

## Helse- og arbeidsmiljø i Barentshavet

*Barents Sea Exploration Collaboration (BaSEC) er et industrisamarbeid for å forberede leteoperasjoner i Barentshavet. BaSECs siktemål er å koordinere operatører og komme med anbefalinger om tiltak som kan danne grunnlag for sikker og effektiv letevirksomhet i Barentshavet. BaSEC har 17 medlemmer, alle operatører på norsk sokkel. BaSEC bygger sine rapporter på beste tilgjengelige kunnskap og på den brede erfaring disse 17 selskapene har fra operasjoner på norsk sokkel og i andre områder med tilsvarende forhold.*

Rapporten om helse og arbeidsmiljø i Barentshavet identifiserer de viktigste risikofaktorene for de som skal ha sitt arbeid på en leterigg i Barentshavet sørøst. Funnene blir nå bearbeidet til konkrete anbefalinger til tiltak som vil bli delt så fort arbeidet er slutført. Rapporten er utarbeidet gjennom en vurdering av eksisterende litteratur og gjennom samarbeidsmøter med deltakere fra de deltakende selskapene.

Rapporten konkluderer med at operasjoner i disse områdene er mulig å gjennomføre på en trygg måte og med et arbeidsmiljø som er fullt ut tilfredsstillende så lenge nødvendige risikoreduserende tiltak er iverksatt.

Rapporten peker på fem hovedområder som må bearbeides videre: hypotermi, frostskafer, ulykker og psykisk stress på grunn av kulde og mørke vinterstid, former for og mengde av nedbør og avstand til land. Det er også identifisert områder som kan påvirke helse- og sikkerhetsrisikoen slik som: manglende medisinsk behandling som følge av avstand, krav til fysisk helse og behovet for spesialisert opplæring for å motvirke negative helseeffekter.

Størst risiko er det funnet å være knyttet til vinteroperasjoner lengst nord i 23. runde arealet på grunn av større sjanse for eksponering mot kulde og lang avstand til land. BaSEC arbeider nå med å se på konkrete virkemidler for å håndtere risikoen. Dette kan inkludere:

- Spesialiserte opplæringstiltak for å forberede medarbeidere på arbeid i kaldt klima
- Anbefalinger til felles retningslinjer for operatørene for hvilke medisinske ressurser som skal være tilgjengelig offshore (inkludert f.eks. personell, telemedisinsk utstyr og medisinske forsyninger)
- Vurdere retningslinjer for krav til fysisk og psykisk egnethet
- Identifisere korrekt verneutstyr, anbefale bekledning for kalde operasjoner

## Health and Working Environment (HWE) work group. Identified risks 2015



Title: <b>Health and Working Environment (HWE) work group. Identified risks 2015</b>		
Document no. :	Contract no.:	Project: <b>BaSEC HWE group</b>

Classification: <b>Open</b>	Distribution: <b>Open</b>
Expiry date: <b>2016-12-31</b>	Status <b>Draft</b>

Distribution date: <b>2016-01-15</b>	Rev. no.: <b>0</b>	Copy no.:
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Author(s)/Source(s): <b>Arne Haugan</b>	
Subjects: HWE risk management of operations in the Barents sea	
Remarks:	
Valid from: <b>2016-01-15</b>	Updated: <b>2016-01-15</b>
Responsible publisher:	Authority to approve deviations:

Techn. responsible (Organisation unit / Name): <b>DPN SSU HWE Arne Haugan</b>	Date/Signature:  <b>X</b> _____
Responsible (Organisation unit/ Name):	Date/Signature:  <b>X</b> _____
Recommended (Organisation unit/ Name):	Date/Signature:  <b>X</b> _____
Approved by (Organisation unit/ Name):	Date/Signature:  <b>X</b> _____

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# 1 Executive Summary

The BaSEC HWE work group was started in 2015 with members from: Statoil, OMV, Lundin, ENGIE E&P Norge and ENI. The group has reviewed literature and arranged two risk assessment workshops in 2015. The main HWE risks based on literature study and the issues identified in the work shops were Hypothermia, freezing injuries, accidents and psychological stress caused by the cold and dark, precipitation and the distance to shore.

Furthermore, insufficient medical treatment because of distance, human fitness and possible lack of customized training can increase the health risk. The highest HWE risks are assessed to be in the Northern part of the Barents Sea and especially in the winter season.

