

~~Standardisering i eksponert havbruk~~

Standardisering i Havbruk til Havs

Hvorfor vi ønsker det og hvordan vi arbeider mot det.

Standardisering av løsninger til bruk i havbruk til havs



**Norsk Industri**



**aibel<sup>®</sup>**

**NSK**  
**SHIP DESIGN**



**moreld**  
aqua

# Standardisering av løsninger til bruk i havbruk til havs



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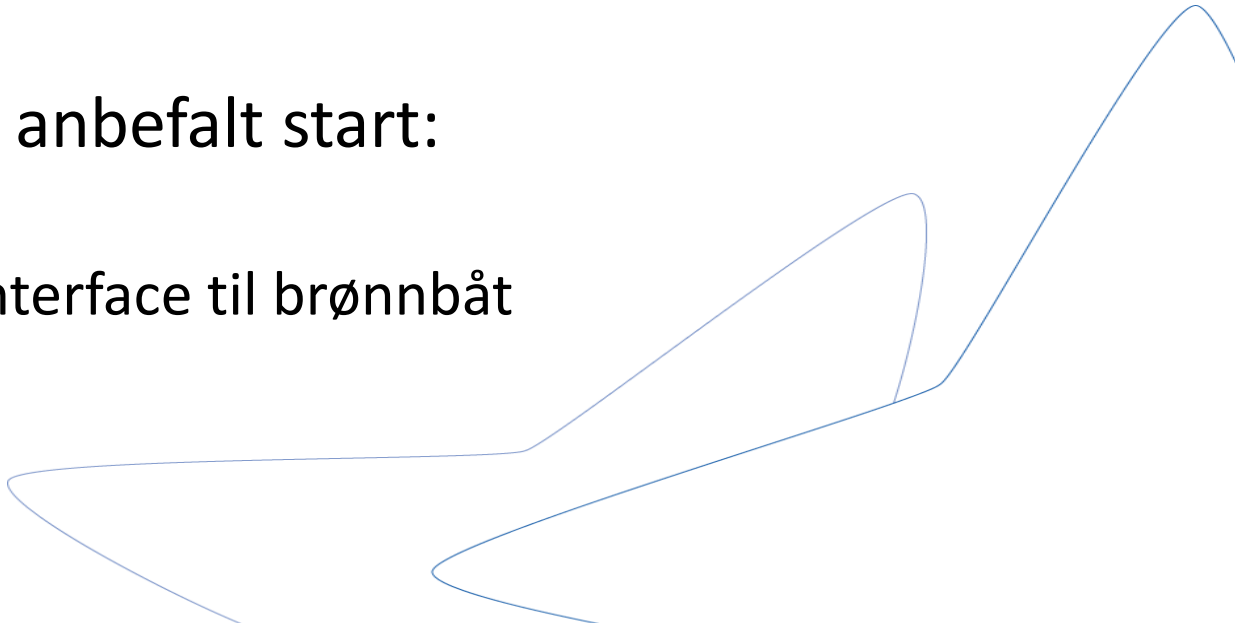


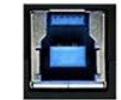
moreld  
aqua

Designer  
løsninger for HtH

Plass til  
flere

# Ide

- Sørge for mulighet for at service-funksjoner fungerer på tvers av ulike Havbruk til Havs konsepter
  - Initiativ fra Aker Solution, Aibel, Moreld Aqua og NSK Ship Design
  - En lang liste med mulige tema, men anbefalt start:
    - [fôr] Levering av fôr
    - [fisk] Overføring av fisk til brønnbåt: interface til brønnbåt
    - [folk] Personell-transport (crew-bytte)
- 

**USB Plug (Male):****Micro B****Mini B****8 Pin Lightning****Type A 2.0****Type B 2.0****Type A 3.0****Type B 3.0****Type C 3.0****USB Port (Female):****Micro B****Mini B****8 Pin Lightning****Type A 2.0****Type B 2.0****Type A 3.0****Type B 3.0****Type C 3.0**





