

# Standardiseringseksempel til å lære fra

## NORSOK R-002 Lifting equipment

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# Disposisjon for presentasjonen

- Hvorfor revidere standarden
- Arbeidsprosessen
- Hva standarder inneholder
- Spesielle tekniske utfordringer, eksempler fra standarden
- Hva kan vi lære



# NORSOK R-002

## Bakgrunn / historikk

- NORSOK R-CR-002, rev. 1, (1995) er utdatert
  - Ikke lenger referert i Ptil's veiledninger
- Behov for revisjon identifisert i 2003
  - Bl.a. pga utgivelse av flere europeiske, harmoniserte standarder
- Påtrykk fra Ptil
  - Problemer med frittfall livbåter
  - Kritiske spørsmål om lårelivbåters egnethet
  - Ptil trakk tilbake referanse til Sjøfartsdirektoratets krav i veiledning
- Arbeidet startet oktober 2007
- Høringsutkast i desember 2008 (Generell del + A +B)
- Totalt 30 møter hittil

# Hva er "lifting equipment"?

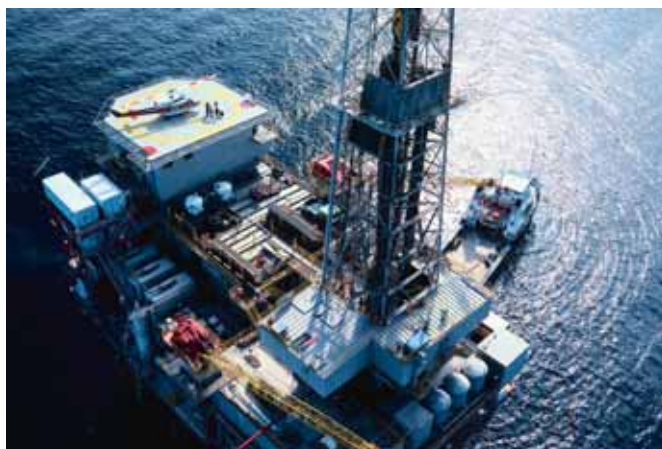
- Løfteinnretninger
  - Komplekse, f.eks.:
    - Offshore kraner
    - BOP-kraner
  - Enklere
    - Taljer
- Løfteredskap
- Person- og vareheiser
- "Portable units"
  - Containere (2.7-1, 2.7-2)
  - Løfterammer (2.7-3)
- Boreutstyr
- Utsettingsarrangement for redningsmidler
  - Daviter:
    - Frittfall livbåter
    - Lårelivbåter
    - MOB-båter
    - Flåter
  - Redningsstrømer
  - Personelloverføring
- Fundamenter og opphengspunkt
  - Løftebjelker, løfteører
- Løftepunkter (på last)
- Materialhåndtering

