RULES FOR BUILDING AND CLASSING

MOBILE OFFSHORE DRILLING UNITS
2018

NOTICES AND GENERAL INFORMATION

American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862

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Notices and General Information

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Notices and General Information

Introduction

1. The year 2018 edition of the *Rules for Building and Classing Mobile Offshore Drilling Units* consists of the nine (9) booklets as shown in Table 1.

   The purpose of the generic title ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)* is to reflect the expanded contents of PART 1, as a result of including consolidated requirements for "Classification" applicable to all types of offshore units, pipelines, risers, and other offshore structures, as specified in the Foreword to Part 1.

   With regard to Part 2, the purpose of the generic title ABS *Rules for Materials and Welding* is to emphasize the common applicability of the requirements to ABS-classed vessels, other marine structures and their associated machinery, and thereby make PART 2 more readily a common "PART" of various ABS Rules and Guides, as appropriate.

2. The numbering system applied in the Rules is shown in Table 2.

3. The primary changes from the 2017 edition of the Rules are identified and listed in Table 3. The effective date of the indicated Rule Changes is 1 January 2018, unless specifically indicated otherwise.

4. The effective date of each technical change since 1993 is shown in parenthesis at the end of the subsection/paragraph titles within the text of each Part. Unless a particular date and month are shown, the years in parentheses refer to the following effective dates:

(2000) and after	1 January 2000 (and subsequent years)	*(1996)*	9 May 1996
(1999)	12 May 1999	*(1995)*	15 May 1995
(1998)	13 May 1998	*(1994)*	9 May 1994
(1997)	19 May 1997	*(1993)*	11 May 1993

   For certain changes that have a major impact on shipyards, designers and vendors, ABS has instituted a two-year Rule cycle to give the industry more time to prepare for these changes. The text of these changes will appear in a box along with the effective date just under the existing Rule requirement.

5. Until the next edition of the *Rules for Building and Classing Mobile Offshore Drilling Units* is published, Rule Change Notices and/or Corrigenda, as necessary, will be published on the ABS website – www. eagle.org – only, and will be available free for downloading. It is not intended to publish hard copies of future Rule Change Notices and/or Corrigenda to existing Rules or Guides. The consolidated edition of the *Rules for Building and Classing Mobile Offshore Drilling Units*, which includes Rule Change Notices and/or Corrigenda using different colors for easy recognition will be published on the ABS website only when RCN and/or Corrigenda are issued.

6. The listing of CLASSIFICATION SYMBOLS AND NOTATIONS is available from the ABS website www.eagle.org for download.

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TABLE 1
Applicable Editions of Booklets Comprising 2018 Rules

Notices and General Information		2018
Part 1:	Rules for Conditions of Classification – Offshore Units and Structures (1)	2018 (2)
Part 1:	Conditions of Classification (Supplement to the ABS *Rules for Conditions of Classification – Offshore Units and Structures*) (1)	2018
Part 2:	Rules for Materials and Welding	2018 (2)
Part 3:	Hull Construction and Equipment	2018
Part 4:	Machinery and Systems	2018
Part 5:	Fire and Safety – Measures and Features	2018
Part 6:	Rules for Equipment and Machinery Certification	2018
Part 7:	Surveys	2018

Notes:

1 The requirements for conditions of classification are contained in the separate, generic ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)*. Additional specific requirements are contained in Part 1 of these Rules.

2 The latest edition of these Rules is to be referred to. These Rules may be downloaded from the ABS website at www.eagle.org, Rules and Guides, Downloads or may be ordered separately from the ABS Publications online catalog at www.eagle.org, Rules and Guides, Catalog.

TABLE 2
Division and Numbering of Rules

Division	*Number*
Part	Part 1
Chapter	Part 1, Chapter 1
Section	Section 1-1-1
Subsection (see Note 1)	1-1-1/1
Paragraph (see Note 1)	1-1-1/1.1
Subparagraph	1-1-1/1.1.1
Item	1-1-1/*1.1.1(a)*
Subitem	1-1-1/*1.1.1(a)i)*
Appendix	Appendix 1-1-A1 or Appendix 1-A1-1

Note:

1 An odd number (1, 3, 5, etc.) numbering system is used for the Rules. The purpose is to permit future insertions of even-numbered paragraphs (2, 4, 6, etc.) of text and to avoid the necessity of having to renumber the existing text and associated cross-references, as applicable, within the Rules and associated process instructions, check sheets, etc.

