ISO 35106:2017-12 (E)

Petroleum and natural gas industries - Arctic operations - Metocean, ice, and seabed data

Contents

Page

Foreword vii

Introduction viii

1 Scope 1

2 Normative references 1

3 Termsanddefinitions 1

4 Symbols and abbreviated terms 7
4.1 Symbols 7
4.2 Abbreviated terms 8

5 General requirements 8
5.1 General 8
5.1.1 Physical environmental data requirements 8
5.1.2 Relationship with ISO 19901-1 and ISO 19906 9
5.1.3 Data sources 9
5.1.4 Selection of appropriate parameters 9
5.1.5 Physical environmental data monitoring 9
5.1.6 Data storage 10
5.2 Particular aspects 10
5.2.1 Region of interest 10
5.2.2 Criticality 10
5.2.3 Variability 10
5.2.4 Statistical 11
5.2.5 Forecasting 12
5.2.6 Weather windows 12
5.2.7 Climatic trends 13
5.2.8 Expertise and experience 13

6 Water depth, tides and storm surges 13
6.1 General 13
6.2 Bathymetry 14
6.3 Tides 14
6.4 Storm surges 14

7 Wind 15
7.1 General 15
7.2 Polar lows 15
7.3 Katabatic wind 15
7.4 Low level arctic jet 15

8 Waves 15
8.1 General 15
8.2 Wave-induced ice motions 15
8.3 Wave transmission through sea ice 15

9 Currents 16
9.1 General 16

9.2 Currents for sea ice and iceberg drift prediction 16
9.3 Current records 16

10 Temperature 16
10.1 General 16
10.2 Sea water temperature 17
10.3 Air temperature 17

11 Atmospheric parameters 17
11.1 General 17
11.2 Daylight considerations 17
11.3 Visibility and cloud ceiling 17
11.4 Precipitation 18

12 Sea ice 18
12.1 General 18
12.2 Sea ice season 18
12.2.1 Operations planning 18
12.2.2 During operations 19
12.2.3 Design 19
12.3 Sea ice coverage 19
12.3.1 Operations planning 19
12.3.2 During operations 19
12.3.3 Design 20
12.4 Sea ice thickness 20
12.4.1 Operations planning 20
12.4.2 During operations 20
12.4.3 Design 20
12.5 Sea ice drift and movement 21
12.5.1 Operations planning 21
12.5.2 During operations 21
12.5.3 Design 21
12.6 Sea ice features and conditions 22
12.6.1 General 22
12.6.2 Operations planning 22
12.6.3 During operations 22
12.6.4 Design 23
12.7 Physical properties 23

13 Icebergs 23
13.1 General 23
13.1.1 General data requirements 23
13.1.2 Data collection 24
13.1.3 Data analysis and presentation 24
13.2 Iceberg location and areal density 25
13.2.1 Operations planning 25
13.2.2 During operations 25
13.2.3 Design 26
13.3 Size, shape and stability 26
13.3.1 Operations planning 26
13.3.2 During operations 26
13.3.3 Design 27
13.4 Iceberg drift 27
13.4.1 Operations planning 27
13.4.2 During operations 28
13.4.3 Design 28
13.5 Metocean and sea ice context 28
13.5.1 Operations planning 28
13.5.2 During operations 28
13.5.3 Design 29
13.6 Physical properties 29

14 Snow and ice accretion 29
14.1 General 29
14.1.1 Consideration of accretion 29
14.1.2 Accretion data collection 29
14.2 Snow accretion 30
14.2.1 Classification 30
14.2.2 Data collection 30
14.2.3 Analysis and presentation 31
14.3 Atmospheric ice accretion 32
14.3.1 Classification 32
14.3.2 Data collection 32
14.3.3 Analysis and presentation 33
14.4 Sea spray ice accretion 33
14.4.1 Classification 33
14.4.2 Data for collection 33
14.4.3 Analysis and presentation 34

15 Seabed considerations 34
15.1 Context 34
15.1.1 General 34
15.1.2 Design issues 35
15.1.3 Operational issues 35
15.2 Ice gouge 35
15.2.1 Requirements for collection 35
15.2.2 Requirements for analysis and interpretation 37
15.2.3 Requirements for documentation 37
15.3 Strudel scours 37
15.3.1 Context 37
15.3.2 Measurements 38
15.3.3 Analysis and interpretation 38
15.4 Submarine permafrost 38
15.4.1 General 38
15.4.2 Design issues 39
15.4.3 Operational issues 39
15.4.4 Site investigations 39

16 Coastal considerations 39
16.1 Context 39
16.2 General coastal considerations 40
16.3 Specific coastal considerations 40
16.3.1 Water levels 40
16.3.2 Wind 40
16.3.3 Waves 40
16.3.4 Currents 40
16.3.5 Temperature 40
16.3.6 Visibility 40
16.3.7 Sea ice 40
16.3.8 Icebergs 41
16.3.9 Snow and ice accretion 41
16.3.10 Seabed considerations 41

17 Onshore considerations 41
17.1 Context 41
17.2 Onshore permafrost considerations 42
17.2.1 General 42
17.2.2 Design issues 42
17.2.3 Operational issues 42
17.2.4 Terrain data requirements 43
17.2.5 Permafrost characterization 43
17.3 Land erosion risks 44
17.3.1 General 44

17.3.2 Shoreline and riverine erosion 44
17.3.3 Flooding and drainage risks 44
17.4 Transportation access 45
17.4.1 General 45
17.4.2 Ice road data needs 45
17.5 Inland snow data 45
17.5.1 General 45
17.5.2 Snow measurements 45

Annex A (informative) Additional information and guidance 46

Bibliography 115