# Mål og hensikt

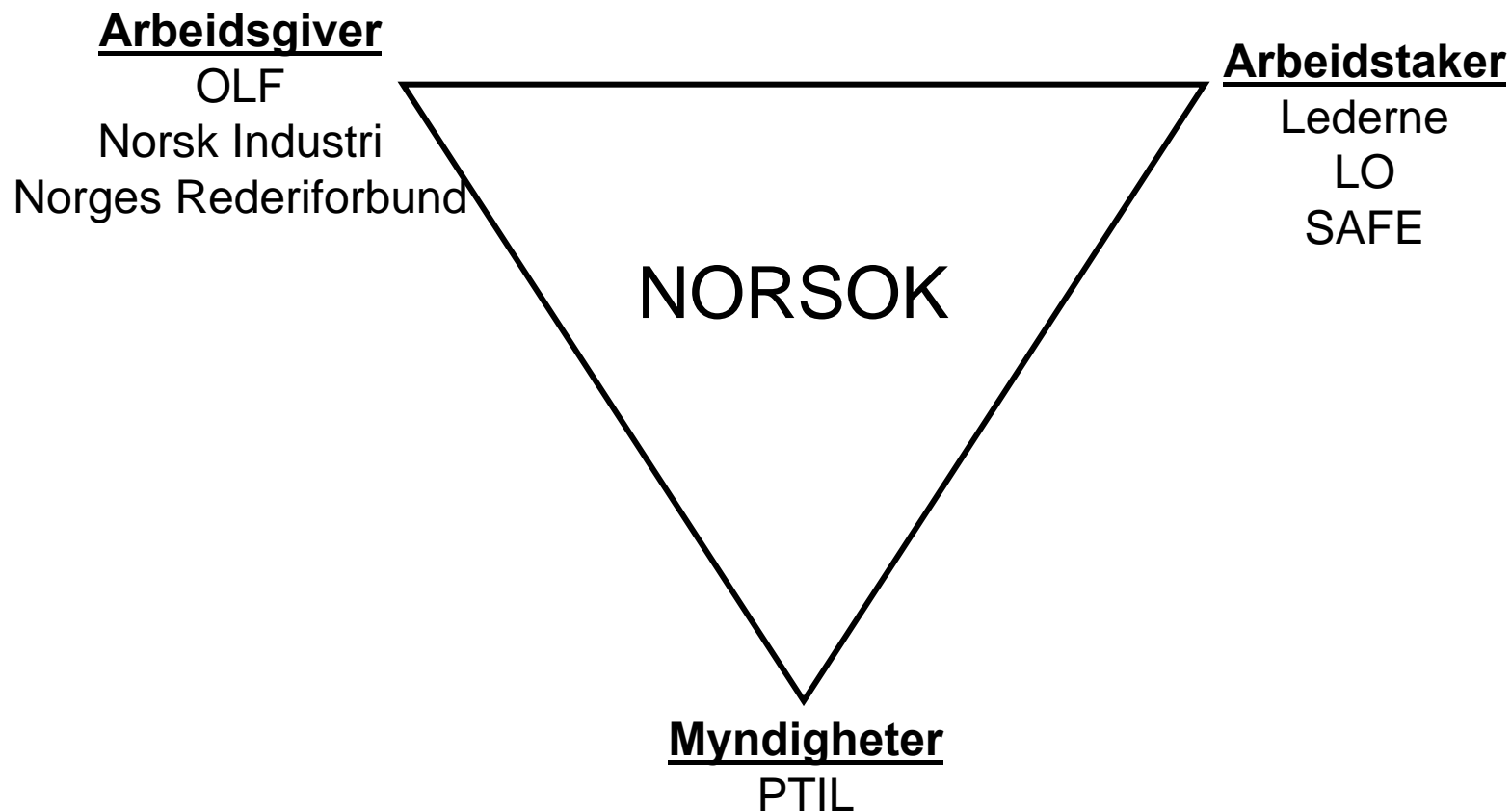
- Høyt sikkerhetsnivå for løfteinnretninger
- Å bli en viktig referanse for hele petroleumsvirksomheten
- Å bli referert i Ptil's veiledninger
- Like krav til løfteinnretninger på permanent plasserte og flyttbare innretninger
- Skal bidra til verdiskaping



# Gyldighetsområde: Petroleumsvirksomhet



# NORSOK: et 3-part samarbeid



# Arbeidsgruppen



Navn	Selskap	Status
Jan Ketil Moberg	ConocoPhillips / EG RL	Leder
Stein Ove Dyngeland	Statoil	Medlem
Arild Eriksen	Seadrill / Norges Rederiforbundet	Medlem
<i>Knut Førland</i>	Kranskolen	Medlem
Sigurd Førstund	Ptil	Observatør
Svein Harald Hetland	BP	Medlem
Nils Justad	Statoil	Medlem
Gunnar Matre	DNV	Tilrettelegger/konsulent
<i>Morten Normo</i>	Statoil	Representant for Industri Energi
Steinar Rødal	NOV Moldekran	Medlem
Sverre Christian Sørensen	Aker MH AS	Medlem
Åse Waage	Sjøfartsdirektoratet	Observatør
Kato Øvestad	Statoil	Medlem
Jan Gustaf Eriksson	Standard Norge	Sekretær



