Guideline for Personnel Transfers by Means of Lifting Appliances
The following Guideline comes into force on 1 November 2011.

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Section 1

Introduction

A. General

1. Application

These guidelines contain technical fundamentals on lifting appliances mainly for personnel transfer and shall apply on both ships and offshore facilities.

Under the condition that the corresponding boundary conditions are observed, these Rules also shall apply for other systems.

2. Regulations and Codes

This guideline is intended as a supplement to the existing Rules for Classification and Construction of Ships. Both national and/or international rules and regulations have to take into consideration.

In case of conflict between other codes or standards, and this document, the latter shall override if this provide a higher safety or serviceability.

3. Standards

- DIN EN 10204 Metallic products – Types of inspection documents
- DIN EN 13001-1 Cranes – General design – Part 1: General Principles and requirements
- DIN EN 13001-2 Cranes – General design – Part 2: Load effects
- DIN EN13155 Cranes – Safety - Non-fixed load lifting attachments
- DIN EN 13414-1 Steel wire rope slings – Safety – Part 1: Slings for general lifting service
- DIN EN 13852-1 Cranes – Offshore cranes – Part 1: General-purpose offshore cranes
- DIN EN 14502-1 Cranes – Equipment for lifting persons – Part 1: Suspended baskets
- ISO 12100-1 Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology
- ISO 12100-2 Safety of machinery – Basic concepts, general principles for design – Part 2: Technical principles
- ISO 12944-1 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 1: General introduction
- BGR 159 Hochziehbare Personenaufnahmemittel
- BGV C21 BG-Vorschrift Hafenarbeit
- IMCA SEL 08/01 Guidelines on Procedures for Transfer of Personnel by Basket on the UK Continental Shelf
- NORSOK R-002 Lifting equipment (Edition 2, draft)
- NORSOK R-003 Safe of use lifting equipment (Rev. 2)
- NORSOK R-005 Safe of use lifting and transport equipment on onshore petroleum plants (Edition 1)
- NORSOK S-002 Working environment (Rev. 4)
- NORSOK Z-008 Critically Analysis for maintenance purposes (Rev. 2)

4. Terms and Definitions

agreed

term used when operating conditions or other design parameters are to be specified, and an agreement has to be reached

automatic overload protection system (AOPS)

system that automatically safeguards and protects the crane against overload and “over-moment” during operation by allowing the hook to be pulled away from the crane in order to avoid significant damage

banksman

skilled person who directs the operation of a crane from the point near where loads are attached and detached

can

verbal form used for statements of possibility and capability whether material, physical or casual
complex lifting appliance
power driven lifting appliances with high capacity and/or high risks.

NOTE: Complex lifting appliances include, but are not limited to: Offshore cranes, BOP cranes, draw works, launching appliances for lifeboats, tower cranes, mobile cranes etc.

crane
lifting appliance whereby the load can be moved horizontally in one or more directions, in addition to the vertical movement

critical lifting operations
operations requiring a work permit and special measures

design criteria
criteria applied for verification of systems, equipment, structures etc. for the planned marine operation

design temperature
lowest mean daily air temperature for the area of operation, used for the selection of steel grades

emergency
an unforeseen combination of circumstances or the resulting state that calls for immediate action

NOTE: Action to safeguard the health and the safety of persons

harm
physical injury or damage to health

inspection
visual control of lifting equipment for defects and check of operating controls, limit switches and indicators

lay down area
deck area for temporary storage of loads and equipment

lifting accessories
components or equipment used between the lifting appliance and the load or on the load to grip it, but which is not an integrated part of the lifting appliances.

NOTE: The term lifting accessories also cover lifting gear and loose gear.

lifting appliance
machine or device used for vertical movement of a load, with or without horizontal movement

NOTE: Include cranes, hoists, drilling hoisting equipment and launching and recovery appliances for life saving equipment etc.

lifting components
parts of the structure of, or used as part of a lifting gear, such as hooks, shackles, rings etc.

lifting equipment
lifting accessories or temporary installed equipment such as slings, shackles, links, pennants, necessary to perform the lift eye bolts etc.

lifting operation
all administrative and operational activities before, during and after a load is moved and until the lifting equipment is ready for a new load

lifting zone
space between the working area and the maximum lifting height

may
verbal form used to indicate a course of action permissible within the limits of this guideline

means of connection
mechanical parts (e.g. hooks, links, rings, etc.) intended for connection of the life saving equipment to the launching and recovery appliances

NOTE: The term „means of connection“ covers both those parts which are integral to the life saving equipment and those parts which are integral to the lifting appliance.

offshore crane
Both slewing crane and knuckle boom crane used offshore for lifting operations with relative movements between the crane and the loading area

open work area
area with no substantial obstacles to the open air and completely exposed to ambient conditions

operation
planned marine operation, with defined start- and termination point

personnel transfer carrier
carrier suspended on cranes used for transfer of personnel between installations and ships

qualified person
person trained or experienced with knowledge required for performing duties related to a specific task

rated capacity (R)
maximum load that a lifting appliance is designed to lift under specific conditions