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Rule Change Notice *(2018)*

TABLE 3
Summary of Changes from the 2017 Rules

EFFECTIVE DATE 1 March 2017 – shown as *(1 March 2017)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 1	**Rules for Conditions of Classification – Offshore Units and Structures**	
1-1-1/7	Scope of Classification	To align with the other sections of Part 1 regarding disclaimers of liability for the responsibilities of vessel owners/operators in this article.
1-1-7/7	Submission of Plans	To align ABS plan submittal process with our legal duty to protect client and third party intellectual property rights.

EFFECTIVE DATE 1 May 2017 – shown as *(1 May 2017)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 1	**Rules for Conditions of Classification – Offshore Units and Structures**	
1-1-4/3.1	Effective Date	To remove the application of the six-month rules for Guides, which are meant for immediate implementation. (Incorporates Notice No. 2)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 1	**Rules for Conditions of Classification – Offshore Units and Structures**	
1-1-A2/5.1.5	Duplicate Product Design Assessment	To clarify ABS policy for PDA-DUP issuance, confirmed by ABS Programs.

EFFECTIVE DATE 1 October 2017 – shown as *(1 October 2017)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 1	**Conditions of Classification (Supplement to the ABS *Rules for Conditions of Classification – Offshore Units and Structures*)**	
1-1-5/1.17 (New)	<No Title>	To require verification that there is a procedure in place for confirming engagement and full disengagement status of fixation system. (Incorporates Notice No. 2)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 1	**Conditions of Classification (Supplement to the ABS *Rules for Conditions of Classification – Offshore Units and Structures*)**	
1-1-5/1.17	<No Title>	To clarify that the requirement is only applicable where a fixation system is used.

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EFFECTIVE DATE 1 July 2017 – shown as *(1 July 2017)*
(based on the contract date for new construction between builder and Owner)

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 3	**Hull Construction and Equipment**	
3-2-1/1	Structural Analysis	To specify that the LRFD structural design criteria in the *Guide for Load and Resistance Factor Design (LRFD) Criteria for Offshore Structures* can be used as an alternative to those affected criteria in Part 3 of the *MODU Rules*, where the criteria are presented in the Working Stress Design (WSD) format. (Incorporates Notice No. 1)
PART 4	**Machinery and Systems**	
4-2-1/11.29	Flexible Hoses	To align the requirements with 4-6-2/5.7 of the *Rules for Building and Classing Steel Vessels*. (Incorporates Notice No. 1)
4-3-2/7.9	Harmonics	To specify that the harmonic distortion calculation report is to be kept on board for exceptions to the 8% limit in cases where all installed equipment and systems have been designed for higher THD levels, in line with IACS UR E24 June 2016. (Incorporates Notice No. 1)
4-3-2/9.18 (New)	Harmonic Distortion for Ship Electrical Distribution System including Harmonic Filters	To introduce requirements for survey of harmonic filters and harmonic distortion levels, in line with IACS UR E24 June 2016. (Incorporates Notice No. 1)
4-3-2/9.19	Protection of Harmonic Filter Circuits Associated with Electric Propulsion	To introduce requirements for survey of harmonic filters and harmonic distortion levels, in line with IACS UR E24 June 2016. (Incorporates Notice No. 1)
4-3-4/7.1.1	General	To identify the standards that have been withdrawn or replaced by new ones and to consider approaches for cables not manufactured to IEC standards identified, in line with IACS UR E7 Rev.4 Apr. 2016. (Incorporates Notice No. 1)

EFFECTIVE DATE 1 October 2017 – shown as *(1 October 2017)*
(based on the contract date for new construction between builder and Owner)

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 6	**Material, Marine Equipment and Machinery Certification**	
6-1-9/19	Control, Monitoring and Alarm System	To relocate the fixation system engagement/disengagement requirement to within 6-1-9/19 and to remove interlock requirements. (Incorporates Notice No. 2)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*
(based on the contract date for new construction between builder and Owner)