## RECOMMENDED BOAT LANDING GEOMETRY FOR PUBLIC RELEASE

- THE AIM OF THE OWA PROGRAM IS TO REDUCE THE COST OF OFFSHORE WIND TO BE COMPETITIVE WITH CONVENTIONAL ENERGY GENERATION AS WELL AS TO PROVIDE INSIGHTS REGARDING INDUSTRY STANDARD (AND BEST PRACTICE) HEALTH AND SAFETY REQUIREMENTS.
- THE AIM OF THIS GENERIC BOAT LANDING GEOMETRY IS TO IMPROVE CONSISTENCY ACROSS NEW WIND FARM DEVELOPMENTS. ALL BOAT LANDINGS SHALL AIM TO BE ROBUST AND HAVE SUFFICIENT STRENGTH TO WITHSTAND, WITHOUT PERMANENT DAMAGE, THE EXPECTED OPERATIONAL LOADS THROUGHOUT ITS DESIGN LIFE. CONSISTENCY CAN HELP REDUCE OPERATIONAL COSTS AND MEANS PERSONNEL CAN GAIN FAMILIARITY WITH THE LAYOUT.
- THE BOAT LANDING WILL BE DESIGNED TO REDUCE THE IMPACT ON THE PRIMARY STEEL BY HAVING FATIGUE EFFICIENT CONNECTIONS AND ALSO A FAIL FIRST MECHANISM UNDER ABNORMAL LOADS.
- THE ASSESSMENT COMPLETED FOR THIS PROJECT AND THE CONCLUSIONS MADE ARE FOR A GENERIC BOAT LANDING DESIGN. THE PROJECT WAS COMPLETED ON A NUMBER OF ASSUMPTIONS TO ENABLE DESIGN INPUT PARAMETERS TO BE DEFINED. FOR A SPECIFIC PROJECT THESE ASSUMPTIONS SHOULD BE CHECKED AND VALIDATED AGAINST AVAILABLE DATA TO ENSURE THEY ARE APPROPRIATE. THESE DRAWINGS ARE FOR A GENERIC DESIGN CASE AND NOT INTENDED TO REPLACE A DETAILED BOAT LANDING DESIGN ASSESSMENT AND REVIEW PROCESS.

THESE PUBLICLY AVAILABLE DRAWINGS ARE PART OF A COMPREHENSIVE STUDY AND REMAIN THE INTELLECTUAL PROPERTY OF THE OWA.

### KEY ASSESSMENT PARAMETERS

#### IMPACT FORCE

THE OPERATIONAL AND ABNORMAL DESIGN CTV IMPACT FORCES ONTO BOAT LANDING SHOULD BE CALCULATED USING THE METHODOLOGY IN DNVGL-ST-0437 [7]. THE FOLLOWING COMPONENTS ARE RECOMMENDED TO BE ACCOUNTED FOR IN THE CALCULATION OF THE IMPACT FORCE.

- STIFFNESS & ACCEPTABLE DEFORMATION OF CTV FENDER
- EXPECTED MAXIMUM DISPLACEMENT OF CTV IN OPERATION AND ASSOCIATED ADDED MASS FACTOR
- DECELERATION OF CTV DURING VESSEL IMPACT NOTING ERGONOMIC SAFETY LIMITS FOR PERSONNEL
- DEFLECTIONS OF BOTH FOUNDATION (PRIMARY AND SECONDARY STRUCTURE) & CTV FENDER TO BE USED IN ENERGY BALANCE CALCULATION
- CONTRIBUTIONS FROM WAVE AND CURRENT TO VESSEL IMPACT SPEED

AN APPROACH ANGLE FOR IMPACT OF +/-45 DEGREES FROM THE CENTRELINE OF THE BOAT LANDING WAS REVIEWED AS PART OF THIS PROJECT

WORK ON IMPACT FORCE CALCULATION IS ONGOING AS PART OF OWA ACTIVITIES

#### CRUSHING FORCE

IF CTVs WITH A GRIPPER DOCKING SYSTEM (FOR EXAMPLE, A CLAMPING SYSTEM WITH ASSOCIATED MOTION COMPENSATING SYSTEM POSITIONED AT THE FRONT OF THE CTV WHICH CLAMPS TO A BUMPER BAR) ARE USED ACROSS THE WIND FARM, THE BUMPER BARS WILL NEED TO BE CHECKED FOR LOCAL BUCKLING AND FAILURE DUE TO THE CRUSHING FORCE FROM THE DOCKING CLAMP.

MATERIAL AND LOAD FACTORS SHOULD BE APPLIED ACCORDING TO RELEVANT CODE REQUIREMENTS.