The southern part of the Barents Sea has less HWE risk potential, especially in the summer operations when the risks are considered to be equal to the areas in which we already operate in the Northern Sea. All the identified risks can be controlled by measures identified and described in chapter 5.

## **Key identified areas for further work:**

- Develop special training concepts for work in cold climate (e.g. mandatory e-learning).
- Optional: develop pocket hand-book
- Agree on common operator standards for medical resources offshore (personnel, telemedicine equipment, medical supplies). Joint workshop with the emergency preparedness group.
- Agree on common requirements for medical fitness
- Identify methods for risk assessment of need for Weather Protection.
- Identify applicable PPE including work wear for cold operations

## 2 Introduction

### 2.1 Project scope, description and mandate

The oil companies Statoil, Eni Norge, Lundin Norway, OMV and ENGIE E&P Norge started the program to collaborate and optimize explorations and operations in the Barents Sea named the Barents Sea Exploration Collaboration (BaSEC). The program covers the whole Barents Sea with special focus on the areas included in the 23<sup>rd</sup> licensing round. See Figure 1. The program is led by a steering committee and has 5 working groups.

The mandate of the Health and Working Environment (HWE) group is to ensure the following tasks:

- Agree on a best joint practice to meet requirements/recommendations for HWE in the Barents Sea region north of 73°N.
- Evaluate existing guidelines for assessment of health risk in cold climate
- Identify challenges and opportunities regarding PPE in an arctic climate
- Identify challenges and opportunities regarding:
  - organisational measures to limit HWE risk exposure such as operational procedures and planning of work
  - existing technical measures to limit HWE risk exposure such as rig winterization manuals
  - PPE in arctic climate

- personnel health requirements including both physical and psychological health factors
- Evaluate existing communication capacity related to telemedicine
- Communicate with relevant professional institutions and technical authorities (PSA, NOROG)
- Evaluate need for follow up of actions from Norwegian Oil and Gas seminars "[HMS utfordringer i nordområdene](#)"

