkanartiger Sturm	Extraordinarily high waves (small and moderately big ships lose sight of each other temporarily in the wave troughs); the sea is completely covered in long stripes of spume that run into wind-direction; edges of crests blow off everywhere; view has been greatly diminished.	Causes extensive damage (occurs hardly ever on land).
12	–	> 63	–	> 32.6	Orkaan		Hurricane	Ouragan	Orkan	The air is full of spume and whipped up seawater. The sea is totally white of spume. View at any distance has ceased to exist.	

6.2.3 Lifting zone

The zone of operation should be clearly demarcated to inform and prevent persons who are not involved in the lifting operation from entering the zone unintentionally. In addition to that, other measures should also be taken to prevent any person from walking under the suspended load. Such measures include deployment of more signalmen to guide the load or installing an audible alarm to warn workers about the on-going lifting operation.

6.2.4 Environment

Weather conditions such as heavy rain, haze or glaze will impact the visibility of the lifting crew. Other weather conditions that can impact the stability and safety of the lifting operations include strong winds, thunderstorms or lightning situation. It is also important to remember that wind speed is stronger at higher ground. During the planning of any lifting operation, the anticipated wind speed at the site must be taken into consideration and refer to the crane manufacturer operation manual for the wind speed limit. It is advisable to stop all lifting operations when the weather condition deteriorates.

6.2.5 Man

Investigations into past accidents showed that human error is the most common cause of accidents involving lifting operations. Therefore, it is important that every single member of the lifting crew (operator, rigger, signalman and lifting supervisor) is adequately trained and competent to carry out his duties properly. They must also be fully conversant with the actual lifting procedures applicable to the lifting operation and not just the generic procedures.

6.2.6 Fit for duty

Besides the prerequisite for competency (i.e. ability to read load capacity charts), the fitness of the personnel, preexisting medical conditions or number of working hours that can adversely affect his ability to discharge his duties must also be considered.

6.2.7 Roles and responsibilities.

The roles and responsibilities of everyone involved in the lifting operations must be clear. There must be proper leadership within the lifting crew so that instructions are relayed appropriately. In addition, all personnel ARE empowered to INTERVENE and stop the activity if the operation is or has become unsafe.

Notice

7 Cranes

7.1 Machinery Directive

Manufacturers are required to meet certain minimum requirements to promote the safety of machinery. These requirements are set down in the Machinery Directive which came into force on 1 January 1995. Machines which meet the requirements are given a CE mark. The letters CE stand for the French “Conformité Européenne”, meaning “European Conformity”. Machines that satisfy the Directive are provided with a CE sticker.

The Machinery Directive includes requirements relating to the preservation of safety, health and the environment. They cover for example design, guarding, controls, maintenance and operating manuals. Lifting equipment falls under the Machinery Directive and is treated in a similar way to machinery. It must, therefore, meet the requirements set down for machinery.

7.2 Declarations and certification

The Machinery Directive states that an EC declaration of conformity is required for some products. This declaration will show which directives and standards the product complies with. There are various declarations of conformity to suit the category of machine involved. We will not go further into this here. For lifting equipment, the appropriate declaration is II-A. This displays the same serial number as that applied to the equipment. Declarations of conformity must always be available for inspection during the work.

Original

EG - Konformitätserklärung Kran

Palfinger Marine erklärt mit diesem Dokument, dass der

Marinekran: PFM4500M mit der

Krannummer: 510004461

den Bestimmungen der EU-Maschinenrichtlinie 2006/42/EG und der EMV-Richtlinie 2004/108/EG entspricht.

Bei der Auslegung und dem Bau des Produktes wurden folgende harmonisierten Normen angewandt:
EN ISO 12100, EN 13135-1, EN 13135-2, EN 13001-1, EN 13001-2, EN 13001-3-1, CEN/TS 13001-3-2

Der Unterzeichner ist auch bevollmächtigt, die technischen Unterlagen zusammenzustellen.

Die Inbetriebnahme ist solange untersagt, bis festgestellt ist, dass der Kran entsprechend der **Palfinger Marine** Montagerichtlinie und den Richtlinien des jeweiligen Herstellers der Unterkonstruktion aufgebaut ist und mit der unten-stehenden Konformitätserklärung, die Konformität für die gesamte Maschine hergestellt wurde. Weiters muss der Kranführer eingeschult und über die bestimmungsgemäße Verwendung informiert sein.

Original

EC - Declaration of conformity

Palfinger Marine *hereby declares, that the*

Crane: PFM4500M with

Crane number: 510004461

complies with the directive of general machinery 2006/42/EC and the EMC-directive 2004/108/EC as they stand.