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 3	**Hull Construction and Equipment**	
3-1-2/1	Hull and Design Data	To specify that a Fiber Reinforced Plastic (FRP) layout drawing is to be submitted.
3-1-4/3.3	Extra High Strength Steel	To align the requirements with the latest IACS UR W16.
3-1-4/5.5	Selection Criteria for ABS Grades of Steel	To align the requirements with the latest IACS UR W16.
3-1-4/5.7.4	Extra High Strength Steels	To align the requirements with the latest IACS UR W16.
3-1-4/Table 2 (New)	Material Selection for ABS Extra High Strength Steel Grades	To align the requirements with the latest IACS UR W16.
3-1-A3 (Deleted)	Material Selection for ABS Grades of High Strength Quenched and Tempered Steel	To consolidate material requirements in the *Rules for Materials and Welding* (Appendix 3-1-A3 was relocated to Section 2-1-8 of the *Rules for Materials and Welding*).
3-2-2/1.5	Protection of Steel Work	To clarify the requirements of corrosion protection of steel.

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Part/Para. No.	*Title/Subject*	*Status/Remarks*
3-2-2/3.3.5 (New)	Bolted Connections	To specify requirements for bolted connections on helidecks.
3-2-3/3.1.3	Secondary Application Structures (Least Critical)	To be consistent with 3-2-5/Figure 1.
3-2-4/1.7.3	Secondary Application Structures (Least Critical)	To be consistent with 3-2-5/Figure 1.
3-2-4/15	Higher-strength Materials	To align the requirements with 3-2-3/7.1 of the *Steel Vessel Rules* for higher-strength material to allow reduced plate thickness.
3-2-5/3.5.2	Secondary Application Structures	To be consistent with 3-2-5/Figure 1.
3-3-2/5.3	Watertight Integrity	To align the requirements with the IMO MODU Code.
3-3-2/5.3.1	Internal Openings Used for Access While Afloat	To align the requirements with the IMO MODU Code.
3-3-2/5.3.1(b)	<No Title>	To align the requirements with the IMO MODU Code.
3-3-2/5.3.2	Internal Openings Permanently Closed While Afloat	To align the requirements with the IMO MODU Code.
3-3-2/5.3.4	External Openings Permanently Closed While Afloat	To align the requirements with the IMO MODU Code.
3-3-A2 (Title)	Computer Software for Onboard Stability Calculations	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/5	Types of Stability Software	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.1	Calculation Program	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.5	Warning	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.15 (New)	Computer Model	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.17 (New)	Further Requirements for Type 4 Stability Software	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/9	Acceptable Tolerances	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/Table 1	Acceptable Tolerances	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/11.1	Conditions of Approval of the Onboard Software for Stability Calculations	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/11.5	Specific Approval	To align the Rules with IACS UR L5, Revision 3.
3-4-1/17.1	General	To relocate the requirements for the anchor windlass to Part 6.
PART 4	**Machinery and Systems**	
4-1-2/3.1.2	Piping Arrangement	To align the requirements with the *Steel Vessel Rules*.
4-2-3/1.9.3	Protection for Fuel Oil and Lubricating Oil Tanks	To clarify that the requirement is not applicable to emergency services.
4-2-4/9.3.1	Main Line	To remove reference to formula that is not required by the IMO MODU and IACS UR D9.6.2.
4-2-5/13	Class Notation – POT	To clarify that the protection requirements for lubrication oil tanks as required in 4-2-5/11 are not applicable to lubrication oil tanks with a capacity not greater than 30 m^3.
4-2-6/1.3	Sight Flow Glasses	To align the requirements with the *Steel Vessel Rules*.
4-2-6/3.11	Accumulators	To refer to the *Steel Vessel Rules* requirements for hydraulic systems.
4-2-6/5.3.2	Ventilation of Storage Room	To clarify that the requirements are applied to acetylene gas (as flammable gas) only.
4-2-6/5.3.3	Electrical Installation in Storage Room	To clarify that the requirements are applied to acetylene gas (as flammable gas) only.
4-2-6/5.5.4	Gas Cylinders	To clarify that the requirements are applied to acetylene gas (as flammable gas) only.