# Standardens struktur



**Chapter 1: Scope**

**Chapter 2: Normative and informative references**

**Chapter 3: Terms, definitions and abbreviations**

**Chapter 4: General safety requirements**

**Chapter 5: Common requirements**

Annex A: Launching & recovery appliance for life saving equipment

Annex B: Material handling principles

Annex C: Lifting accessories

Annex D: Drilling hoisting equipment

Annex E: Lifts

Annex F: Portable units

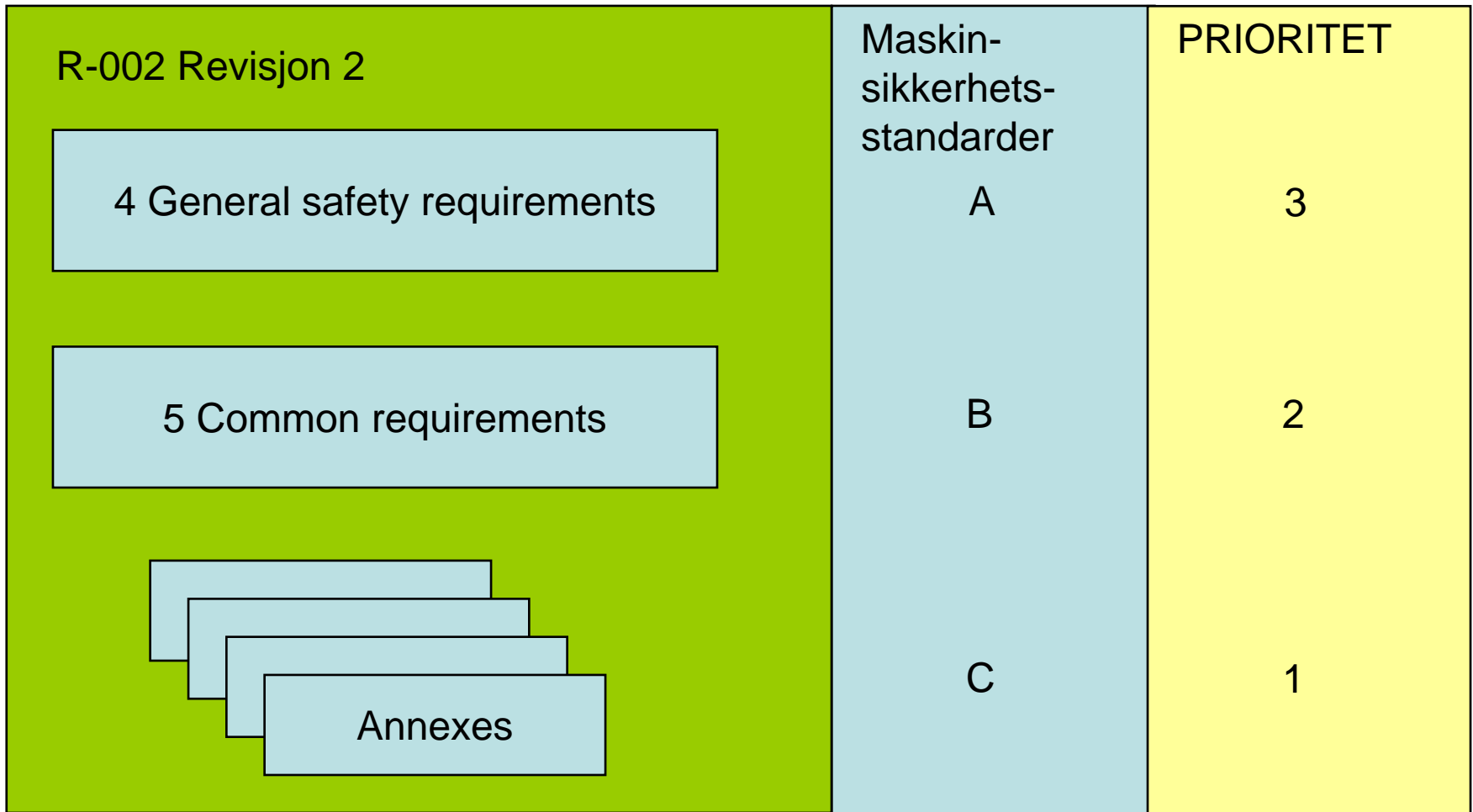
Annex G: Cranes

Annex H: Foundations and suspensions

Innledende del (1 -5) og anneksene A og B har vært ute på høring.