Following harmonized standards were used in the dimensioning and fabrication of the machine:
EN ISO 12100, EN 13135-1, EN 13135-2, EN 13001-1, EN 13001-2, EN 13001-3-1, CEN/TS 13001-3-2

The subscriber is also authorised, to prepare the technical documentation.

Putting the device into operation is prohibited until it is proven that the unit is installed according to the **Palfinger Marine** *installation guidelines and the instructions of the manufacturer of substructur. The complete machine has to be conform according to the below written conformity declaration. Furthermore the crane operator must be adequately trained and informed about the proper operation of the unit.*

PALFINGER

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A-5203 Köstendorf / Austria
Tel. +43 (0)6216 7680 / www.palfingermarine.com

Karl Oberreiter
Geschäftsführer / General Manager

Köstendorf, 25.07.2014
Datum / Date

The declaration of conformity must be kept with the lifting equipment

7.3 Cranes in the offshore industry

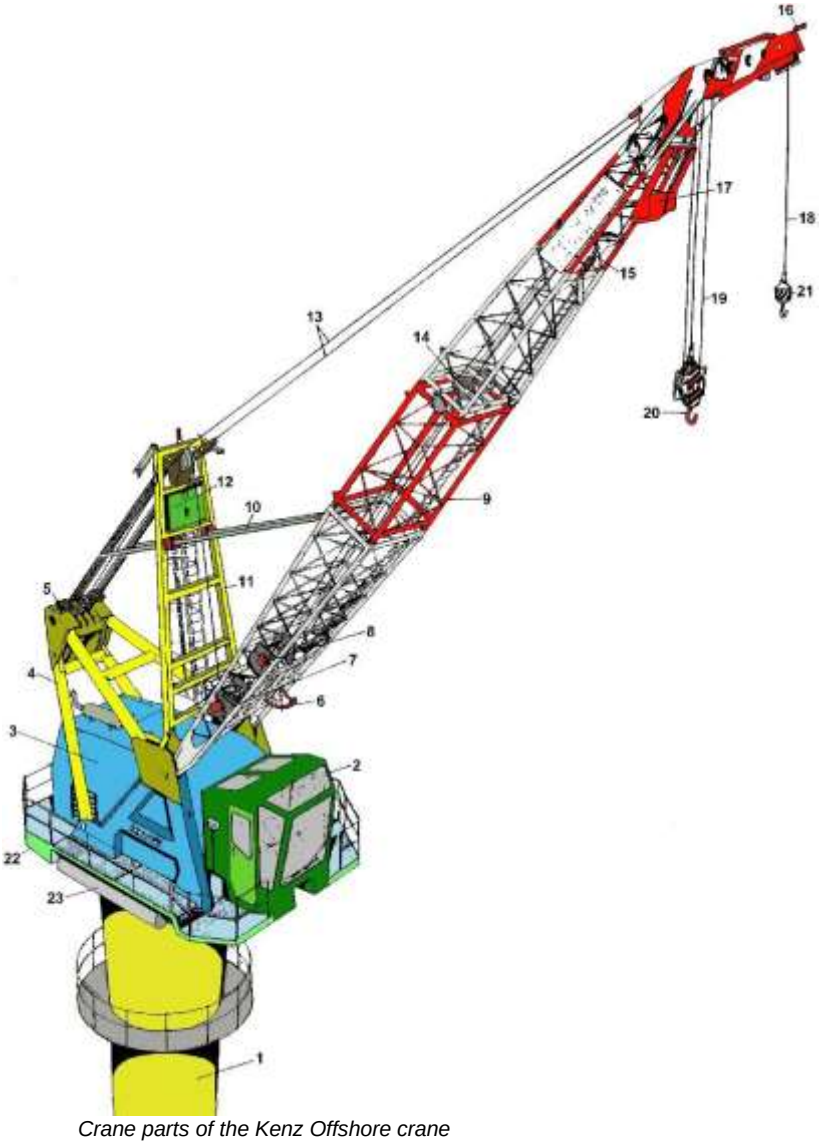
Pedestal lattice boom crane.

Pedestal fixed boom crane

7.4 Crane book

On every crane, with a load moment of more than 10 tm, there should be a crane book present. In this crane book all tests, inspections and major repairs are recorded. Also, the quarterly hoisting rope inspection must be recorded in the crane log book.

