

ISO 35101:2017-10 (E)

Petroleum and natural gas industries - Arctic operations - Working environment

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Abbreviated terms	4
5	Risk management	5
5.1	General	5
5.2	Management of working environment risks in the design process	5
5.3	Mitigating measures -- Risk reduction principles	5
5.3.1	Hierarchy of controls	5
5.3.2	ALARP	6
5.4	Special assessment in Arctic environment	6
5.4.1	Input to design specification	6
5.4.2	Risk assessments in operation -- Operational solutions	8
6	Management of working environment hazards in Arctic operations	8
6.1	General	8
6.2	Information on climate conditions	8
6.3	Illumination	9
6.4	Visibility	9
6.4.1	General	9
6.4.2	Preventing glare	10
6.5	Physiological and psychosocial effects (human performance)	10
6.6	Noise and vibration	11
6.6.1	General	11
6.6.2	Noise	11
6.6.3	Vibration	11
6.6.4	Hand-arm vibration	11
6.7	Hazardous chemicals	11
6.8	UV radiation	12
6.9	Wildlife	12
7	Environmental and cold climate preconditions	12
7.1	General	12
7.2	Metocean data	12
7.3	Assessment of the need for permanent weather protection	13
7.4	Area wind chill temperature (WCT) -- CFD simulations	13
8	Working environment design philosophy and technical solutions	14
8.1	General	14
8.2	Design process and design requirements for Arctic conditions	14
8.3	Enclosures for weather protection	15
8.4	Anti-icing, anti-freezing and de-icing	15
8.5	Anti-icing and anti-freezing measures	16
8.6	De-icing measures	17

8.7	Work areas and access ways protection	17
8.8	Falling ice protection	18
8.9	Anti-slip systems	18
8.10	Cold surfaces protection	18
8.11	Safety equipment	18
8.12	Heat tracing and insulation	19
8.13	Hospital	19
8.14	Living quarters	19
8.15	Cabins	19
9	Operational requirements for prevention and management of cold-related problems	19
9.1	General	19
9.2	Buddy control system	20
9.3	Background	20
9.4	Cold risk management system	20
9.5	Cold risk assessment	21
9.5.1	General	21
9.5.2	Identification of cold-related problems at work (Stage 1)	22
9.5.3	Determination of wind cooling (wind chill exposure) (Stage 2)	22
9.5.4	Work, warm-up and recovery regimes (Stage 3)	24
9.6	Clothing and personal protection regimes	25
9.6.1	General	25
9.6.2	Hand protection	26
9.6.3	Foot protection	27
9.6.4	Face protection -- Cold air protection	27
9.6.5	Chemical respiratory protection	28
9.7	Fitness for work in the Arctic environment	28
9.7.1	General	28
9.7.2	Cold-related health risks	28
9.7.3	Cold-related health assessment	28
9.7.4	Medical health examination associated with operation in the cold	29
9.7.5	Suggested health requirements	29
9.7.6	Other aspects relevant to assessment of fitness for work	30
9.8	Health and stress management	31
9.8.1	Psychosocial stress exposure	31
9.8.2	Health and stress management	31
9.9	First aid and medical provision	31
9.9.1	Medical support assessment	31
9.9.2	Medical facilities	31
9.9.3	Medical evacuation	32
10	Education, training and supervision	32
	Annex A (informative) Working environment studies and deliverables in project development	34
	Annex B (informative) Assessment of weather protection	36
	Bibliography	40