NOTE: Rated capacity which corresponds to SWL used by International Labour Organization (ILO)

reliability
ability of an item to perform a required function under given conditions for a given time interval
responsible person
someone appointed who can reliably communicate
information about the position of the load and can
be settled by banksman, rigger or signaler

rigger
person who is familiarized with rigging hardware,
slings and safety issues associated with rigging,
lifting loads and lifting planning

risk
The hazard which undesirable incidents represent
for people, the environment and financial assets. Risk can be quantitatively expressed in several
ways, but usually as the frequency of (the probability of) and consequence of the undesirable
incidents.
Risk = f(probability × consequence)

safe condition
condition where the object is considered exposed to “normal” risk for damage or loss

safe working load (SWL)
Safe Working Load (SWL) of a lifting appliance is
the static load which may be directly applied to the
supporting element (e.g. cargo hook) of the lifting
appliance. A precondition is that the lifting
appliance must be working within the loading
parameters on which the design calculations have
been based. The dead load imposed by loose gear
forms part of this Safe Working Load.

shall
verbal form used to indicate requirements strictly
to be followed in order to conform to this guideline
and from which no deviation is permitted, unless
accepted by all involved parties

should
verbal form used to indicate that among several
possibilities one is recommended as particularly
suitable, without mentioning or excluding others,
or that a certain course of action is preferred but
not necessarily required

significant wave height
average height of the highest third of prevailing
waves, typically measured over a period of 3 hours

test
specific operation of lifting equipment, with or
without a defined load, in order to determine
whether the lifting equipment is suitable for use

test load
specified load that the lifting equipment shall
withstand within the manufacturer’s specified
limits without resulting in permanent deformation
or other defects

NOTE: Thereby confirming that the design,
materials and manufacture comply with
specification and statutory requirements.

work area
area of the installation where personnel stay or
move in connection with work

working area
vertical projection of all possible load positions

working load limit (WLL)
Working Load Limit (WLL) of the interchangeable
components refers to the permissible load of these
parts (e.g. shackles, hooks, chains, links etc.)
without regard to the hoist load and/or dead load
coefficient.
It should be noted that the Working Load Limit
(WLL) of an interchangeable component is not
normally identical the Safe Working Load (SWL)
of the lifting appliance, as the components have to
be dimensioned in accordance with the local
occurring forces. These forces are indicated in the
rigging plans.

work place
space within a work area, allocated to one or more
persons to complete work tasks related to
production, inspection or maintenance

work system
combination of people and work equipment, acting
together in the work process, at the work place, in
the work environment, and under the conditions
imposed by the work task

working environment
totality of all physical, chemical, biological and
physiological factors at work that may affect the
employees’ health and well-being through acute
trauma or lasting exposure

working environment analysis
systematic work process including the following:
- definition, limitation and breakdown of the
installation, work systems and work areas with
respect to one or more parameters to reduce the
risk of human error and improve task performance,
e.g. area activities during operation, type
of equipment, chemical substance,
- hazard identification,
- estimation of potential consequences to the
employees’ health and, if feasible, of probabil-
ity of occurrence,
- evaluation of needs for remedial actions,
- development of recommendations for remedial
actions and/or follow-up activities,
- identification of nonconformities and problems
in meeting specified requirements
5. Abbreviations

ABS  American Bureau of Shipping
ALARP  As low as reasonable practicable
AMSA  Australian Maritime Safety Authority
AOPS  Automatic overload protection system
API  American Piping Institute
DNV  Det Norske Veritas
EVA  Ethylene-vinyl acetate
GL  Germanischer Lloyd
HAZID  Hazard identification
HAZOP  Hazard and operability study
HSE  Health and Safety Executive
IMCA  International Marine Contractors Association
IMO  International Maritime Organization
LR  Lloyd’s Register of Shipping
MDPE  Medium density polyethylene
MODU  Mobile offshore drilling unit
NORSOK  Norwegian Standard Organization
OCIMF  Oil Companies International Marine Forum
OIM  Offshore Installation Manager
OMHEC  Offshore Mechanical Handling Equipment Committee
PPE  Personal protective equipment
PU  Polyurethane
SJA  Safe job analysis
SWL  Safe working load
UK  United Kingdom
UKOOA  United Kingdom Offshore Operators Association
UV  Ultra-violet
WLL  Working load limit

B. Personnel Transfers

1. General

The transfer of personnel is one of the specific activities for offshore operations. Purpose, scope and responsibilities shall be clearly defined, to avoid any damage and loss of life.

Such transfers include here in this specific guideline only personnel mainly in the offshore industry. It covers risk assessment, training and competence, responsibility, equipment and communications.

2. Type of Possible Transfers

- ship to ship including small boats
- ship to offshore structures and vice versa
- nets, baskets
- special accessories like FROG and TORO
- swinging ropes
- gangways, bridges, accommodation ladders, pilot ladders
- mating “surfer” structures
- automatic devices like robot arm or equivalent
- helicopter

3. Applicable Personnel Transfers

This guideline will cover only transfers using lifting appliances on both offshore structures and ship and following services shall apply:

- ship to ship
- ship to offshore structures or vice versa
- lifting and lowering of boats for rescue and other purposes
- access to a specific working area
Section 2

Facilities on Board of Ships and Offshore Structures

A. Arrangements

1. Crane

The crane shall be equipped with a special mode for personnel transfer. Range and operational loads are subject to the service requirements, mentioned in the specification and operations manual.

2. Type of Personnel Transfer System

It depends on Company’s transfer system, their knowledge and their experiences.