## 2.2 The operation area - the Barents Sea

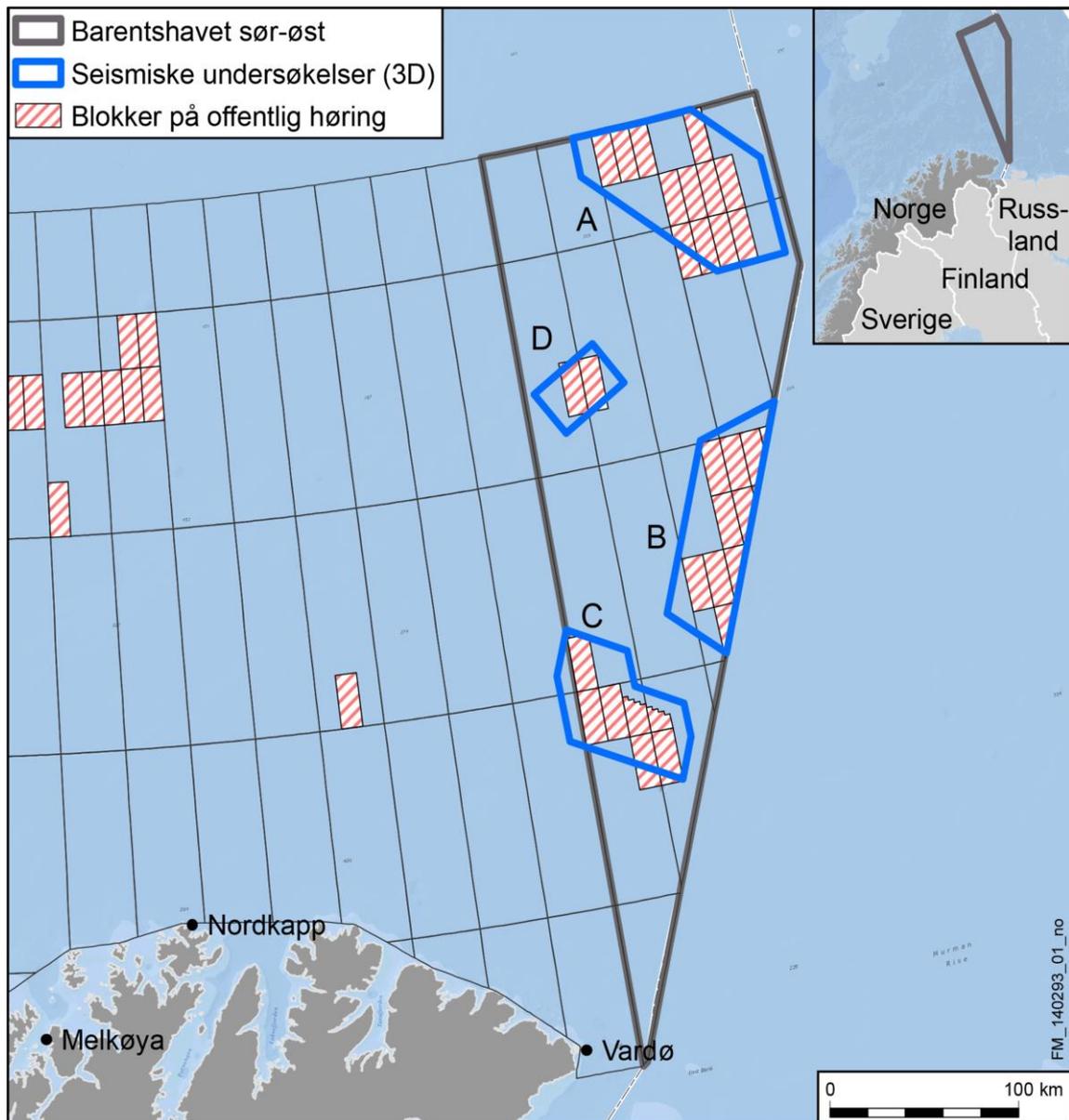


Figure 1. The area included in the scope. In this report the areas A&D is referred to as the **northern part** and areas B&C as the **southern part** of the Barents Sea.

## 2.3 Participants in the HWE group

Arne Haugan*	Statoil
Åshild Tandberg Skjærseth	Statoil

Sønnøve Mclvor	OMV
Henning Veland	OMV
Arne Tiltnes	Lundin
Sigbjørn Dalane	ENGIE E&P Norge
Hege Bjerkås	ENI
Anne Hjelle	ENI

## 2.4 Work method Meetings / workshops

The BaSEC project was launched with a project kick of meeting in March 2016 followed by information meetings with key stakeholders in March& April 2015.

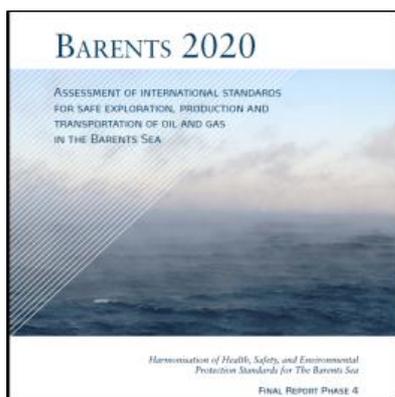
The HWE work group had its first meeting April [14th](#) and decided on work plan and work form. The second meeting was a risk assessment work shop [May 29th](#). The third meeting was the second risk assessment work shop, also including health professionals from the member companies August [26th](#).

## 3 Background information

The work group has collected reports and studies regarding HWE in arctic environments and present the most relevant studies in [a common worksheet](#).

A variety of work shop results, scientific publications, presentations from meetings and seminars, guidelines, proposed standards etc. are collected for use in the BaSEC HWE group. Some relevant part of this information is brought into our risk assessments and suggested mitigating measures. Recent and relevant studies performed the latest years are presented here:

### 3.1 The Barents 2020 project (2012)



*The Russian-Norwegian Barents 2020 project was established in 2007 in order to assess the standards needed for safeguarding people, environment and asset values in the Barents Sea. This project organized seven teams of experts working together to make common recommendations on selected safety critical issues.*

*The objective of the Barents 2020 project was to identify GAPs and recommend standards for oil and gas activities in the Barents Sea. The project was supported by Russian and Norwegian authorities and by the oil and gas industry. DNV GL was managing the international element of the project. Report: [Link](#)*

### 3.2 Oppsummeringsrapport HMS-utfordringer i nordområdene (2014) (Summary report HSE-challenges in the northern areas)



This report [Link](#) presents the results from a series of workshops facilitated by the Norwegian Oil and Gas Association during 2014. A total of 263 participants from the operating companies, contractors, Universities & other research institutions, the Norwegian air force, the authorities (PSA), the labour unions and satellite communication company. The 6 workshops covered the topics; climate & communication, HWE, logistics and helicopter preparedness, risk management and design, preparedness, logistics and ice control.