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Part/Para. No.	*Title/Subject*	*Status/Remarks*
4-2-6/13.5 (New)	Storage and Use of SCR Reductants	To provide requirements for Selective Catalytic Reduction (SCR) systems, in line with IACS UR M77 Sept. 2016.
4-2-6/17	Helicopter Deck Drainage Arrangements	To align the requirements with the *Steel Vessel Rules* and the IMO MODU Code.
4-3-3/1.5	Electrical Equipment in Hazardous Areas	To include the electrical equipment operable after shutdown that is required to be rated for hazardous areas.
4-3-3/3.25	Receptacles and Plugs of Different Ratings	To permit receptacles in hazardous areas, in line with 8.11.1 of IEC Std. 61892-7.
4-3-3/Table 1	Minimum Degree of Protection	To permit plugs and socket outlets installed in hazardous areas, in line with IEC 61892-7 Para. 8.11.1 and IEC 60079-14 Para. 5.13.
4-3-5/1.3.5	Earth Fault Detection and Indication	To clarify the requirements for audible and visual indication of earth faults for high voltage systems.
PART 5	**Fire and Safety – Measures and Features**	
5-1-1/3.17ii)	<No Title>	To align the requirements with 9.2.9 of the IMO MODU Code.
5-1-1/33	<No Title>	To align the requirements with 9.3.17 of the IMO MODU Code.
5-1-1/Figure 1	Pipes Penetrating “A” Class Divisions	To add PVC material, in line with SOLAS Chapter II-2 Regulation 9.3.
5-1-1/Figure 2	Pipes Penetrating “B” Class Divisions	To add PVC material, in line with SOLAS Chapter II-2 Regulation 9.3.
5-1-1/Figure 4	Ventilation Ducts Penetrating “B” Class Divisions	To align the requirements with 9.3.17 of the IMO MODU Code.
5-2-3/1.3.1	Fixed Fire Extinguishing Systems on Drilling Area and Temporary Well Test Area, and Moonpool Area	To require that the closed moonpool area is also to be protected for firefighting at the same level as the drillfloor.
5-2-3/3.1.2	Design	To provide a clear instruction for the pressure rating of the distribution pipe.
5-2-3/9.1	General	To specify provisions for the use of aluminum helidecks.
5-2-4/Table 2	Hand Portable Fire Extinguishers and Semi-portable Fire-Extinguishing Systems	To align the requirements with Table 9-3 of IMO MODU Code 2009 (refer to MSC.1/Circ.1275).
5-2-5/1.1.2	Machinery Spaces	To align the requirements with ABS practice.
5-2-5/5.3	Alarms	To clarify the requirements and to specify that “the high level alarm” should immediately activate the toxic alarm without waiting for crew’s acknowledge at the main control panel.
5-3-1/3	Means of Access and Egress	To clarify the requirements for aluminum helideck escape stairs and intermediate platforms.
5-3-1/9.9	Floor Plating in Machinery Spaces of Category A	To specify that FRP is not allowed in machinery spaces of Category A.
PART 6	**Material, Marine Equipment and Machinery Certification**	
6-1-5/1.1	Application	To clarify the requirements for accumulators of extruded seamless construction.
6-1-6/7.3.2	Survey and Certification of Pumps	To clarify that raw water pumps and booster pumps are to be certified when part of the fire system, and to include certification of pumps for non-self-propelled DPS units.
6-1-7/9.9.6(b)	Alternative	To include IEC 61439-2 for power switchgear and control gear assemblies.
6-1-7/Table 7	Clearance and Creepage Distance for Switchboards, Distribution Boards, Chargers, Motor Control Centers and Controllers	To align the requirement with IEC 60092-302 and IEC 61892-3.
6-1-7/Table 8	Equipment and Instrumentation for Switchboard	To provide a reference to the requirements for high voltage systems.

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Part/Para. No.	*Title/Subject*	*Status/Remarks*
6-1-9/19	Control, Monitoring and Alarm System	To specify interlock override requirements for designs that incorporate an interlock system between jacking operations and a rack fixation system engagement.
6-1-9/25.5 (New)	Replacement Jacking Equipment for Units in Operation	To require that all replacement parts be manufactured in accordance with the original or subsequently ABS approved/accepted designs.
6-1-10/1	General	To relocate the requirements for the anchor windlass to Part 6.