3. Location of Boarding

Several restrictions and requirements on board shall apply for an easy boarding of personnel:
- Size of area for both boarding and inspection for riggers as well as a free hoisting and lowering has to be safe and adequate.
- Service range of lifting appliance during operation has to be considered.
- Place of embarkation is to be marked.
- Barrages to be installed.
- Area to be free of obstacles, e.g. each kind of piping, air vents, clamps, bollards etc.
- Adequate illumination is to be provided.
- Area to be wind-sheltered and spray-protected.
- Good visibility for both the crane driver and banksman.
- Area only with low noise and free of vibrations.
- Non-skid surface to be provided.
- During operation the place is manned all the time.
- In case of emergency safe exits for attending personnel is required.

B. Approval, Tests and Surveys

Personnel transfer systems shall be approved, surveyed and tested. Type approval of sophisticated transfer carriers is preferable.

Generally it is not part of the Certificate or Classification procedure for ships or offshore structures, but lifting appliances and personnel transfer systems may be included in the general survey scheme upon Owner’s request.

1. Marking and Identification

1.1 Lifting Appliances

The following items shall be permanently marked on the appliance:
- manufacturer
- year of construction
- type
- order or manufacturing number
- characteristics like rated load etc.
- certificate number of Certifying Body
- testing date: Month/year
- any other necessary details

1.2 Lifting Equipment (Personnel Transfer System)

The following items shall be permanently marked on the equipment:
- manufacturer/supplier
- type
- serial number
- year of building
- weight of equipment in kilograms/tonnes
- SWL/WLL in tonnes/kilograms
- capacity of persons
- minimum SWL for lifting appliance in tonnes
- Certifying Body

1.3 Interchangeable Components

The following items shall be permanently marked on the equipment:
- certificate number
- stamp of Certifying Body
- testing date: Month/year
- WLL in tonnes

2. Safety Devices for Boarding Area

- General safety devices (Wearing of PPE and reflective vest, emergency exits to be marked)
- Attendance of authorized people only
- Use of personnel transfer equipment for other duties is not allowed
Section 3

Design Requirements

A. Design Requirements for Lifting Appliance

1. Special Requirements

Generally the crane shall apply to DIN EN 13852-1 for loading and discharging goods in the applied range of service and applicable environmental conditions.

Due to higher safety aspects for personnel transfers additional requirements shall apply:

- separate mode for personnel transfer started by a key-operated switch
- this specific mode shall be able to guarantee both soft acceleration and retardation
- normal lifting and lowering speed during personnel transfers shall be reduced to 0.5 m/s maximum
- secondary break circuit with an independent and separate control
- design of cylinders (Approval of Certifying Body and test certificate acc. to DIN EN 10204 type 3.2 required)
- manual release system for both lowering of the boom and load for leaving the carrier in a safe way
- range of service shall be limited for:
  - wind maximum 10 m/s sea
  - state maximum significant wave height of 2 m
- connection to emergency power system in case of blackout or other defects
- the activation switches or levers shall be of hold-to-run type and shall be marked clearly and permanently
- the control station for emergency lowering shall be positioned in a place that gives the operator a clear view of the load and the lifting zone
- communication system for the crane driver with the responsible person
- specific transport appliance for personnel transfer
- the automatic overload protection system (AOPS) is out of order
- a direct drive from the lifting equipment is not allowed

2. Loose Gear and Interchangeable Components

2.1 General Explanation

For the purpose of these Regulations loose gear and interchangeable components includes following items: Hooks, swivels, rings, master links, shackles, pennants.

2.2 Design criteria

- For personnel transfer services all loose gear to be calculated with a minimum static load of 10 times of the total load of the personnel transfer carrier, i.e. deadweight of equipment including loose gear plus weight of permissible load.
- All loose gear shall be tuned to both the lifting appliance and lifting equipment.
- The crane hook has to be equipped with a safety latch or an additional secured safety device between crane hook and lifting equipment.
- The pennant has to be manufactured with ferrules and thimbles. Wire grips are not allowed. For each appliance a separate pennant is required, minimum length 1000 mm. Multi-sling pennants (maximum 4) have to be combined in a ring or master link.
- All shackles shall be C-type.

B. Design Requirements for Personnel Transfer Units

1. Net – people outside (System Billy Pugh)

The bottom structure, inside of the ring, to be closed with a net, covered by plastic or canvas. The bottom ring outside made of PU-foam, strong enough for the designed capability of people and equipped with an adequate fender system. An upper ring will stabilize the netting. The net-material has to be UV-stabilized. Tag line to be fitted in the bottom area. Hoisting facility corresponding to the SWL. Depending on the capacity a shock absorbing system will be preferably.
2. **Net – people inside (System Esvagt)**

Bottom deck plate with vertical rigid parts is made of stainless steel with a non-slip pattern on the top side surface. Between these vertical parts UV-stabilized netting material is mounted. The 4 entrances fitted with non-skid flooring and can be closed by webbing strips with fast click-buckle system.

Underneath of the bottom plate big collars are mounted and provide shock-absorbs functions with an outside large collar. The capacity is limited up to 4 persons. Strap-tightener are used for tightening the stretcher.

3. **Basket – Type A**

This type of basket has a base and top and plurality of concentric sets of laces extended between the base and top. An expander post is coupled between the base and top for placing tension on the laces extending between the base and top. A hoist connection for attachment of the personnel transfer device to a hoist is mounted.

This type should be preferably used as a transport unit and not for personnel transfers.