#### BOAT BUMPER IMPACT ELEVATION INPUTS

AT THE HIGHEST TIDAL CONDITIONS DURING WHICH TRANSFERS ARE TO BE UNDERTAKEN, AND ALLOWING FOR VESSEL HEAVE DUE TO SEA STATE, THE VESSEL MUST NOT BE CAPABLE OF RIDING OVER THE TOP OF THE BUMPER BARS, AND ANY REST PLATFORMS ON THE LADDER MUST BE CLEAR OF THE VESSEL [6].

#### UPPER LIMIT ASSUMPTIONS AND VALUES:

- GLOBAL WATER LEVEL RISE = + 0.3m
- WATER DEPTH UNCERTAINTY = + 0.5m
- MAXIMUM VESSEL FREEBOARD = + 4.0m
- WAVE CREST HEIGHT @ Hs OF 2.5m =  $2.5 * 1.86 * 0.6 = + 2.8m$

TOTAL: HAT + 7.6m

AT THE LOWEST TIDAL CONDITIONS DURING WHICH TRANSFERS ARE TO BE UNDERTAKEN, AND ALLOWING FOR VESSEL HEAVE DUE TO SEA STATE, THE VESSEL MUST NOT BE AT RISK OF BECOMING TRAPPED BENEATH THE BUMPER BARS [6]

#### LOWER LIMIT ASSUMPTIONS AND VALUES:

- WATER DEPTH UNCERTAINTY = - 0.5m
- MINIMUM VESSEL FREEBOARD = + 0.5m
- WAVE TROUGH HEIGHT @ Hs OF 2.5m =  $2.5 * 1.86 * 0.4 = - 1.9m$

TOTAL: LAT - 1.9m

#### G+ GUIDELINES [6]

##### SAFE ZONE:

A SAFE ZONE TO PROTECT PERSONNEL FROM POTENTIAL CRUSHING, EXTENDING FROM THE LADDER FACE OF 500mm SHALL BE MAINTAINED AT ALL TIMES.

##### MAXIMUM STEPPING DISTANCE:

THE DISTANCE FROM THE LADDER TO A SAFE AND SUITABLE NON-SLIP WALKING SURFACE ON THE CTV SHALL BE A MAXIMUM OF 650mm FROM THE CENTRELINE OF THE LADDER RUNG TO ALLOW SAFE ACCESS.

A DISTANCE OF 850mm FROM THE FRONT OF THE BUMPER TO THE CENTRELINE OF THE LADDER RUNG IS RECOMMENDED AS THIS FULFILLS THESE REQUIREMENTS, WHERE POSSIBLE 850mm SHOULD BE USED ACROSS DIFFERENT WIND FARM DEVELOPMENTS TO IMPROVE CONSISTENCY AND AID FAMILIARITY IN OPERATIONS.

THE 850mm BUMPER OFFSET IS MOST APPLICABLE IN AREAS OF NEW WIND FARM DEVELOPMENTS, WHERE PROJECTS ARE TO BE LOCATED CLOSE TO EXISTING WIND FARMS. THE LAYOUT OF THE EXISTING WIND FARMS SHOULD BE TAKEN INTO CONSIDERATION. IT IS NOTED THAT IN BOTH UK & EUROPEAN WATERS A BUMPER OFFSET DISTANCE OF 770mm IS COMMONLY USED AS PER RECOMMENDATIONS IN [5].

#### CORROSION ALLOWANCE

DUE TO MATERIAL LOSS THROUGH ABRASION AND IMPACT BY CTVs A CORROSION ALLOWANCE OF BETWEEN 2-4mm IS RECOMMENDED IN [8]. A CORROSION ALLOWANCE OF 4mm IS RECOMMENDED FOR THE BUMPER BAR SURFACES THAT ARE SUBJECT TO ABRASION FROM CTVs AND 2mm FOR OTHER SURFACES. THE REQUIRED CORROSION ALLOWANCE IN EACH PROJECT SHOULD BE REVIEWED ALONGSIDE THE PAINT/COATING SPECIFICATION AND THE CORROSION PROTECTION STRATEGY.

ALL MEMBERS SHALL AIM TO BE SEALED TO PREVENT INTERNAL CORROSION.

A THERMALLY SPRAYED COATING CAN BE APPLIED FOR ADDITIONAL CORROSION PROTECTION; THIS SHOULD BE REVIEWED ON A PROJECT SPECIFIC BASIS.