# Tekniske krav - Hierarki



# Generell del – Kap. 4

## 4 General safety requirements

- 4.1 Safety
- 4.2 Fitness for use
- 4.3 Reliability and availability
- 4.4 Principle of safety integration
- 4.5 Inherently safe design
- 4.6 Safeguarding and complementary protective measures
- 4.7 Information for use
- 4.8 Strength proportion
- 4.9 Maintenance
- 4.10 Quality management system
- 4.11 Risk assessment
- 4.12 Risk reduction
- 4.14 Documentation of risk assessment
- 4.15 Verification

# Generell del – Kap. 5



## **5 Common requirements**

- 5.1 Suitability
- 5.2 Materials and products
- 5.3 Fire and explosion
- 5.4 Ergonomics
- 5.5 Environmental conditions
- 5.6 Operational loads
- 5.7 Strength and stability – structure and mechanisms
- 5.8 Strength and stability – classification
- 5.9 High risk applications
- 5.10 Power systems
- 5.11 Electro technical equipment
- 5.12 Non-electro technical equipment

## **5 Common requirements (forst)**

- 5.13 Control systems and control station
- 5.14 Limiting and indicating devices
- 5.15 Emergency systems
- 5.16 Communication
- 5.17 Pneumatics
- 5.18 Hydraulics
- 5.19 Electromagnetic compatibility (EMC)
- 5.20 Exhaust and noise emissions
- 5.21 Utility systems
- 5.22 Fabrication
- 5.23 Installation and assembly
- 5.24 Corrosion protection
- 5.25 Technical construction file

# Krav til personløft

## 5.9 High risk applications

Lifting equipment for critical lifting operations, such as equipment for the lifting of persons, shall be designed using an increased risk coefficient as stated in NS-EN 13001-2.

As a general rule, the risk coefficient for lifting of persons by the use of lifting appliances shall be taken as  $\gamma_n = 1.5$ .

Other requirements for the high risk applications are stated in the annexes.



# Krav til nødsystemer

## Emergency lowering

Power operated lifting appliances on floating installations shall be equipped with an emergency lowering system.

## Emergency operation

Complex lifting appliances and lifting appliances for the lifting of persons shall be equipped with an emergency operation system. The system shall be able to move the load in any direction, in case of a main power failure or a control system failure, utilising a secondary independent power supply system and a secondary independent control system.



# Felles krav til fabrikasjon

Løfteinnretninger skal fabrikeres i henhold til DNV Standard for Certification No. 2.22 "Lifting Appliances", Section 2 Materials and fabrication.. Dette inkluderer eksempelvis:

- Material utvalgelse
- Material sertifikater
- Material kvalitet
- Sveising
- Forming
- Inspeksjon og testing



# Felles krav til vedlikehold

Design for lett og effektivt vedlikehold med  
prioritet på:

- Sikkerhet
- Pålitelighet
- Tilgjengelighet



Alt løfteutstyr  
Risiko vurdering



**Vedlikeholdsprogram**

Komplekse løfteinnretninger



**RCM - Reliability Centered Maintenance**



# Viktige grensesnitt til andre standarder



Hearing edition November 2008

**Annex A (Normative)**  
**Launching and recovery appliances for life saving equipment**

**A.0 General (Group E)**  
 This annex contains technical requirements concerning lifting, suspension and lowering facilities of launching and recovery appliances for life saving equipment. Reference is made to NORSOK S-001. This standard does not cover operational aspects, outfitting, release hooks, lifting attachments, hang-off tags, lifting frames, and other technical facilities which are integral parts of the life saving equipment. For each equipment, reference is made to DNV-OS-E406.

The supplier shall ensure that interfaces regarding operational and technical aspects between launching and recovery appliances and the life-saving equipment are in compliance with this standard.