4. **Basket – Type B**

The typical basket is made of mild steel or solid wood as a design with rail and roof without buoyancy device. Sometimes the roof is missing. This type of basket is normally applied as a working basket. It is not allowed to be used as a personnel transfer carrier for example for the transfer from ship to ship or other similar duties. The size of such a basket depends on the maximum capacity of persons.

The handrail shall be inside for protection of external contact and a minimum height of 1.1m. The basket has an access gate that does not swing outwards equipped with a safe locking device. Working baskets shall be provided with means for attaching safety harness and adequate space for tools, which has to be locked in a safe way.

A static calculation is required for the basket itself and for lifting accessories like master link and hoisting facilities. The hoisting unit is like a bridle and depending on the size of the basket the relevant type is applicable (4 slings or 2×2 slings, details see DIN EN 13414 – 1).
The corrosion protection shall meet the requirements, which material is applicable (mild steel or solid wood) and shall be painted in a bright colour.

All personnel involved shall assess the need for a pre-job talk, SJA or use of other analysis method is mandatory.

5. Special Personnel Carriers

This type of transfer carrier has a stainless steel frame with fixed buoyancy bodies incorporated in the body structure. Therefore both systems, which are today available, have adequate buoyancy capacity and are self-righting afloat in a stable condition. The safe transport is guaranteed by mounted seats with safety belts on a sprung suspension including a shock absorbed feet protection. Also stretcher mode is possible for both carriers.

These two types have typical shapes and different systems of buoyancy. One has a tetrahedral configuration with fixed buoyancy bodies and the other one has rotationally moulded MDPE shell with PU-foam fill and central column lifting equipment.

5.1 Description of FROG

- Robust stainless steel frame with a fixed buoyancy configuration to provide this type (tetrahedral configuration with a very low centre of gravity) feet protection.
- Due to this design an excellent stability at inclination up to 35° is provided.
- Furthermore the seating are mounted on a sprung suspension system including a shock absorbed feet protection for heavy landings up to 4 m/s.
- According to the tetrahedral configuration the capacity depends on the size, minimum 3 persons, maximum 9 persons.
- Additionally conversion to stretcher-mode is possible (for 3- or 6-person-size only).
- Fitted with quick release system.
- Buoyancy configuration ensures that the FROG is self-righting afloat in a stable upright position.
5.2 Description for TORO

- High sophisticated transfer system with stainless steel frame and central column lifting equipment.
- The buoyancy is guaranteed by rotationally moulded MDPE shell with PU-foam fill
- Both the seat back and base is rotationally moulded by MDPE shell filled with PU foam. For the seats a foam seat cushion is provided.
- Shock absorption is guaranteed by foam set cushion, foam headrest and EVA foam feet in case of hard landings.
- Stretcher transport is possible.

C. Loads, Load Conditions and Emergency Use

1. Loads

Following loads to be considered:

Accidental loads
Are loads not normally occurring during installation and operating phases e.g. failing crane operations or falling dropped objects

Dead load
This is the self-weight of any component of the lifting appliance which is not included in any other load

Design loads
Load or load condition which forms basis for design and design verification

Functional loads
Loads due to normal operations including dynamic amplification

Environmental loads
Following influences and load effects have to be taken into consideration: Wind, waves (sea state, mainly significant wave height), temperature influences

Permanent loads
To be clearly documented and accounted for the design documents and calculations

Static load
For design of transfer units a calculation of all relevant forces shall apply including of load distribution of the equipment

Test loads
Required load for testing the lifting appliance and/or loose gear and/or lifting equipment. Safety factor is generally $2.2 \times \text{SWL}$.

2. Load Conditions

2.1 Operating Loads

Operating loads include all loads occurring during normal operations, i.e.
- permanent loads
- defined limited environmental loads
- functional loads, here especially crane loads

2.2 Limitation of Operations

Especially for cranes the change over to personnel lifting mode shall apply and extreme environmental loads, i.e. wind and sea state have to take into account. Furthermore any range limitation to be observed, if applicable.

3. Emergency Use

In case of emergency the actual limitations for personnel transfers by crane will be ignored. Entirely the OIM has to decide, which environmental loads on site are acceptable or not. But the crane driver must have the right to object.
Section 4

Materials, Fabrication and Surveys

A. Material and Welding

1. General

Materials for lifting appliances and loose gear as well as other accessories shall comply with the minimum requirements according to material specifications of the Classification Society or other Certifying Body in charge.

Material certificates according to DIN EN 10204 shall apply, type of certificate is relevant to importance, calculated stresses and redundancy of components.

During fabrication all materials are to be marked clearly.

2. Selection of Steel Material

When selecting materials for the various components of lifting equipment or loose gear, the following criteria shall apply:

- the effect of the components on the structural integrity of the assembly
- the type and magnitude of the load (static or dynamic loading, internal stresses in the component, stress concentrations, direction of the stress relative to the fibre structure of the material)
- the design temperature
- chemical composition and weldability
- the mechanical properties of the material (dimensioning of components)
- the toughness of the material (resistance to brittle fracture at design temperature, as verified by the notched-bar impact test)
- the through thickness properties of the material when loaded perpendicular to the surface of the product (prevention of lamellar tearing)
- it may be appropriate to apply for further criteria to the selection of material

3. Materials other than Mild Steel

In case of other materials than mild steel, the specified criteria have to be fulfilled (details see Rules for Materials). If such kind of material like stainless steel and/or aluminium alloys is required type of process and the applicable material properties to be presented.