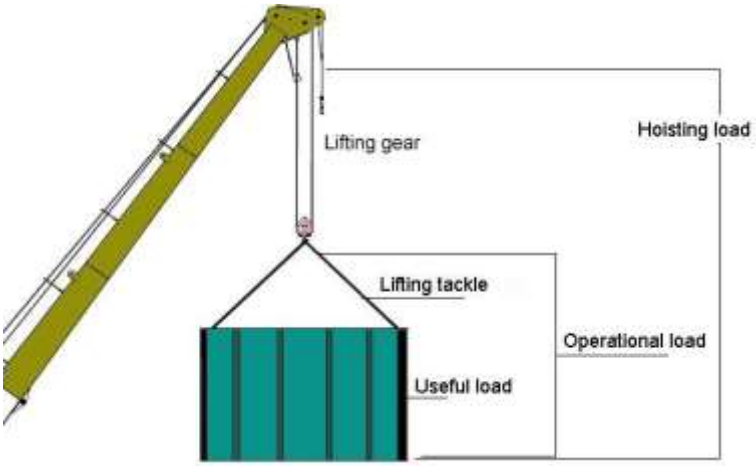
7.5 Crane parts



Crane parts of the Kenz Offshore crane

1. pedestal
2. cabin
3. engine room
4. A-frame
5. jib stops
6. radius indicator
7. main hoist winch
8. aux. hoist winch
9. jib
10. jib guide
11. aux. mast
12. hydro oil tank
13. guy ropes
14. guide pulley
15. sheave assembly
16. aircraft warning lights
17. block storage
18. aux. hoist
19. main hoisting rope
20. main block

7.6 Definitions



1. Hoisting load = Lifting gear + Operational load
2. Lifting gear = Hoist rope + Crane block and hook
3. Operational load = Lifting tackle + Useful load
4. Lifting tackle = Hoisting equipment (steel wire ropes, chains, sling, etc)
5. Useful load = The load himself without anything

7.6.1 Hoisting hook

Both single and double hooks are used for the attachment of loads.

7.6.2 Lifting gear

Lifting gear means the items needed to raise the operational load, these consist of the hook and crane block and the suspended part of the rope. You can say anything that is hanging on the boom top including the crane hook is the lifting gear.

Lifting gear = hoist rope + crane hook

7.6.3 Lifting tackle

Lifting tackle is the equipment to connect the useful load to the crane hook. This can include slings, chains, levellers and or lifting beams. Some times we call it hoisting equipment.

Lifting tackle = al the equipment necessary to connect the load onto the crane hook

7.6.4 Hoisting load

Hoisting load is the total weight what is hanging on top of the boom. It's the total of lifting gear plus the operational load

Hoisting load = lifting gear + operational load

7.6.5 Operational load

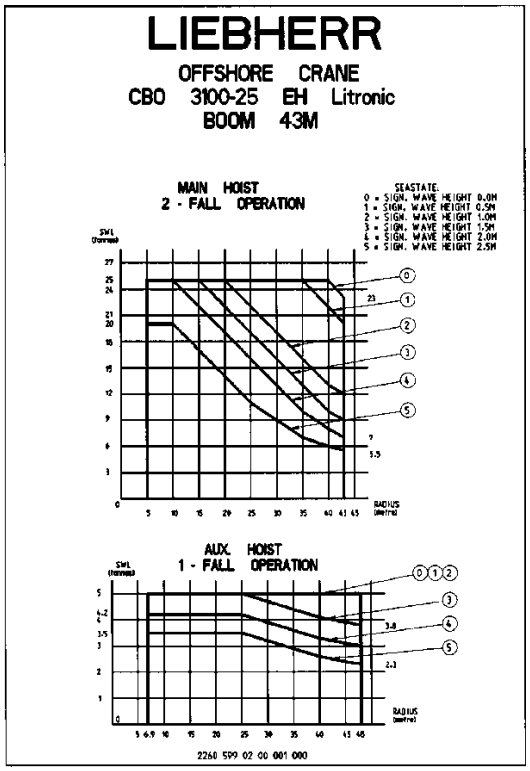
The operational load is the combination of the useful load and the lifting tackle.

Operational load = useful load + lifting tackle

7.6.7 Useful load

The useful load is the maximum load that can be lifted, minus the lifting tackle.

7.6.8 Lifting load cart



Liebherr CBO 3100-25 EH Load chart for main- and Auxiliary hoist

With any crane, there must be a lifting load chart present, so the crane operator can make his decision to start a safe lift. This load chart tells him what the lifting capacity of the crane is by a certain radius.

8 Checking – Inspection – Examination

8.1 Checking

Checking of lifting equipment takes place prior to the lifting operations, this check is performed by the "user". The user check is done at the user's level. That means you must look at;

- readability of the data,
- working load limit,
- applicability of the lifting tools,
- (severe) damage

8.2 Inspection

Inspections are performed at least once a year by a competent person designated by the employer. This person will need to have training which has brought him above user-level. This can be an employee of the employer.