The specific HWE challenges that were discussed on the two-day seminar in April 2014 were: medical services, health requirements, PPE including clothing, survival suits, shift & rotation, work organisation and travel time/distance and telemedicine. The HWE challenges were identified and

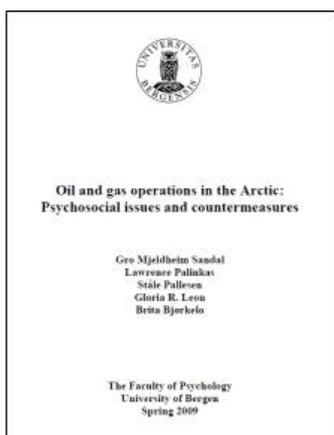
the relevant stakeholder / responsible for actions proposed.

Actions addressed to the operators or ship owners were: further development of PPE, work wear and survival suits, work shift and work organisation, design and winterisation issues.

The need for further research was identified, and the need for special health certificates and medical services offshore were discussed. If the company suggests that the medical and health requirements need improvement, this must be addressed to the Norwegian Directorate of Health.

### 3.3 Oil and gas operations in the Arctic

*Psychosocial issues and countermeasures (The Faculty of Psychology, University of Bergen - 2009)*



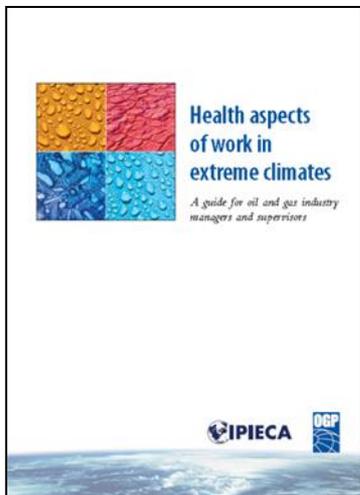
Psychosocial aspects related to work on oil and gas installations in the Arctic may have impacts on health and safety. This report defines the behavioural issues and countermeasures that should be considered. Severe cold, changes in light/dark cycle, long distance for transport and evacuation, and isolation represent stressors that can accentuate operational and individual risks. The report discusses individual health and performance, work teams and organizational behaviour and work organization.

Specific emphasis is put on efficient procedures for selecting personnel based

on psychological assessments and on training programs.

Some countermeasures are recommended and the need for more research and empirical studies is described. [Link to report Presentation](#)

### 3.4 Health aspect of work in extreme climates



These guidelines [Link](#) update two previous publications, *Health Aspects of Work in Extreme Climates within the E&P Industry—The Cold* (Report No. 6.65/270, January 1998) and *Health Aspects of Work in Extreme Climates within the E&P Industry—The Heat* (Report No. 6.70/279, September 1998).

There are two major factors affecting the body's temperature: Environmental factors: air temperature, radiant heat (from the sun and other hot surfaces), air speed and humidity. Metabolic factors: heat generated by body functions increases with the workload. Extremes in atmospheric temperature may have major consequences on the body's thermal reaction. These guidelines aim to provide practical information to line management and health professionals in order to protect and maintain health and prevent accidents, illness and loss of life.

### 3.5 IRHC: "Remote Healthcare Guidance Document for Energy and associated Maritime activities"



This document represents the collective views and discussion points during the Remote Healthcare (RHC) Consensus Workshop 2013, Bergen, Norway. The [document](#) serves as a guidance text to assist remote healthcare practitioners implement health support in remote locations within the energy and its associated marine operations.

## 4 Risk Assessment Method

The BaSEC HWE group decided in the first meeting to arrange two work shops to assess the risks connected to operations in the Barents Sea. The method suggested was based on a HAZID/ WEHRA assessment method.

The risk assessment is used to identify the most important contributors to risks for people, and select the best possible solutions from a health and working environment perspective. The main focus shall be on exposures that can lead to health problems over time.

In the first workshop the main focus was on the special exposures as a function of the operating environment, e.g. Wind Chill Temperature, illumination and psychosocial exposure, but all HWE factors

were assessed (noise, vibration exposure, chemical exposure, ergonomic etc.). Increased job hazard as a function of the weather conditions was also assessed.

The second workshop had focus on medical factors like: onshore resources, emergency preparedness, medical resources, equipment, communication, crew training, and medic. Training, medical and psychological fitness. In this workshop the BaSEC Work group was strengthened with medical experts from the companies.