The structural strength of integral parts of life-saving equipment such as lifting attachments, hang-off tags, lifting frames, etc. shall comply with the requirements of this standard. Dynamic coefficients and risk coefficients shall be applied in accordance with Sections A.0.3, A.0.4 and A.0.5.

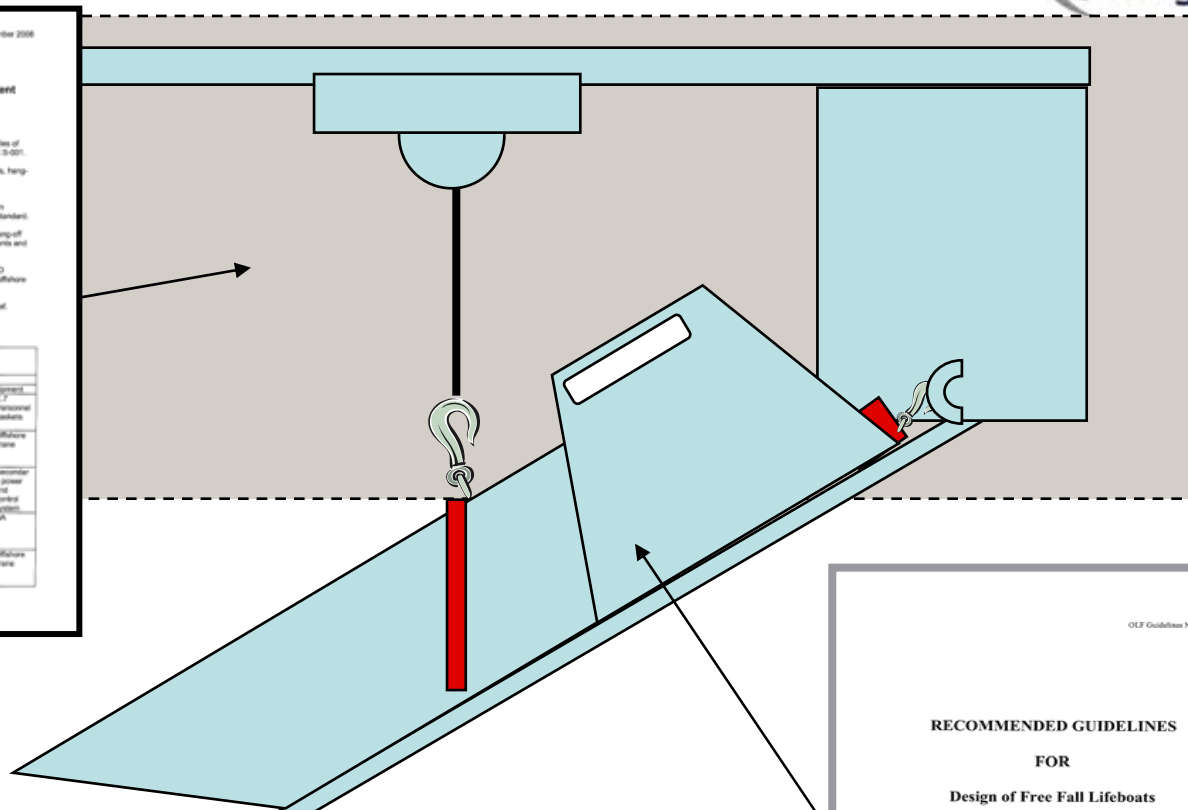
Launching and recovery appliances for life saving equipment shall be in accordance with IMO Regulation 4.01 (2017) No. 850 concerning evaluation and life-saving appliances on mobile offshore units, SOLAS 1974, paragraph 4.27 paragraph 4.28 and 4.29 and 4.30.

The requirements stated in this Annex apply in addition to the requirements of the standard, not in substitution to this standard.