The inspection of lifting equipment requires thorough knowledge. Management of the inspections and maintenance, on to a responsible person. He checks the lifting equipment on:

- breakage,
- wear,
- hairline cracks (using a detection/penetration fluid),
- corrosion,
- damage,
- deformation,
- functional testing.

8.3 Examination

Examination of lifting equipment used to take place every 4 years, with the maritime sector had an exception. There was a period of 4 + 1 year used. This meant in practice that examination of the cranes and lifting equipment done at the same time with the surveying of the ship.

This period is no longer applied with the introduction of the CE marking. The legislator has a more logical solution given by stating that lifting equipment "as many times should be examined and (possibly) be tested, this to ensure a proper functioning". This period should be determined together with the manufacturer and strongly depends on the frequency and load intensity of this lifting tool. For one user this will be for a period of 6 years and possibly for another user may be a period of only 2 years.

Also, there are hoisting equipment's which by law must be offered on a shorter period for examination, these are:

- clamping hoisting equipment,
- vacuum lifting tools,
- magnetic lifting equipment,
- man baskets.

8.4 Colour-codes

Hoisting tools must be marked with a colour code. In the Maritime sector is this colour code established by the IMO, the International Maritime Organization. Also, National inspection companies use this colour code. The colour code is with paint or coloured sticker affixed to the lifting tool and is as follows:

IMO colour code

Orange (Red)	2013	2019
Black	2014	2020
Green	2015	2021
Brown	2016	2022
Blue	2017	2023
Yellow	2018	etc.

The "Year colour" Orange is Orange since 2019, before that the colour in 2007 was namely **Red**, this gave frequent confusion because red disapproving often for rejection.

Year	Netherlands (IMO) Yearly	United Kingdom (1/2 Year) Half yearly		Norway (Norsok) Yearly
2016	Brown	Blue	Yellow	Blue
2017	Blue	Green	Blue	Red
2018	Yellow	Yellow	Green	Yellow
2019	Red	Blue	Yellow	Green
2020	Back	Green	Blue	Blue
2021	Green	Yellow	Green	Red
2022	Brown	Blue	Yellow	Yellow
2023	Blue	Green	Blue	Green
2024	Yellow	Yellow	Green	Blue

Some countries use a semi-annual inspection period. If this is the case, they use the diagram as shown

8.5 Storage rejected lifting equipment

Rejected lifting equipment must be decommissioned. It will be clear that a disapproved webbing sling will be destroyed and afterwards put in a waste container. However, a chain assembly can potentially still be repaired. However, these should be taking (temporarily) out of use.
This should take place by means of the lifting tools to mark with a label or to keep him in a confined space, the so-called quarantine.

This method of storage will not prevent illegal use.

9 Load weight determination

In situations where the load weight is unknown, a banksman must be able to perform a calculation to obtain approximate load weight. This can be performed by considering:

1. Load dimension (length, width, thickness, etc.)

2. Volume of the load (V)

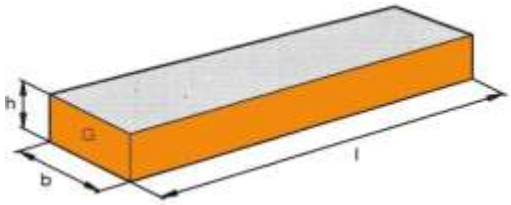
3. What the load is made to determine the density.
   Density is the weight of material per cubic volume

4. Does the load contain any other material (liquids, etc.)?

The general method to determine the weight of a load is by multiplying the volume of the load by its density.

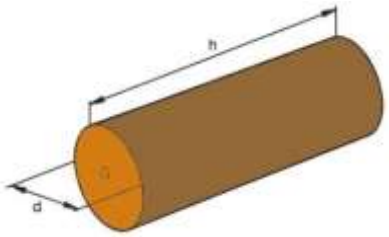
LOAD WEIGHT = VOLUME X DENSITY

Solid bock



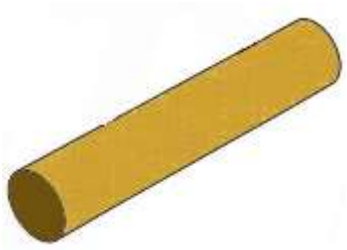
Volume = Length x width x thickness

Solid Cylinder



Volume = 0.25 x π x diameter^2 x length

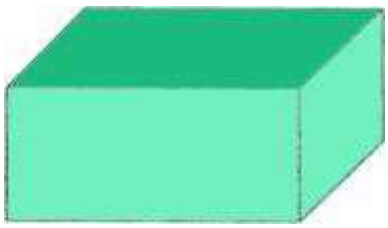
Pipe



Volume = π x diameter x length x thickness

Density of Materials

Steel	7.8 tons or	7,800 kg per cubic meter
Concrete	2.4 tons or	2,400 kg per cubic meter
Wood	0.6 tons or	600 kg per cubic meter
Water	1.0 tons or	1,000 kg per cubic meter