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The reference date which is indicated in the parentheses following the title of the requirement in this Part is the date that the requirement becomes effective [e.g., 7-1-2/23.9 "Air Testing" (2018) is to apply for vessels undergoing survey on or after 1 January 2018].

EFFECTIVE DATE 1 July 2017 – shown as *(2017)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 7	**Surveys**	
7-2-1/7.9 (New)	Prompt and Thorough Repairs	To provide guidance for Surveyors on how to deal with required repairs found during surveys. (Incorporates Notice No. 1)
7-2-5/13.15	Self-Elevating Drilling Units – Leg Jacking Systems	To add requirements for pin and yoke type jacking systems and to reference the new *Guide for Survey and Inspection of Jacking Systems.* (Incorporates Notice No. 1)
7-2-5/15.3.1	DP Thrusters	To clarify that the requirements are not applicable to only retractable thrusters and to establish minimum CM requirements for DP thrusters. (Incorporates Notice No. 1)
7-2-6/1.5	Self-Elevating Units	To specify the requirements for visual examination and NDE of leg-to-spudcan connections. (Incorporates Notice No. 1)
7-2-A2/3	Survey of Portable Accommodation Modules	To specify the application dates of the *Guide for Portable Accommodation Modules*. (Incorporates Notice No. 1)
7-2-A2/5xiii)	<No Title>	To clarify the application of the hazardous area requirements. (Incorporates Notice No. 1)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
PART 7	**Surveys**	
7-1-2/23.1.1 (New)	Types and Definition of Test	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.9	Air Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.11	Hose Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.15 (New)	Compressed Air Fillet Weld Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.17 (New)	Vacuum Box Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.19 (New)	Ultrasonic Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.21 (New)	Penetration Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.23 (New)	Hydropneumatic Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.25 (New)	Other Methods of Testing	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/23.27 (New)	Application of Coating	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/Table 3 (New)	Application of Leak Testing, Coating and Provision of Safe Access for Type of Welded Joints	To align the requirements with Section 3-7-1 of the *Steel Vessel Rules* and IACS UR S14 Rev.5, as applicable.
7-1-2/27	Hull Inspection and Maintenance Program (HIMP) (Optional)	To provide references to the ABS *Guide for Hull Inspection and Maintenance Program* and HIMP survey requirements

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Part/Para. No.	*Title/Subject*	*Status/Remarks*
7-1-3/3vi)	Survey of Machinery, Piping, Pressure Vessels, and other Outfitting Items	To align with 4-6-2/7.1 of the *Steel Vessel Rules*.
7-1-8/15.1	Hydrogen Sulfide (H_2S) Detection and Alarm System	To align with 2009 MODU Code Chapter 9 Paragraph 9.12.1 and 5-2-5/5.3 of the ABS *MODU Rules* and IACS UR D11.8.2.
7-2-1/1.1	Chapter 2 Sections 1 through 11	To advise that current survey Rules are applied to all vessels after construction.
7-2-3/1.1	Plan for UWILD	To require the attending Surveyor review the UWILD plan prior to submitting to ACS Office.
7-2-3/1.5	Survey Planning Document (SPD)	To specify survey requirements for spud can leg to can connections.
7-2-4/1.1.15	HIMP Notation	To specify HIMP survey requirements.
7-2-4/3.4 (New)	Drilling Units	To specify survey requirements for air intake shut off arrangements for internal combustion engines.
7-2-5/1.13	Alternatives	To require the attending Surveyor review the alternative means plan prior to submitting to ACS Office.
7-2-5/1.15 (New)	HIMP Notation	To specify HIMP survey requirements.
7-2-5/5.1.6	Lightship Displacement	To align with the 2009 MODU Code, which allows placement of the weight difference in an indisputably conservative center of gravity.
7-2-5/7.1.1vi)	Spud Cans or Mats	To align the requirements with current practice, whereby examination of all parts below the waterline (submerged parts of the leg structure to spud can connections) are postponed until the next rig move.
7-2-5/7.3.1	General Visual Inspection (GVI)	To require the attending Surveyor review the alternative means plan prior to submitting to ACS Office.
7-2-5/9	Special Periodical Survey – Machinery	To specify survey requirements for air intake shut off arrangements for internal combustion engines.
7-2-5/9.3.7 (New)	Ventilation Valves	To specify requirement to open and examine the ventilation valves at Special Survey.
7-2-6/1.5v)	Suspect Areas	To align the requirements with current practice, whereby examination of all parts below the waterline (submerged parts of the leg structure to spud can connections) are postponed until the next rig move.
7-2-6/1.9.4 (New)	HIMP Notation	To specify HIMP survey requirements.
7-2-6/3	Underwater Inspection in Lieu of Drydocking (UWILD)	To remove the limitation of the 20 year requirement and include items to be in the UWILD Plan.
7-2-6/3.7	Crediting UWILD on a Self-Elevating Unit without Completing the Examination of Spud Cans/Mat	To align the requirements with current practice, whereby examination of all parts below the waterline (submerged parts of the leg structure to spud can connections) are postponed until the next rig move.
7-2-A4/1	General	To specify that to credit a part for a Periodical Machinery Survey in the middle of the survey, the vessel must be on Continuous Machinery Survey.
7-2-A4/3.1	Surveys	To specify that to credit a part for a Periodical Machinery Survey in the middle of the survey, the vessel must be on Continuous Machinery Survey.