Bolts and nuts shall meet the requirement of the relevant standards, depending on the design calculation.

Nominal tensile strength and other properties as well as type of manufacturing are mentioned in the certificate. Nuts have to be fastened securely.

4. Welding

Welded connections and the welding sequence shall be designed to minimize residual stresses and avoid excessive deformation. Welded connections shall not be oversized.

The preparation and execution of welds, their inspection and any tests applied must conform to current engineering practice and the relevant rules of welding technology.

B. Fabrication

1. Constructional Details

The manufacturing documents (work drawings etc.) shall contain all the details relevant to the quality and serviceability of the structural member concerned. Besides dimensional data, these data shall include, wherever necessary, the tolerances applied, details of surface finishes, special manufacturing methods, tests and specifications.

2. Workmanship and Quality Control

Workmanship to be applied to the specified tolerances mostly in welding.

Repairs of defects are subject to the specification.

Manufacturers have to ensure, by means of effective internal quality control, that manufacture and assembly are carried out in accordance with the applicable regulations.

The existing quality management system shall be operable, where responsibilities and acting devices are mentioned.

3. Non-destructive Testing

The nature and scope of non-destructive tests depends on the importance and loading of the member concerned and on the possible weld defects or effects on the base metal which may arise from the welding technique, position etc.
4. **Corrosion Protection**

In selecting of materials and combination of materials used in lifting equipment, due to consideration shall be given to environmental conditions with regards of corrosion.

All structural members made of mild steel to be suitable protected against corrosion, surface preparation and protective coating shall in accordance with ISO 12944-1, bright colours preferred.

Bolt assemblies to be observed carefully.

5. **Technical Construction File**

5.1 **General**

Such file is part of final documentation to perform a verification of the product according to the specified requirements.

5.2 **Content**

- unique identification of the lifting equipment
- design specification including design parameters
- risk assessments including resulting risk reduction measures and residual risk level
- applicable requirements for the lifting appliance and/or equipments
- standards and codes used
- technical information, such as drawings, diagrams, calculations, test reports etc.
- fabrication documentation, e.g. material certificates, fabrication procedures, welding documentation, non-destructive programs, if applicable etc.
- verification reports
- formal statements, declarations and certificates
- maintenance instructions, in detail:
  1. General instructions for to running maintenance
  2. Specific repair instructions
  3. Preventing action in case of any repair works
  4. Supply of origin spare parts
  5. Documentation of carried-out maintenance
  6. Specific parts, for which extraordinary handling and inspection is required
  7. Use of lubricating
- instructions for use, including inspection and maintenance instructions, including wear and tear tolerances.

C. **Surveys for Certification**

1. **Surveys during Fabrication**

Construction of structural parts and fabrication of components shall be carried out according to the approved quality assurance procedures, with random detailed inspection and final acceptance by Certifying Body.

Test and trials, if required, shall be witnessed by Certifying Body.

Issuance of certificate after check of documentation and successful tests.

2. **Periodical Surveys**

All parts for personnel lifting appliances required a periodical survey. A detailed inspection schedule will be set up in each individual case depending on the type of item. The schedule shall cover supervisions by the Surveyor, as appropriate:

- continuous control and maintenance by the operators
- annual surveys by Certifying Body
- intermediate surveys by Certifying Body
- special surveys by Certifying Body (at 5 years interval)

3. **Other Surveys**

3.1 **Damage and Repair Survey**

Where damage has occurred to the unit the parts have to be accessible for a thorough inspection.

Following steps to be mandatory:

1. The repair measures are to be agreed with the Surveyor
2. Additional trials and/or testing shall be attended by the Surveyor.
3. The required certificate to be issued after successful testing.
4. Documentation of carried-out repairs

3.2 **Reinstallation, Reactivation or Conversion**

Such survey may be combined with a repair survey, detailed procedure see above.
Section 5

Safety Requirements and Risk Assessment

A. General Safety Requirements

1. Safety

Lifting equipment shall be designed, fabricated, tested, installed, operated, maintained and repaired in such a way to reduce and minimize risks to humans, the environment and material assets.

All forms of energy including lifting and moving objects, represented or produced by lifting equipment, shall be controlled at any time in a safe manner.

The lifting equipment shall be designed such that no single technical failure results in an unacceptable risk.

2. Fitness for Use

To minimize the risk of human error during all phases of use, simplicity, comprehensibility, maintainability and recognizability shall be emphasized when designing the lifting equipment.

The selection of type and specification of requirements for lifting equipment shall be based on the specific conditions at the workplace, the transfer of personnel, regular maintenance, qualified persons and any risk that may arise during the transfer.

3. Reliability and Availability

Lifting equipment shall be designed and constructed using well-proven components and safety principles, to ensure reliability by withstanding

- the operating stresses and loadings,
- the environmental influences,
- other relevant influences.

Lifting equipment shall be designed to ensure high availability and a minimum of “down-time” during the design life. In case of conflict between reliability, availability and/or safety, safety shall always prevail.

4. Principle of Safety Integration

The designer shall aim to eliminate any risk throughout the design lifetime of the lifting equipment, including the phases of transport, assembly, disabling, scrapping and dismantling.

In selecting the most appropriate methods, the manufacturer shall apply the following principles of safety integration in order given:

- Eliminate and reduce risks as far as possible by implementation of inherently safe design measures
- Safeguarding and complementary protection measures in relation to risks that cannot be eliminated
- Inform the users of the residual risks due to any shortcomings of the protection measures adopted, etc.