#### PROJECT DETAILS

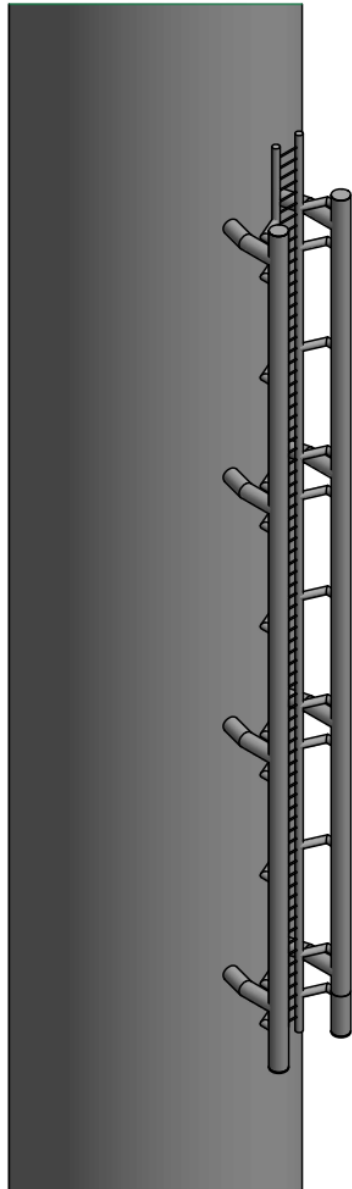
AS PART OF THIS PROJECT OTHER AREAS OF THE BOAT LANDING DESIGN WERE REVIEWED. THESE ARE DETAILED IN [1] AND INCLUDE: CONNECTION DETAILS TO PRIMARY STRUCTURE INCLUDING FATIGUE IMPLICATIONS, SYMPATHETIC LOADING EFFECTS, FAIL FIRST DESIGN CRITERIA, AREAS OF DESIGN TO AID OFFSHORE REPLACEMENT OF BOAT LANDING IF DAMAGED, VORTEX INDUCED VIBRATION & SUPPORT ELEVATIONS.

#### REFERENCES

- [1] MARKET REVIEW AND BOAT LANDING DESIGN BRIEF, REV A2, ATKINS, FEB 2019
- [2] LOADS AND SITE CONDITIONS FOR WIND TURBINES, DNVGL-ST-0437, DNVGL, NOV 2016
- [3] BS EN ISO 14122 PARTS 1 - 4: SAFETY OF MACHINERY, JUNE 2016
- [4] BS EN 50308 WIND TURBINES - PROTECTIVE MEASURES, DEC 2005
- [5] STANDARDISED BOAT LANDING RESEARCH REPORT, IMCA SEL 041, M 232, SEPT 2016
- [6] WORKING AT HEIGHT IN THE OFFSHORE WIND INDUSTRY, G+ GOOD PRACTICE GUIDELINES, NOV 2014
- [7] LOADS AND SITE CONDITIONS FOR WIND TURBINES, DNVGL-ST-0437, DNVGL, NOV 2016
- [8] SUPPORT STRUCTURES FOR WIND TURBINES, DNVGL-ST-0126, DNVGL, JULY 2018.

#### ACRONYMS

HAT = HIGHEST ASTRONOMICAL TIDE  
 LAT = LOWEST ASTRONOMICAL TIDE  
 OWA = OFFSHORE WIND ACCELERATOR  
 CTV = CREW TRANSFER VESSEL  
 WTG = WIND TURBINE GENERATOR



**ISOMETRIC VIEW RECOMMENDED  
BOAT LANDING DESIGN**

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

OTHER THAN THE HAZARDS/ RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NO FURTHER SIGNIFICANT RISKS HAVE BEEN IDENTIFIED

#### NOTES:

1. WORK IN ASSOCIATION WITH CARBON TRUST AND OFFSHORE WIND ACCELERATOR PROGRAM (OWA PARTNERS: EnBW, RWE RENEWABLES, INNOGY SE, ØRSTED, SCOTTISH POWER, RENEWABLES/IBERDROLA, SHELL, SSE RENEWABLES, EQUINOR, VATTENFALL WIND POWER).
2. LARGER VESSELS (>>120t) ARE IN OPERATION, FOR EXAMPLE, SATVs. THESE ARE CURRENTLY EXCEPTIONS AND SHOULD BE CONSIDERED ON A CASE BY CASE BASIS - SEE [1] FOR DETAILS.