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RULES FOR BUILDING AND CLASSING

MOBILE OFFSHORE DRILLING UNITS
2018

PART 1
CONDITIONS OF CLASSIFICATION

(Supplement to the ABS Rules for Conditions of Classification – Offshore Units and Structures)

American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862

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(1997)	19 May 1997	*(1993)*	11 May 1993

Listing by Effective Dates of Changes from the 2017 Rules

Notice No. 2 (effective on 1 October 2017) to the 2017 Rules, which is incorporated into the 2018 Rules, is summarized below.

EFFECTIVE DATE 1 October 2017 – shown as *(1 October 2017)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
1-1-5/1.17 (New)	<No Title>	To require verification that there is a procedure in place for confirming engagement and full disengagement status of fixation system. (Incorporates Notice No. 2)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*

Part/Para. No.	*Title/Subject*	*Status/Remarks*
1-1-5/1.17	<No Title>	To clarify that the requirement is only applicable where a fixation system is used.

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Foreword *(1 January 2008)*

For the 2008 edition, Part 1, "Conditions of Classification" was consolidated into a generic booklet, entitled *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)* for all units, installations, vessels or systems in offshore service. The purpose of this consolidation was to emphasize the common applicability of the classification requirements in "Part 1" to ABS-classed offshore units, pipelines, risers, and other offshore structures, and thereby make "Conditions of Classification" more readily a common Rule of the various ABS Rules and Guides, as appropriate.

Thus, this supplement specifies only the unique requirements applicable to mobile offshore drilling units. This supplement is always to be used with the aforementioned *Rules for Conditions of Classification – Offshore Units and Structures (Part 1).*

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CHAPTER 1 Scope and Conditions of Classification

SECTION 1 Classification *(1 January 2008)*

The requirements for conditions of classification are contained in the separate, generic ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)*.

Additional requirements specific to mobile offshore drilling units are contained in the following Sections of this Part.

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CHAPTER 1 Scope and Conditions of Classification

SECTION 2 Classification Symbols and Notations *(1 January 2008)*

A listing of Classification Symbols and Notations available to the Owners of vessels, offshore drilling and production units and other marine structures and systems, “List of ABS Notations and Symbols” is available from the ABS website “http://www.eagle.org”.

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CHAPTER 1 Scope and Conditions of Classification

SECTION 3 Rules for Classification *(1 January 2008)*

1 Application of Rules

1.1 General

These Rules are applicable to Mobile Offshore Drilling Units intended for unrestricted ocean service, except where specifically mentioned otherwise.

These requirements are applicable to those features that are permanent in nature and can be verified by plan review, calculation, physical survey or other appropriate means. Any statement in the Rules regarding other features is to be considered as a guidance to the designer, builder, Owner, et al.