**A.0.1 Group overview**

	Devices							
	Escape equipment				Recovery equipment			
	E.1 Free fall lifeboats	E.2 Convent area lifeboats	E.3 Escape slides	E.4 Rafts	E.5 Escape ladders	E.6 Rescue boats	E.7 Personnel hoists	E.8
Primary means of launching	Gravit or other launching	Gravit lowering	Gravit lowering	Gravit lowering	Gravit lowering	Offshore crane or other MOCB hoist crane	Offshore crane	
Secondary means of launching	Gravit or other lowering	Power lowering	Power lowering	Power lowering	NA	Secondary power or other control system	Secondary power or other control system	NA
Recovery for installation and/or maintenance	Power hoisting	Power hoisting	Power hoisting	Power hoisting	NA	NA	NA	NA
Recovery operations	NA	NA	NA	NA	NA	Offshore crane or other MOCB hoist crane	Offshore crane	

NA – not applicable



**Eksempel:**  
*Launching and recovery arrangement for skid launched lifeboat*

OLF Guideline No. 124

**RECOMMENDED GUIDELINES**  
**FOR**  
**Design of Free Fall Lifeboats**

OLF guideline is also issued as DNV-OS-E406

# Spesielle utfordringer for utsettingsarrangementer

- Mange gjennomtenkte og gode høringskommentarer
- Innretningsforskriften §43 "Evakueringsmidler": *Personell på innretninger skal kunne evakueres raskt og effektivt til et sikkert område under alle værforhold...* → 100-års bølgen
- Re-entry
- Dynamikkfaktorer
- Implementering av EN 13001-serien mht laster og lastkombinasjoner
- Opprinnelig scope utfordret, ref. DNV-OS-E406. Kroker og utløsningsmekanismer i båt var unntatt i høringsutkast av R-002.

# Annex A - Grupper



Table A.1 lists the groups of launching and recovery appliances covered by this Annex.

**Table A.1 – Groups of launching and recovery appliances**

Launching and recovery appliances for life saving equipment							
	Groups						
	Evacuation equipment					Rescue equipment	
	E.1 Free fall lifeboats	E.2 Lifeboats launched by falls and a winch	E.3 Escape chutes	E.4 Rafts	E.5 Escape lines	E.6 Rescue boats	E.7 Personnel transfer carriers

# Annex A – Operasjonsbegrensninger



Table A.2 – NLS and LS conditions

Equipment group	NLS condition			LS condition		
	Max wind speed (m/s) <sup>1)</sup>	Max significant wave height, Hs (m)	Max offlead/ sidelead angle in any direction (°)	Max wind speed (m/s) <sup>1)</sup>	Max significant wave height, Hs (m)	Max angle of heel in any direction (°)
E.1	10	1,0	10	36	16	17
E.2	10	1,0	10	36	16	17
E.3	10	1,0	10	36	16	17
E.4	10	1,0	10	36	16	17
E.5	15	N/A	10	36	N/A	17
E.6	10	3,0	10	17	6,0	17
E.7	10	2,0	10	36	16	17

Notes:

- 1) Mean wind velocity,  $v_m(z)$  at 10 m height above sea (10 min), ref. EN13001-2, 4.2.3.1. Mean wind velocity shall be recalculated into 3s gust winds at the actual height of the launching appliance above sea.
- 2) Example: 17 m/s (10 min) corresponds to ~25 m/s (3s gust wind)



# Dynamikkfaktor

$$\phi_2 = 1 + k_{\Delta} \cdot v_R \cdot \sqrt{\frac{C}{g * R_n}}$$

$$\phi_2 = \frac{F_{bra}}{R_n}$$

- Pick-up fra sjø
- Nødbremsing
- Re-entry
- Test av release system (avhengt)
- Minimum 1,5
- Oppad begrenset til:
  - 2,5 for stående personell
  - 4,0 for sittende personell med setebelter
- Om nødvendig må det være innretninger som begrenser dynamikk (for eksempel sjokk-demper)

# Annex A - Risikokoeffisient

**Risiko koeffisient skal være i henhold til EN13001-2 , paragraf 4.3.2**

For løfting av personell så skal alle lastbærende struktur og maskinkomponenter inkludert ståltau og redskap og innfesting designes med en risiko koeffisient på 1.5\*



\*) : This requirement addresses the subject of increased mechanical strength during the lifting of persons, ref. Machinery Directive Annex I Clause 6.1.1.