A documented risk assessment shall be worked out for all lifting appliances. The documentation of risk assessment shall demonstrate that the requirements for performing the risk assessment have been met, and that the results with respect to the acceptance criteria are fulfilled.

Basic terminology, methodology and technical principles are given in ISO 12100-1 and ISO 12100-2, principles for risk assessment are given in ISO 14121-1 and ISO/TR 14121-2.

5. Safe Job Analysis

A SJA is a systematic and documented review of all risk elements before a concrete work task or operation, such that measures can be initiated in order to eliminate or control the identified risk elements during the preparations for, and execution of, the work task or operation.

If, during the execution of a lifting operation, there is a change in operational conditions or in the assumptions on which the risk mapping was based, the operation shall be ceased and a new risk assessment shall be carried out.

B. Risk assessments

1. Basics of Risk Assessment

Risk assessment shall be an integral part of the supply of lifting equipment.

Furthermore it shall be an iterative process and repeated after the application of risk reduction measures until an acceptable level of safety is obtained.

The risk assessment shall be carried out in accordance with ISO 14121-1.

The relevant method of analysing hazards and estimating risks shall be selected depending on the lifting equipment characteristics and the type of risks that are dominating.

Examples of such methods are described in ISO/TR 14121-2 Annex A
Acceptance criteria shall be based on international codes, proven offshore standards and guidelines, local authority/legislative requirements and/or internal company standards where the most conservative figures shall be used.

2. Determination of Limits
Determination of the limits of the lifting equipment is the first step in the risk assessment.
Determination of the limits of the lifting equipment includes the technical properties and the performance of the lifting equipment, the personnel involved and the environmental constraints at all times.
Determination of limits of the lifting equipment shall include, but not be limited to
- use limits including intended use and foreseeable misuse,
- different modes of operation and operator interventions,
- space limits,
- time limits,
- environmental limits,
- manoeuvrability of carrier.

3. Identification of Hazards
All hazards, hazardous situations and events shall be systematically identified. The phases shall include, but not be limited to
- construction,
- assembly,
- FAT, HAT and SAT
- transport,
- installation,
- commissioning,
- use and foreseeable misuse,
- maintenance and testing,
- repair,
- decommissioning, dismantling and removal.

Further references see ISO 14121-1 or other methods like HAZID or HAZOP

4. Estimation of Risks
The risk is the combination of the probability of occurrence of harm and the severity of that harm.
The severity of harm to health can be estimated by taking into account
- the severity of injuries or damage:
  1. slight,
  2. serious,
  3. fatal,
- the extent of harm:
  1. one person,
  2. several persons.

Or, in case of an extended/ additional harm of an economic and/or environmental nature:
- the severity of the extended harm in terms of cost or environmental damage:
  1. minor,
  2. major,
  3. catastrophic.
- the extent of the extended harm in terms of cost or environmental damage:
  1. slight,
  2. moderate,
  3. extensive.

The probability of occurrence of any harm shall be estimated by taking into account the exposure to a hazard, occurrence of a hazardous event, and the possibilities of avoiding the harm.
The exposure to a hazard is influenced by
- need for access to the hazard zone,
- time spent in the hazard zone,
- number of persons exposed,
- frequency of access.

The occurrence of a hazardous event is influenced by
- reliability and other statistical data,
- incident and accident history,
- risk comparison,
- number of relevant transfers.

The possibilities of avoiding the harm are influenced by
- personal skills (i.e. training and experience),
- how quickly the hazardous situation is developing,
- awareness of risk,
- possibility of escape,
- risk mitigating measures in place,
- effectiveness of risk mitigating measures in place,
- PPE (personal protective equipment).

5. Evaluation of Risks
Risk evaluation shall be carried out to determine if risk reduction is required. If risk reduction is required, the appropriate risk reduction measures shall be selected and applied in accordance with B.6, followed by repeated risk assessment. As a part of this iterative process, the designer shall check whether additional hazards are created or other risks are increased, when new measures are applied. If additional hazards to
occur, they shall be added to the list of identified hazards, analysed and evaluated.

For non-standardized lifting equipment or standardized lifting equipment the remaining risks shall comply with the ALARP principle, if another standard does not meet the requirements. The ALARP principle may be described as a reverse burden of proof. i.e. that risk reduction measures shall be implemented, if there is no evidence showing why not. The designer shall implement risk reduction measures unless it can be proven that there is a major inconsistency between cost and benefit.

6. **Risk Reduction**

Risk reduction shall comprise all possibilities to reduce the risk, including redesign, design modification, protective measures and information for use.

The designer shall select the most appropriate measure following the three step method below:

- **Step 1.** Inherently safe design measures
- **Step 2.** Safeguarding and possible complementary protective measures
- **Step 3.** Information for use covering residual risks

For further details see ISO 14121-1 and ISO/TR 14121-2

7. **Documentation of Risk Assessment**

Documentation of risk assessment shall demonstrate that the requirements for performing risk assessment have been met, and that the acceptance criteria are fulfilled.