Risk scoring was done as a table top review and the scoring is coarse and qualitative according to the risk scale presented below. Many of the requirements available are functional and thus difficult to evaluate compliance with. We have assessed the totality of the working environment and the risk factors that may cause negative health impacts or compromise a fully satisfactory working environment. The risk numbers are indicative, representing the different risks seriousness relative to each other. The scoring is done based on the discussion in the work shop and on the knowledge of the environmental conditions and the requirements, standards and guidelines available (e.g. The PSA regulations, NORSOK S-002). The risk score shall be used as decision support to prioritize the mitigating measures.

The risks are scored without any measures applied and include the uncertainty because knowledge is lacking or inconsistent.

SCORE	COLOUR	DESCRIPTION	DETAILS
1	Green	Risk is low and acceptable	Good working conditions
2	Yellow	Risk is controlled	Working conditions OK, but can be improved (ALARP)
3	Red	Risk is unacceptable	Control measures to improve Working conditions shall be applied.
4	Red	Risk is high and unacceptable	Control measures to improve working conditions shall be applied. Immediate action.
5	Black	Risk is unknown	Control measures shall be applied immediately. Detailed risk assessment must be started.

## 4.1 Context

This work is done to assess and seek to mitigate general risks when operating in this area. We do not know which company to operate or explore, or what type of equipment, rig or vessel to be used at this moment. The study is therefore of generic type, can be used by all the participants and must be repeated when details are known. The design of the rigs has not been evaluated since there are different types available and the actual rigs to be used are not decided.

The operating environment was divided into 4 “cases”:

1. Barents Sea North\* – winter operation
2. Barents Sea North – summer operation
3. Barents Sea South\* – winter operation
4. Barents Sea South – summer operation

\* The definition of Barents Sea North & South, see Figure 1.

## 4.2 HWE risk workshop 1

The workshop was held at the ENI Norge office Vestre Svanholmen 29.05.2015. Main focus: general Health and Working Environment risks.

Participants:

Arne Haugan	Advisor/ WE Technology	Statoil
Åshild Tandberg Skjærseth	Leader SSU exploration	Statoil
Sønnøve Mclvor	Sr. HSSE expert	OMV
Henning Veland	HSSE expert	OMV
Arne Tiltnes	Senior Advisor HWE	Lundin
Sigbjørn Dalane	Leader HWE	ENGIE E&P Norge
Hege Bjerkås	HWE Manager	ENI
Anne Hjelle	Senior Advisor HWE	ENI

## 4.3 HWE risk workshop 2

The workshop was held at the GDF SUEZ E&P Norge office Vestre Svanholmen, 26.08.2015. Main focus: Medical risk factors, Health service and human fitness.

Arne Haugan	Advisor/ WE Technology	Statoil
Åshild Tandberg Skjærseth	Leader SSU exploration	Statoil
Sønnøve Mclvor	Sr. HSSE expert	OMV
Henning Veland	HSSE expert	OMV
Arne Tiltnes	Senior Advisor HWE	Lundin
Sigbjørn Dalane	Leader HWE	ENGIE E&P Norge
Invited medical experts:		
Arne MC Evensen	Advisor HWE	Statoil
Svein Øyvind Nondal	Leading Advisor / MD	Statoil
John Hjelle	MD	ENI/ Mediteam BHT
Rune Meldahl	MD	OMV/ Medco BHT
Hans Egil Eckhoff	MD	ENGIE E&P Norge/ Stamina Helse BHT

## 5 Results

The risk workshops divided the operations into 4 scenarios: North – winter, North – summer, South – winter and South – summer. The winter operations in the Barents Sea North were considered as the worst case scenario and therefore the results from this risk scoring is presented in detail in appendix A. The other scenarios have less risks and the summer operations in the Southern part of the Barents Sea was considered as equivalent to the areas we already operate regularly as e.g. the Northern Sea areas. The details from risk scoring are available in appendix A&B and in this [excel sheet](#).

The main identified HWE risks are:

- Risk as a function of cold and dark. Freezing injuries, accidents because of slippery surfaces, falling ice or impaired cognitive function. Possibility for increased hearing impairment or chemical induced health consequences if PPE functions are reduced because of low temperature or combination of clothing and PPE.
- The proposed mitigating measures are: Weather protection (WP), Development of personnel protective equipment (PPE) including clothing, training of personnel, assessment and procedures for operational limitations (work rest schedule and/or organisational measures) and sufficient illumination.
- Risk as a function of precipitation, snow, ice, rain.
- The mitigating measures are: WP, equipment and methods for ice and snow removal, heat tracing of dedicated areas.
- Risks as function of distance and isolation.
- The mitigating measures are: Information, training of personnel, good communication equipment.
- Increased health risks as function of insufficient medical treatment and distance. Deficient human and technical resources.
- Mitigating measures: The right offshore hospital equipment, telemedicine availability, sufficient data transfer capacity, onshore medical support resources, harmonize between companies, consider minimum standard, drug transport procedures and equipment, special medic training and assessment of need for extra medic resources offshore.
- Risk as a function of human fitness.
- The mitigating measures are: Need to assess if there is need for additional health restrictions to personnel. Have focus on psychological fitness in the most remote areas especially.