# Annex A – Nye definisjoner

- Utgår: "KROK"
- Innfører:
  - Means of connection
  - Release mechanism
  - Release system

# Annex A – Release systems

## Primary release system

The primary release system consists of the following parts:

- A power source (i.e. stored potential energy)
- An actuator
- A control system incorporating a detection system for detection of:
  - seaborne lifeboat
  - one of the suspension points is offloaded

When the conditions for release (seaborne lifeboat and one offloaded suspension point) are detected, the control system shall initiate movement of the actuator to open the release mechanisms simultaneously.



# Annex A – Release mechanism

## Release mechanism

The release mechanism shall be designed in such a way that it will not be forced open by the self weight of the boat, i.e. an external force from an actuator shall be necessary to open the release mechanism. The actuator and release mechanism shall be interconnected in the positive mode in accordance with NS-EN ISO 12100-2 clause 4.5.

Dynamics caused by initiation of the emergency evacuation from installation deck elevation or oscillation during the decent (boat acceleration) shall not cause the release mechanism to open unintentionally.



# Lårelivbåter – to bruksmoduser



Launching appliance functional characteristics		Mode for Installation & Maintenance	Mode for Emergency Evacuation
During wire rope suspended lifeboat	Start	Yes	“Launch”
	Stop	Yes	No
	Emergency stop	Yes	No
	Power hoisting and power lowering by variable speed control	Yes	No
	Gravity lowering by two independent constant speed controls	No	Yes
	Re-entry overload protection	No	Yes
	•Primary brake	Yes	No
	Secondary brake	Yes	No
	Motion limiter up	Yes	No
	Motion limiter down	Yes	No
	Secondary independent power- and control system	Yes	No
Rated capacity limiter	Yes	No	
During seaborne lifeboat	Primary release system	No	Yes
	Back up release system	Yes	Yes

# Krav til styrke – EN 13001 serien

## ”Limit state method”

- NS-EN 13001-1: General principles

## Loads and load effects:

- NS-EN 13001-2: Load effects

## Limit states and proof of competence:

- CEN/TS 13001-3-1: Steel structures
- CEN/TS 13001-3-2: Wire ropes
- prCEN/TS 13001-3-3: Wheel/rail contact
- prCEN/TS 13001-3-4: Machinery
- prCEN/TS 13001-3-5: Hooks



**Table A.3.1.2 – Load combinations for Group E.1 – launching appliances for free fall lifeboats  
Lowering by secondary means of launching and hoisting by means of retrieval**



Categories of loads	Loads		Reference		Load combinations A			Load combinations B			Load combinations C		
			EN 13001-2	NORS OK R-002	Partial safety factors $\gamma_p$	A1	A3	Partial safety factors $\gamma_p$	B1	B3	Partial safety factors $\gamma_p$	C3	C6
Regular	Gravitation acceleration, Impacts	Mass of the launching appliance	4.2.2.1	-	*)	$\Phi_1$	1	*)	$\Phi_1$	1	*)	$\Phi_1$	1
		Mass of the hoist load <sup>1)</sup>	-	A.1.5.1	1,34	$\Phi_2$	1	1,22	$\Phi_2$	1	1,1	-	-
	Inertia forces due to acceleration from hoist drives		4.2.2.4	-	1,34	-	$\Phi_5$	1,22	-	$\Phi_5$	-	-	-
	Displacements		4.2.2.5	-	**)	1	1	**)	1	1	**)	1	1
Occasional	Environmental actions	Wind loads	4.2.3.1	Table A.2	-	-	-	1,22	1	1	1,16	1	-
		Snow and ice loads	4.2.3.2	-	-	-	-	1,22	1	1	1,1	-	-
		Temperature variations	4.2.3.3	-	-	-	-	1,16	1	1	-	-	-
Exceptional	Dynamic <b>overload</b> test <a href="#">load</a>		4.2.4.3	A.1.15	-	-	-	-	-	-	1,1	$\Phi_6^{2)}$	-
	<b>Emergency cut-out</b> <a href="#">Mass of the hoist load</a>			A.1.5.3	-	-	-	-	-	-	1,1	-	$\Phi_2$
<b>Risk coefficient, <math>\gamma_n^{3)}</math></b>			4.3.2	5.9	-	<b>1,5</b>		-	<b>1,5</b>		-	<b>1,0</b> <a href="#">[sum1]</a>	<b>1,5</b>