The documentation shall include description of
- the lifting equipment for which the assessment was made (e.g. specifications, limits, intended use) and any relevant assumptions that have been made (e.g. loads, strengths, safety factors),
- the hazards and hazardous situations identified and the hazardous events considered in the assessment,
- the information on which risk assessment was based:
  1. the data used and the sources (e.g. accident histories, experiences gained from risk reduction applied to similar lifting equipment),
  2. the uncertainty associated with the data used and its impact of the risk assessment,
- the objectives to be achieved by protective measures,
- the protective measures implemented to eliminate identified hazards or to reduce risk (e.g. from standards or other requirements),
- residual risks associated with the lifting equipment,
- the result of the risk assessment,
- any forms completed during the assessment such as those given in ISO/TR 14121-2.
Section 6

Handling of Lifting Appliances and Associated Gear

A. Basic Considerations

1. General Fundamental Safety Requirements

- Transfer shall take place in good visibility with sufficient lighting, and only when weather conditions permit a safe transfer.

- Before the operation commences, the pick-up and lay-down areas for the personnel transfer carrier shall be prepared and barricaded to ensure adequate room to carry out a safe operation.

- The load and any load carrier shall be properly secured and prepared before the lifting operation.

- Personnel shall not walk under suspended load.

- All personnel who are involved in the lifting operation shall ensure that they have an unrestricted escape route in all phases of the operation.

- The lifting operation shall cease immediately if safety is jeopardized, when instructions are unclear, or in the event of loss of communication.

- The crane operator shall only obey instructions from the designated banksman, but shall obey the emergency stop signal at all times, regardless who gives the signal.

- The lifting operator shall not leave the operator’s cabin or station with load hanging on the hook. In case of using a remote control unit the same procedure shall apply.

- Any damaged lifting accessory shall not come into use and to be marked extraordinarily.

- Use of tag line to be clarified before the lifting operation started. End of rope to be secured against fraying.

- Particular care and attention shall be exercised.

2. Instructions for Use of Lifting Accessories

Generally the content of such an instruction shall include the following items:

- short description
- SWL / WLL
- kind of use
- range of service to be determined
- information for application and use
- fastening, securing, mounting and dismantling of the equipment to the crane
- handling and secured storage of the appliances
- limitations of operational use to be observed: Temperature, humidity, wind, sea state etc.
- introduction to the riggers (important for special personnel transfer carriers like FROG or TORO)
- check of specific safety devices during mounting of appliance
- check of pennant and other loose gear/interchangeable components
- specific introduction to the appliance, which is in use
- for personnel transfers the personal protective equipment (PPE) to be as well as available and to be worn
- fastening devices for personnel has to be controlled by the rigger/banksman
- stowage of a stretcher to be according to instructions
- overload of the appliance is not allowed
- instructions of the manufacturer have to be strictly observed

B. Guidance Notes

1. Inspection Procedures

All inspections shall be performed by a qualified person and shall always incorporate an operator’s pre-use inspection, which shall include the following minimum components:

- Visually inspect safety load line when attaching to the crane. Inspect crane hook
positive locking device for function and physical condition.

- Check side walls, rigging of top and bottom platforms and cushion ring for wear or damage (e.g. general visual inspection of the personnel carrier).

- Ensure snag resistant tag line is properly affixed.

- Cleaning and removing of spilling grease and oil, loose painting etc. on a 3-monthly basis.

The following quarterly inspection procedures are recommended for all personnel carriers:

- Inspection of carriers (e.g. nets including supporting facilities, steel bodies etc.) for excessive wear, cracks, or corrosion following manufacturer’s recommendation and relevant specification.

- Visually inspect safety load line when attaching to the crane. Inspect crane hook positive locking device for function and physical condition.

- Check side wall rigging line splices (top and bottom) for wear, UV degradation (blistering, discolouration or cracking), and unravelling. All synthetic rope splices should have a 3 tuck minimum (e.g. especially for net designs).

- Visually inspect stabilizer and safety load line unit for visual damage including external protective cover. Damage of external cover may require additional internal examination by a qualified inspector.

- Inspect bottom platform ring for deterioration, cracks or angular distortion.

- Check cover on bottom platform ring for tears or cuts. Damage of bottom platform cover may require additional examination by a qualified inspector.

- Check top and bottom flotation bats for deterioration or damaged closed cell foam. Damage of flotation may require additional examination by a qualified inspector.

- Visually inspect bottom and top pneumatic cushion hoses (if so equipped) for deterioration or damage.

- Inspect for modifications or other components. These items should be removed.

- Lifetime of nets, baskets or other personnel transfer devices depends on the daily use. It is recommended, when nets are used on a daily basis, to replace these nets annually. Very important is, however the equipment is cared and stored.

2. **Operational Practice Procedure**

- Any offshore facility making personnel transfers with a personnel carrier should have a written procedure for this task.

- A pre-use inspection should be conducted prior to any personnel carrier transfer.

- Cranes assigned to personnel lifting duties should be suitable for this purpose.

- Crane operations assigned to personnel lifting duties should be certified and competent to perform this task.

- A snag resistant tag line should be affixed to all personnel carriers.

- Crane hooks used for personnel transfers must have a positive locking latch.

- Only approved personnel carriers should be used for lifting personnel. Personnel carriers should not be used as a work basket or cargo net.

- Personnel carriers should be legibly marked with the maximum number of passengers.

- Personnel carriers should not be utilized in weather, wind, or sea conditions that the carried person considers to be unsafe.

- Before any attempt is made to lift personnel with a carrier, clear instructions should be given to all persons involved.