REV	DATE	DESCRIPTION	BY	CHKD	APVD
01	08/02/19	ISSUED FOR REVIEW	DL	DL	DL
02	09/02/19	ISSUED FOR REVIEW	DL	DL	DL

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Project Title  
**CARBON TRUST -  
RECOMMENDED BOAT LANDING  
GEOMETRY**

Drawing Title  
**PUBLIC RELEASE  
DRAWINGS  
GENERAL NOTES  
AND DESIGN BRIEF SUMMARY**

Scale	Package Code	Drawn	Checked	Authorised	OA
Original Size <b>A3</b>	Functional Area	Date 04/09/2019	Date 04/09/2019	Date 04/09/2019	

Atkins Drawing Number  
**5166244-ST-DRG-0004**

Client Drawing Number  
**OWA-A-RBD-ATK-DWG-0004**      Revision  
**02**

# Status

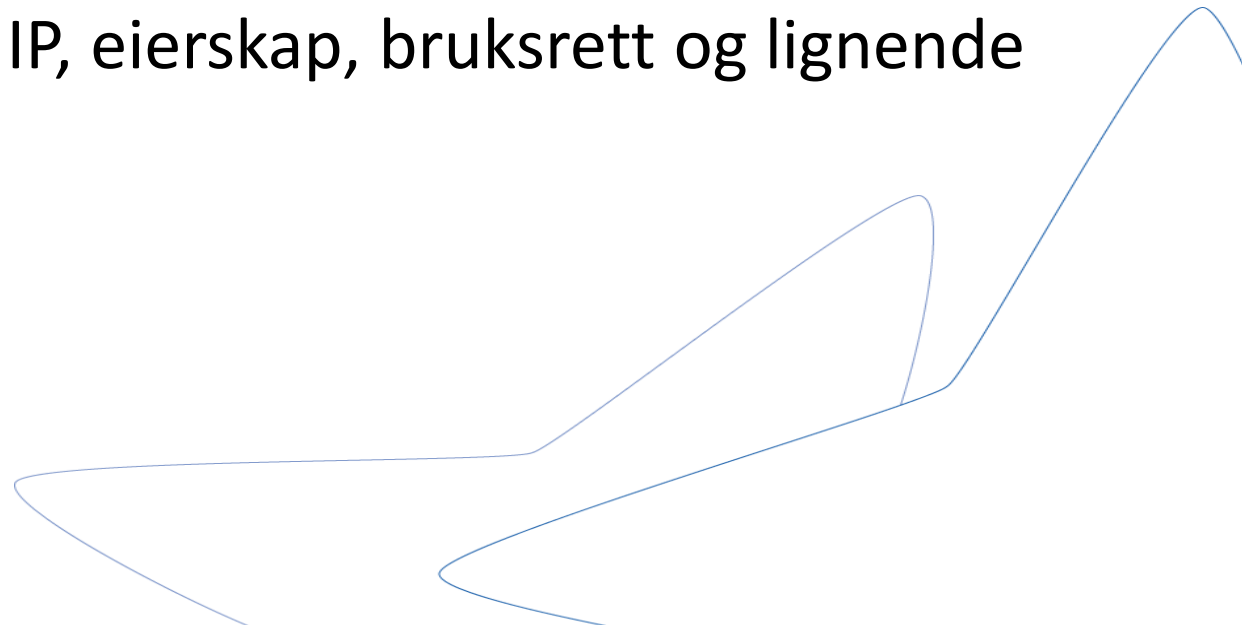
- Norsk Industri som sekretariat samler interesserte og kvalifiserte til en arbeidsgruppe
- Mulig skille mellom arbeidsgruppe og innspillsgruppe
- Oppstartsmøte denne uken





# Nødvendige avklaringer

- Avklare og kommunisere mandat, visjon og strategi for gruppen
- Vurdere finansiering i form av støtteordninger
- Avklare problemstillinger knyttet til IP, eierskap, bruksrett og lignende



# Mål

- Forenkle fremtidig drift – skape rom for mer fleksibilitet
- Forenkle utvikling av løsninger for leverandører (tar ned risiko)