## Annex B Materials Handling

Prosjekter for utvikling av nye installasjoner skal utarbeide:

- Overordnet material håndtering filosofi
- Offshore kran studie (3D modellering/simulering)
- Detaljert material håndtering plan



FREMDRIFTSPLAN 2009/2010 NORSOK R-002, rev 2

		2009												2010						
		Januar	Februar	Mars	April	Mai	Juni	Juli	August	September	Oktober	November	Desember	Januar	Februar	Mars	April	Mai	Juni	Juli
Main part of standard	Common requirements																			
Annex A	Launcing & recovery appliance for life saving equipment																			
	Justering av tekst																			
Annex B	Material handling principles																			
	Høring																			
	Behandle høring																			
	Oppdatere dokument etter høring																			
	Midlertidig utgivelse Gen, A & B																			
Annex C	Lifting Accessori																			
Annex D	Drilling hoisting																			
Annex E	Elevators and lif																			
Annex F	Portable units																			
Annex G	Cranes																			
Annex H	Foundations an																			
	Forberede høring																			
	Høring																			
	Behandle høring																			
	Oppdatere dok																			
	Utgivelse av kor																			

Foreløpig utgave (hoveddel og Annex A og B er klar innen kort tid.

Komplett standard forventes på høring etter sommeren.

Komplett standard ventes ferdig i løpet av året.

# Erfaringer og lærdom

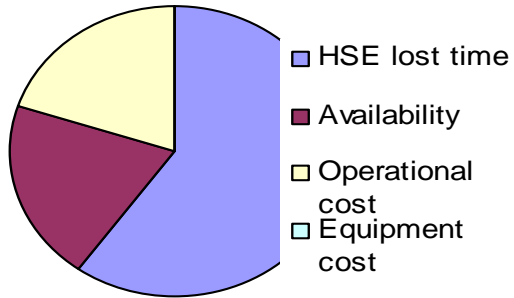
- Tilrettelegger (konsulent) er nødvendig ved omfattende prosjekter
- Dugnader strekker ikke til, enda mindre nå enn før
- Ekstern finansiering er en forutsetning
- Store faglige krav til tilretteleggeren
- Teknisk krevende i grenseland for kjente løsninger
- Pass på grensesnittene, tenk helhetlig system
- Vanskelig (umulig?) å planlegge for det ukjente



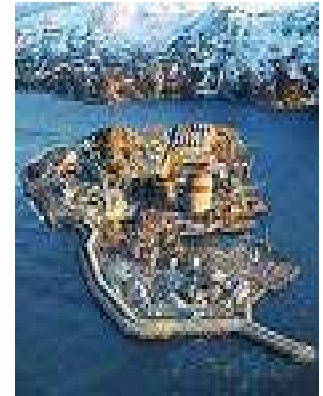
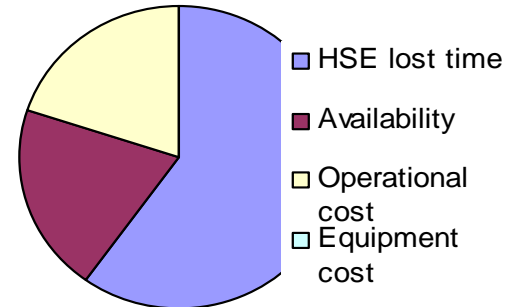
# Safe lifting – improving the bottom line



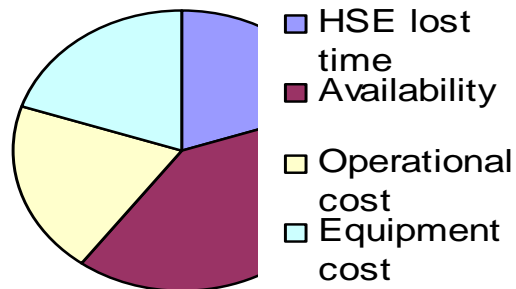
**R-003**



**R-005**



**R-002**



**EN 13852-1**