## 6 Conclusions

The HWE work group has reviewed recent studies on challenges to health and working environment during operations in the Barents Sea. Two risk assessment workshops have been held to further study the risks and propose mitigating measures. Winter operation in the northern part of the Barents Sea has HWE risks that need to be managed. The risks and suggested mitigating actions are presented in this report.

However, the main conclusion is that the operations in these areas are possible to perform in a safe matter and with a working environment that is fully satisfactory when the necessary mitigating measures are applied.

## 7 Abbreviations

BaSEC	Barents Sea Exploration Cooperation
HWE	Health & Working Environment
NOROG	Norwegian Oil and Gas Association
PSA	Petroleum Safety Authority Norway (Petroleumstilsynet)
WP	Weather Protection

## 8 References

*Barents 2020 – Assessment of international standards for safe exploration, production and transportation of oil and gas in the Barents Sea. Final Report. (DNV 2012).*  
*Oppsummeringsrapport HMS utfordringer I nordområdene. (Norsk olje & gass 2014).*

*Health aspects of work in extreme climates: a guide for oil and gas industry managers and supervisors OGP report 398 (IPIECA & OGP, 2008).*

*Oil and gas operations in the arctic: Psychosocial issues and countermeasures. (The Faculty of Psychology, University of Bergen, 2009).*

*IRHC: "Remote Healthcare Guidance Document for Energy and associated Maritime activities". IRHC "Remote Healthcare Workshop 2013 Bergen, Norway". IRHC 2013.*

## **8.1 Additional reading**

ISO 11079, Ergonomics of the thermal environment — Determination and interpretation of cold stress when using required clothing insulation (IREQ) and local cooling effects

ISO 12894, Ergonomics of the thermal environment — Medical supervision of individuals exposed to extreme hot or cold environments

ISO 13731, Ergonomics of the thermal environment — Vocabulary and symbols

ISO 15265, Ergonomics of the thermal environment — Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions

ISO 15743, Ergonomics of the thermal environment — Cold workplaces — Risk assessment and management

ISO 19906, Petroleum and natural gas industries — Arctic offshore structures

NORSOK S-002, Working environment

## App A Risk score tables – Northern part of the Barents Sea

### A.1 Working Environment Risks Northern part of the Barents Sea - Winter

Table A-1 The table presents the Working environment risk scores and suggested mitigating actions as agreed on in risk assessment work shop 1.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors										Comments	Mitigation action	
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate			Job Hazards
1	Polar night - Darkness	1	1	1	1	3	1	1	1	3	1	2	Psychological: SAD (seasonal Affective Disorder) Illumination: safety in operations	Optimisation of illumination. Daylight illumination in selected areas. Focus on psychological fitness (requirements to be assessed by medical personnel). Information to personnel and focus on additional risks in these areas.
2	Polar day - Light											NA		
3	Wind	2	1	2	3	1	1	1	1	1	1	2		Level of weather protection. Method to decide and prioritize weather protection
4	Temperature - cold	2	1	3	3	1	1	3	1	3	1	1	Noise: impaired function of PPE Ergonomic: customized clothing	Training (describe type and contents) Operational requirements Special PPE for operations in the Barents sea
5	Fog													
6	Polar Low	1	1	1	1	1	1	1	1	1	1	3	Presuppose that work is terminated temporarily.	Weather forecast, operational procedures.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors										Comments	Mitigation action		
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate			Job Hazards	
7	Snow - precipitation	1	1	3	1	2	1	1	1	1	1	1	3	Ergonomic: Remove snow, slippery surfaces	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
8	Icing -air	1	1	3	1	1	1	1	1	1	1	1	3	Ergonomic: Removal of ice and operation of equipment. Slippery surfaces and falling ice	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
9	Sea spray	1	1	3	1	1	1	1	1	1	1	1	3	Ergonomic: Removal of ice and operation of equipment. Slippery surfaces	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
10	Remoteness, distance	1	1	1	1	1	1	1	1	3	1	1	1	Psychological: isolation	Focus on psychological fitness in routine medical examinations (requirements to be assessed/defined by medical personnel). Information to personnel and focus on additional risks in these areas.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors									Comments	Mitigation action		
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial			Indoor climate	Job Hazards
12	Satellite - Communication	1	1	1	1	1	1	1	1	2	1	1	Psychological: Deficient social contact with e.g. family.	Focus on psychological fitness in routine medical examinations (requirements to be assessed/defined by medical personnel). Information to personnel and focus on additional risks in these areas. Eventually improve communication capacity / coverage.
12	Acclimatization/Culture	1	1	1	1	1	1	1	1	3	1	1	Psychological: How to cope when working in a new and unaccustomed climate.	Information to personnel and focus on additional risks in these areas.