# ISO Standards for use in the oil & gas industry

**ISO 15438** Process safety systems (PSS)  
 Replaced by API Spec 692

**ISO 15439** Wellhead & christmas tree equipment

**ISO 15487** Reliability modelling/quality systems

**ISO 15584** Shallow gas (water) equipment

**ISO 15553** DNV-Integrigasement (ISO)

**ISO 15554** Hoisting equipment - card/maintenance

**ISO 15555** Hoisting equipment - specification

**ISO 15625** Drilling and well-servicing structures

**ISO 15732** Control and piping systems of lines and explosions

**ISO 15733** Offshore piping systems

**ISO 16224** Reliability and maintenance data

**ISO 16492-1** GRP piping: vocabulary, symbols, applications and materials

**ISO 16492-2** GRP piping: qualification and manufacture

**ISO 16492-3** GRP piping system design

**ISO 16492-4** GRP piping fabrication, installation and operation

**ISO 16493** Drilling equipment

**ISO 15136** Heating, ventilation and air-conditioning (HVAC)

**ISO 15154** Corrosion-resistant materials for use in H2S environments, Parts 1-3

**ISO 15155** Emergency response

**ISO 15463** Life cycle costing, Parts 1-3

**ISO 14961** Risk assessment in the design of offshore LNG installations

**ISO 14963** Characteristics of LNG inflaming design and material selection

**ISO 14964** LNG Marine Transfer Arms

**ISO 17172** Unconventional LNG transfer systems

**ISO 17262** Metal ball valves

**ISO 17374** Major Accident hazard management during design

**ISO 17381** Major Accident hazard materials testing

**ISO 17732** Qualification of manufacturers of special materials (Steel)

**ISO 17943** Materials resistant to sulfide stress cracking

**ISO 17958** Guidelines on competency for personnel

**ISO 18483** Systems and installations for supply of LNG as fuel to ships

**ISO 19008** Standard Cost Coding System

**ISO 19272** Qualification testing for coating under insulation (Steel)

**ISO 20301** Processed steels (Steel)

**ISO 20303** Production assurance and reliability management (Steel)

**ISO 21457** Materials selection

**ISO 22794-1** Thermoplastics

**ISO 22934-2** Elastomers

**ISO 25448** Method of test for offshore fire dampers

**ISO 26001** Sector-specific quality management systems

**ISO 15654** Marine drilling riser systems, Parts 1-7

**ISO 15625** Marine drilling riser couplings

**ISO 19913-3** Stationkeeping systems

**ISO 13628-1** Subsea production systems

**ISO 13628-2** Subsea flexible pipe systems

**ISO 13628-3** Subsea TFL completion systems

**ISO 13628-4** Subsea wellhead and tree equipment

**ISO 13628-5** Subsea control umbilicals

**ISO 13628-6** Subsea production controls

**ISO 13628-7** Compressor/booster riser systems

**ISO 13628-8** ROT and interfaces

**ISO 13628-9** ROT intervention systems

**ISO 13628-10** Blowout flexible pipe

**ISO 13628-11** Flexible pipe systems for subsea and marine applications

**ISO 13628-15** Subsea structures and manifolds

**ISO 11960** Casing and tubing for wells

**ISO 11961** Drill pipe (Steel)

**ISO 12925** Qualification of casing connections for thermal wells

**ISO 13395** Tubing in medium alloy pipes

**ISO 13660** Drilling fluids

**ISO 13561** Drilling fluids - processing systems evaluation

**ISO 13563-1** Measurement of viscosity properties of completion fluids

**ISO 13563-2** Measurement of properties of proppants

**ISO 13563-3** Testing of heavy brines

**ISO 13563-4** Measurement of stimulation & gravel-pack fluid leakoff

**ISO 13563-5** Measurement of long term conductivity of proppants

**ISO 13563-6** Measuring leak-off of completion fluids under dynamic conditions

**ISO 13676** Thread components

**ISO 13677** Casing and tubing connections testing (Steel)

**ISO 13680** CRA seamless tubes for casing & tubing

**ISO 14310** Packers and bridge plugs

**ISO 14998** Accessory completion equipment

**ISO 15134** Progressing cavity pump systems, Parts 1-2

**ISO 15443** Field inspection of flow casing, tubing and plain end drill pipe

**ISO 15444** Flanging and inspection of threads

**ISO 15511-1** Electric submersible pump systems for artificial lift