What is the weight of a concrete block, with the dimension of;
Length of 3.5 meters.
Height of 1.2 meter
a width of 2.2 meter

What is the weight of the steel pipe, if the dimensions are;

Length	= 12.0 meter
Diameter	= 1.22 meter
Thickness	= 10 mm

What is the weight of the drum fully filled with water if the dimensions are;

Height of drum is = 1.8 meter
Diameter of the drum is = 1 meter

10 Handling Offshore Containers

The use of containers for the transport of goods is common practice in the offshore world, and the use of goods nets as employed by the merchant navy has virtually disappeared. In this chapter, we will consider the characteristics of containers and the requirements when working with them. Special stipulations apply to containers used offshore. These are included in European standard EN 12079.

There are a number of different types of container in use, for example:

- the general freight container, an enclosed container with doors
- the freight container, an open container for general or special freight
- the tank container, for hazardous or non-hazardous liquids
- the bulk container used to transport bulk solids
- special containers, such as containers for waste, gas cylinders, tools, generators and the like.

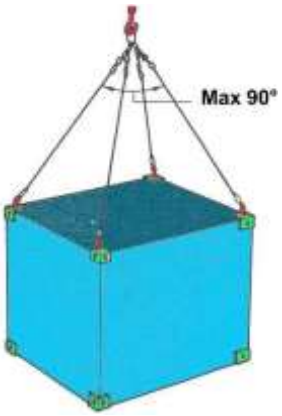
We will be concentrating on the three most specific containers, the general freight container, tank container and gas cylinder rack containers. We will go on to consider the forces containers need to withstand, and the attachment of containers.

Cargo container

Tank container

Gas cylinder rack container

Offshore, containers are usually lifted using the corner fittings. A 4-leg sling is usually attached to the container. The container's corner fittings are then horizontally loaded. This is only permitted with 10- foot containers and the diagonal included angle of the sling legs may not exceed 90°.



10- foot containers are usually lifted with a 4-leg sling offshore.

10.1 Attaching containers

The 10-foot container is therefore much used offshore. There are 5, 8 and 10-foot containers which can be lifted with a 4-leg sling, the so-called platform containers.
The slings are usually connected to the container with a D-Shackle, and the top link is left hanging over the side of the container. This makes it easier to attach the hook.
Before attaching a container, you must be aware of the inspection criteria.

10.2 Inspection of containers

EN 12079 states that containers must be inspected just like lifting machines and lifting gear. The inspections are carried out by the same bodies which inspect lifting machines and lifting gear. EN 12079 prescribes the periods for inspections.

When	time	letter
After the manufacturing of the container	date	**ST-3**
Annual visual inspection by an inspection agency	date	**V**
A visual inspection by an inspection agency and an MPI inspection every 48 months	date	**VN**
after significant repairs, a load test and MPI inspection	date	**T**

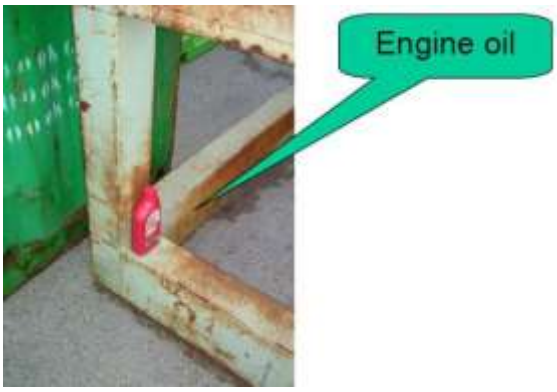
MPI is a Magnetic Particle Inspection, which checks for cracks with the aid of magnetism. Where this test is impractical a penetrant dye test will be carried out. The object in question is sprayed with a penetrant dyestuff which reveals any cracks.

The load test is a test of the load-bearing capacity of the container. The inspection data are shown on a plate. A crane operator can always see whether a container has been inspected.

The most important data on the container, including the inspection details are shown on the inspection plate.

10.3 Inspection for dropping objects.

Just before sending the container to the supply-boat check them for dropping objects.



Forgotten oilcan

or forgotten tools.

Care should be taken when opening the container, because it is possible the load can fall out of the container if it is not secured.

Unsecured load.

Notice

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