- No person suffering from acute seasickness or vertigo shall be transported by personnel carrier.

- Any individual has the right to refuse transfer by a personnel carrier.

- All personnel riding on a personnel carrier should wear an approved life vest or life preserver. An approved type should be required for all transfers conducted at night.

- All personnel riding on a personnel carrier should sit or stand on the determined place, whether it is outside or inside of a net, inside of a basket or appointed seat. Safe locking with arms in the nets or by safety belts depends on the system and has to be followed strictly.

- If crane operators view of the primary banksman is obstructed, the personnel carrier should not be moved until alternative communication or signal devices are placed in service.

- A designated primary landing zone should be marked in a safe area as determined.

- When transferring personnel, the personnel carrier should be lifted only high enough to
clear obstructions. It should then be gently lowered to the deck.

- A loaded personnel carrier should not be raised or lowered directly over a vessel.
- The crane operator may refuse to lift any person who does not comply with the operator’s instructions.
- An experienced escort should be provided for persons who are not confident performing a personnel carrier transfer.
- Injured, ill, or not feeling well persons may ride in a sitting position on the inside of the personnel carrier, with a qualified person as an escort.

3. Rescue Arrangements

In the event of a case of emergency, arrangements should be in place for carrying out a rescue. Throughout the operation, a lifebuoy, boat hook, heaving line and any other appropriate accessories should be available for use in an emergency.

Where an offshore installation (or MODU) is involved in the transfer operation, recovery arrangements should be made with the standby vessel, helicopter, or other rescue unit as appropriate. The offshore installation (MODU) should instigate the appropriate state of alert for the transfer operation according to its evacuation, escape, and rescue plan.

When using the offshore crane to handle the MOB, the crane, boat and pennant line shall be approved for such use. The approval shall refer to the relevant crane and the additional dynamic load applied by crane and pennant line on the boat.

An elasticized pennant line or other suitable damping element should be used between the MOB, hook and crane.

Each installation shall define limit values for maximum allowable movements.

4. Qualification of Personnel

All personnel involved have sufficient competence, training and experience as well as knowledge of the regulations and standards that govern the operation that is to be executed.

4.1 Crane Operator

The lifting appliance operator shall map and take into consideration limitations that can effect the lifting operation, including the capacity of the lifting equipment, weather conditions, movements, landing areas, blind zones and other limitations as a result of the travel path.

Minimum experience time as operator of equivalent lifting appliances is one year.

4.2 Procedure for the Crane Operator

Duties during operation:

- raising of carrier only high enough off deck to clear all obstructions
- swing the loaded unit over the water
- raise or lower it in such a manner to minimize swinging
- positioning it slightly above the landing area
- gently lower it to the deck
- a loaded personnel carrier should not be raised or lowered directly over the vessel

4.3 Training Schedule

For training it must be verified that the necessary equipment is available and in order. Furthermore, it must be emphasized that the equipment shall be used correctly by the crew during training.

All details shall be reviewed during training, and all hand motions shall be carried out to ensure that the service is performed in the best and safest possible manner.

All training shall be logged with training elements, participants, weather, sea and wind data, and any information useful for further development of the emergency preparedness on board.

Training plans, programs and practices are to be established and carried out for all personnel. They will include training on basic safety procedures and on environmental issues, and job specific safety procedures according to their duties and responsibilities.

Training should include but not limited to:

- instruction on the operation of equipment
- emergency survival and fire fighting
- how to read and understand Material Safety Data Sheets and safe chemical handling
- emergency response procedures
- personal protective equipment (PPE)
- evacuation, including alternative means of egress from the platform
- applicable regulatory requirements

5. Maintenance

Maintenance is a combination of all technical, administrative and managerial measures taken throughout the equipment’s lifespan with the aim of re-establishing the condition of the equipment whereby it can perform the intended functions. Maintenance can include preventive activities, monitoring, inspection, testing, repair, replacement, cleaning and tidying.
Maintenance shall be in accordance with the manufacturer’s instructions. The maintenance programme shall focus on preventing failure in components that would result in a high risk of hazardous situations. Consideration shall also be given to the company’s experiences, as well as standards for safe use of lifting appliances referred to the applicable standard.

Maintenance shall be developed and improved continuously based on experiences made during the operation and maintenance of the equipment.

After the maintenance has been carried out, and before the lifting appliance is used, the lifting appliance operator shall perform a user check and ensure that the functions have been returned to normal operational status. If the scope of the maintenance is limited, it is sufficient to control the functions related to the maintenance carried out.

The maintenance and the technical condition of lifting equipment shall also be monitored through the enterprise of competence carrying out the following activities:

- control upon start-up of new lifting appliance
- periodic control
- control after the lifting appliance has been used for significant periods
- control following damage or important modifications
- control in connection with extension of lifespan.
Annex A

Important Links

Germany:
Verkehrs-Berufsgenossenschaft www.bg-verkehr.de/dienststelle-schiffssicherheit
GL www.gl-group.com

UK:
HSE www.hse.gov.uk
UKOOA www.oilandgas.uk.co.uk
LR www.lr.org
IMCA www.imca-int.com
OCIMF www.ocimf.com
OMHEC www.omhec.org

Norway:
DNV www.dnv.com
NORSOK www.standard.norge.no

USA:
ABS www.eagle.org
API www.api.org

Australia:
AMSA www.amsa.gov.au

International:
IMO www.imo.org
ILO www.ilo.org