**ISO 15544** Aluminium alloy drill pipe

**ISO 16070** Lock mandrels and landing nipples

**ISO 16300-1** Well integrity manual

**ISO 17076-1** Seal-joint mandrels

**ISO 17076-2** Flow control devices for side-pocket mandrels

**ISO 17076-3** Latches & seals for side-pocket mandrels & flow control devices

**ISO 17076-4** Seal-joint mandrels and related equipment

**ISO 17076-5** Sand control screens

**ISO 20312** Design of aluminium drill string

**ISO 21427** Aluminium alloy drill pipe thread gauging

**ISO 28911** Subsurface tubing reamed formation barriers

**ISO 2180** Steel pipe for pipeline transportation systems

**ISO 13495** Actuation, mechanical integrity and wiring for pipeline valves

**ISO 17226** Wet thermal insulation coatings

**ISO 17247** Pipeline life extension

**ISO 13623** Pipeline transportation systems

**ISO 13647** Welding of pipelines

**ISO 14313** Pipeline valves

**ISO 14323** Subsea pipeline valves

**ISO 15569-1** Cathodic protection of on-land pipelines

**ISO 15569-2** Cathodic protection for offshore pipelines

**ISO 15569-3** Pipeline electrical bonds (Steel)

**ISO 15569-4** Pipeline fittings

**ISO 15569-5** Pipeline Bumpers

**ISO 15569-6** Pipeline factory cold bends (Steel)

**ISO 14440** Steel-cased pipelines

**ISO 14708** Pipeline reliability based limit state design

**ISO 19245-1** Full-life cycle integrity management for offshore pipeline (Steel)

**ISO 19245-2** Full-life cycle integrity management for offshore pipeline (Steel)

**ISO 20374** Geographical hazards risk management of pipelines (Steel)

**ISO 20329** Test procedures for pipeline mechanical connectors

**ISO 21869-1** Polyethylene coatings (3-layer PE and 3-layer PE (Steel)

**ISO 21869-2** Fusion-bonded epoxy coatings

**ISO 21869-3** Pipeline total joint coating (Steel)

**ISO 21869-4** Polyethylene coatings (2-layer PE)

**ISO 21869-5** Pipeline external concrete coatings

**ISO 21869-11** Pipeline Coating repairs (Steel)

**ISO 21801** Sewer valves DN 100 and smaller

**ISO 14872** Sewer & tube float valve (Steel)

**ISO 14971** Risk assessment of offshore LNG installations

**ISO 14961** Internal coating and lining of steel storage tanks

**ISO 17177** Unconventional LNG transfer systems

**ISO 17370** Metal ball valves

**ISO 17368** Materials Selection in CO<sub>2</sub> Environment for casing, tubing and downhole equipment

**ISO 17549** Systems containing high levels of CO<sub>2</sub>

**ISO 16434** Guidelines for design of LNG storage tanks (Steel)

**ISO 18176-1** Internal coating and lining of pressure vessels (Steel)

**ISO 20008-1** Resistance to cryogenic collapse of insulation materials - Liquid phase

**ISO 20008-2** Resistance to cryogenic collapse of insulation materials - Vapor phase (Steel)

**ISO 20008-3** Resistance to cryogenic collapse of insulation materials - high pressure jet exposure (Steel)

**ISO 22351-1** General requirements for floating LNG installation (Steel)

**ISO 22351-2** Specific requirements for FPSO (Steel)

**ISO 21549** Centrifugal and rotary pumps shaft sealing

**ISO 21551** Regenerators for API Spec 611 (Steel)

**ISO 24817** Composite repairs for pipework

**ISO 25487** Flange details

**ISO 17509** Compact forged connections

**ISO 20330** Wording of storage tanks

**ISO 20440** LNG - Ship to shore interface

**ISO 2180** Steel pipe for pipeline transportation systems

**ISO 13495** Actuation, mechanical integrity and wiring for pipeline valves

**ISO 17226** Wet thermal insulation coatings

**ISO 17247** Pipeline life extension

**ISO 13623** Pipeline transportation systems

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**ISO 21869-11** Pipeline Coating repairs (Steel)

**Standards in purple issued in 2018**  
**Standards in blue are a priority for 2019 issue**

These ISO standards, TR and TS (abbreviated titles) are only a core collection of several hundreds of standards available for the oil & gas industry from ABNT, ANSI, API, AS, BSI, CSA, DIN/ISO, NF, GOST, SAC etc. Some ISO/TC67 standards have been withdrawn and the relevant API standard is referenced above