## A.2 Medical and health risks Northern part of the Barents Sea – Winter

Table A-2 The table presents the Medical and Health risk scores and suggested mitigating actions as agreed on in risk assessment work shop 2.

No.	Health & Working Environment Risk variables/ factors	Medical							Comments	Mitigation action
		Medical fit	Psychological fit	Special training, medic	Training crew	equipment/communication	Medic resources	emergency preparedness		
4	Temperature - cold			2	2	2		2		<p>Training, procedures and equipment in SAR (search and rescue) for treatment of hypothermia. Also applicable for Stand - by vessels.</p> <p>Transport requirements for drugs and other medicals must be specified (e.g. frost proof)</p>
10	Remoteness, distance	3	1	2	2	2	3	2	2	<p>People on e.g. insulin, anticoagulant must be restricted.</p> <p>Medical fitness. Special medical certificate. Hospital equipment: Check if standard North sea hospital equipment is adequate. Tele medical equipment mandatory. Real time image and data transfer mandatory. Automatic heart compressor mandatory. Onshore resources: Anchoring/connection against specialist health service (including psychiatry, formalized, good dialog with helicopter operators. Emergency/preparedness: Harmonizing / standardizing between companies regarding: emergency medicine, procedures and documentation / registration. Recommend 2 special nurses in these areas. Consider if there is need for minimum standards (e.g.. issued by the Norwegian Oil and Gas Association), competency matrix for medical personnel.</p>

### A.3 WE risks - Northern part of the Barents Sea - Summer

Table A-3 a) The WE risk scores are the same as in the winter, except that items No. 2 & 5 now has red risk scores caused by the long summer daylight period and the increased fog probability.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors										Comments	Mitigation action	
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate			Job Hazards
2	Polar day - Light	1	1	1	1	3	3	1	1	3	3	2	Radiation: UV radiation Illumination: glare Indoor climate: heat from sun Psychological: Sleep deprivation (SAD)	Optimisation of illumination. Focus on psychological fitness (requirements to be assessed by medical personnel). Information to personnel and focus on additional risks in these areas. UV protection (especially eyes)
5	Fog	1	1	1	1	2	1	1	1	3	1	3	Psychological: delay in personnel transport Visibility	Operational requirements

#### A.4 Medical and health risks Northern part of the Barents Sea – Summer

Table A-4 a) The Medical and Health risk scores and suggested mitigating actions are identical to North-Winter, see Table A2. on item No.10. The temperature, cold risk (item No. 4.) is not considered a risk in the summer period.

No.	Medical							Comments	Mitigation action
	Medical fit	Psychological fit	Special training, medic	Training crew	equipment/communication	Medic resources	emergency preparedness		
10	3	1	2	2	2	3	2	2	<p>People on e.g. insulin, anticoagulant must be restricted.</p> <p>Medical fitness. Special medical certificate. Hospital equipment: Check if standard North sea hospital equipment is adequate. Tele medical equipment mandatory. Real time image and data transfer mandatory. Automatic heart compressor mandatory. Onshore resources: Anchoring/connection against specialist health service (including psychiatry, formalized, good dialog with helicopter operators. Emergency/preparedness: Harmonizing / standardizing between companies regarding: emergency medicine, procedures and documentation / registration. Recommend 2 special nurses in these areas. Consider if there is need for minimum standards (e.g.. issued by the Norwegian Oil and Gas Association), competency matrix for medical personnel.</p>

## App B Risk score tables – Southern part of the Barents Sea

### B.1 WE risks – Southern part of the Barents Sea – Winter

Table B-1 WE risk scores and mitigations are identical to the Northern part – Winter, see Table A.1, with the exception of item No. 10 which has risk score 2-yellow because of less distance to land and thus less remoteness and psychological isolation.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors											Comments	Mitigation action
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate	Job Hazards		
1	Polar night - Darkness	1	1	1	1	3	1	1	1	3	1	2	Psychological: SAD (seasonal Affective Disorder) Illumination: safety in operations	Optimisation of illumination. Daylight illumination in selected areas. Focus on psychological fitness (requirements to be assessed by medical personnel). Information to personnel and focus on additional risks in these areas.
2	Polar day - Light	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
3	Wind	2	1	2	3	1	1	1	1	1	1	2		Level of weather protection. Method to decide and prioritize weather protection
4	Temperature - cold	2	1	3	3	1	1	3	1	3	1	1	Noise: impaired function of PPE Ergonomic: customized clothing	Training (describe type and contents) Operational requirements Special PPE for operations in the Barents sea
5	Fog													
6	Polar Low	1	1	1	1	1	1	1	1	1	1	3	Presuppose that work is terminated temporarily.	Weather forecast, operational procedures.

No.	Health & Working Environment Risk variables/ factors	Working Environment Factors										Comments	Mitigation action		
		Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate			Job Hazards	
7	Snow	1	1	3	1	2	1	1	1	1	1	1	3	Ergonomic: Remove snow, slippery surfaces	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
8	Icing -air	1	1	3	1	1	1	1	1	1	1	1	3	Ergonomic: Removal of ice and operation of equipment. Slippery surfaces and falling ice	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
9	Sea spray	1	1	3	1	1	1	1	1	1	1	1	3	Ergonomic: Removal of ice and operation of equipment. Slippery surfaces and falling ice	Describe methods and supply equipment for removal of snow and ice. Procedures, equipment designed to be operated wearing mittens and gloves.
10	Remoteness	1	1	1	1	1	1	1	1	2	1	1	1	Psychological: isolation	Information to personnel and focus on additional risks in these areas.
11	Sat - Com	1	1	1	1	1	1	1	1	2	1	1	1	Satellite communication is not a significant problem	
12	Acclimatization/Culture	1	1	1	1	1	1	1	1	3	1	1	1	Psychological: How to cope when working in a new and unaccustomed climate.	Information to personnel and focus on additional risks in these areas.

## B.2 Medical and health risks Southern part of the Barents Sea – Winter

Table B-2 The Medical and Health risk scores are considered as medium (yellow) or low (green).

No.	Area	Medical								Comments	Mitigation action
		Medical fit	Psychological fit	Special training, medic	Training crew	equipment/communication	Medic resources	emergency preparedness	Onshore resources		
4				2	2	2		2			Training, procedures and equipment in SAR (search and rescue) for treatment of hypothermia. Also applicable for Stand - by vessels. Transport requirements for drugs and other medicals must be specified (e.g. frost proof)
10		2	1	2	2	2	2	2	2	2	Assess if people on e.g. insulin, anticoagulant needs to be restricted. Focus on psychological fitness in routine medical examinations (requirements to be assessed/defined by medical personnel).

### B.3 WE risks – Southern part of the Barents Sea – Summer

Table B-3 a) Only the polar day light (item 2) and possible fog (item 5) and subsequent delay in personnel transport were considered as red risks in the southern part in the summer season.

No.	Area	Activity	Health & Working Environment Risk variables/ factors	Working Environment Factors										
				Noise	Vibration	Ergonomics	WCT	Illumination	Radiation	Chemical	Biological	Psychosocial	Indoor climate	Job Hazards
2			Polar day - Light	1	1	1	1	3	3	1	1	2	2	2
5			Fog	1	1	1	1	2	1	1	1	3	1	3

## B.4 Medical and health risks Southern part of the Barents Sea – Summer

Table B-4 The Medical and Health risk scores are all medium (yellow) or low (green). The southern part of the Barents Sea is comparable to areas that we already operate in and are familiar with.

No.	Medical								Comments	Mitigation action
	Medical fit	Psychological fit	Special training, medic	Training crew	equipment/communication	Medic resources	emergency preparedness	Onshore resources		
10	2	1	2	2	2	2	2	2	Assess if people on e.g. insulin, anticoagulant needs to be restricted.	Focus on psychological fitness in routine medical examinations (requirements to be assessed/defined by medical personnel).