1.3 Application *(2005)*

The application of the Rules is, in general, based on the contract date for construction between the shipbuilder and the prospective owner. (e.g., Rules which became effective on 1 July 2004 are not applicable to a drilling unit for which the contract for construction was signed on 30 June 2004.) See also 1-1-4/3 of the ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1).*

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CHAPTER 1 Scope and Conditions of Classification

SECTION 4 Plans and Design Data to be Submitted *(2012)*

1 Hull and Design Data

Plans showing the scantlings, arrangements and details of the principal parts of the structure of each unit to be built under survey and supporting analyses and calculations, as described in Section 3-1-2, are to be submitted for review and approved before the work of construction are commenced.

3 Machinery Plans

Plans are to be submitted showing the arrangements and details of all propulsion and auxiliary machinery, steering gear, boilers and pressure vessels, electrical systems, jacking or other self-elevating systems, bilge and ballast systems, fire extinguishing systems, and other pumps and piping systems as described in 4-1-1/5, 4-1-2/7, 4-2-1/7, 4-3-1/5 and 5-2-1/3.

5 Additional Plans

Where additional class notations or certification under the other Rules, Guides or regulations, as described in Section 1-1-5 of the ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)*, are requested, submission of additional plans and calculations may be required.

7 Submissions

Plans from designers and builders should generally be submitted electronically to ABS. However, hard copies will also be accepted.

All plan submissions originating from manufacturers are understood to have been made with the cognizance of the builder.

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CHAPTER 1 Scope and Conditions of Classification

SECTION 5 Operating Manual

1

(1 October 2015) An operating manual which is consistent with the information and criteria upon which classification is based is to be placed aboard the unit for the guidance of the operating personnel. The primary language of the Operating Manual is to be English. Units not meeting the criteria of 3-1-3/1.3 and 4-1-1/7.7 for unrestricted service are to have the notation **Restricted Service – Elevated Condition** or **Restricted Service – Afloat Condition** and details of the service restrictions are to be placed in the Operating Manual. Insofar as classification is concerned, the operating manual is to include, as appropriate, the following information:

1.1

A general description of the unit, including major dimensions, lightship characteristics;

1.3

Summaries of approved modes of operation (See 3-1-1/17), including for each mode of operation:

i) *(2012)* Limiting environmental conditions, including wave height and period, wind velocity, current velocity, service temperature of the unit (see 3-1-1/25), minimum expected sea temperature, sea bed penetration, spud can-soil stiffness, air gap, and water depth

ii) Design deck loadings, mooring loads, icing loads, variable load, total elevated load, cantilever load, rated capacities of derricks, cranes and elevating systems and types of helicopter for which the helideck is designed;

iii) Draft or draft range, leg length, spud can position and whether buoyant or non-buoyant, disposition of movable equipment (See 3-3-2/3.1) such as cantilevers, drilling masts, crane booms, etc.;

iv) Maximum allowable KG versus draft curves or equivalent and associated limitations or assumptions upon which the allowable KG is based;

v) Disposition (open or closed) of watertight and weathertight closures (See 3-3-2/5);

vi) *(2011)* Identification of “Restricted Service” conditions.

1.5

Information showing:

i) General arrangements;

ii) Preload capacity (See 3-1-3/1.11 and 3-2-3/5);

iii) Watertight and weathertight boundaries, location of unprotected openings, and watertight and weathertight closures;

iv) Type, location and quantities of permanent ballast;

v) Allowable deck loadings (See 3-1-3/1.11);

vi) Capacity, centers of gravity and free surface correction for each tank;

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vii) Capacity and centers of gravity of each void provided with sounding arrangements but not provided with means of draining [See 3-3-2/1.3.4(a)];

viii) Location and means of draining voids, as specified in 4-2-4/3.3

ix) Hydrostatic curves or equivalent;

x) Hazardous areas (See Section 4-3-6);

xi) *(2003)* Simplified electrical one line diagrams of main power and emergency power systems;

xii) Schematic diagrams of the bilge, ballast and ballast control system;

1.7

Ballasting procedure as specified in 4-2-4/13.1;

1.9

Recommended sequence of emergency shut-downs as specified in 4-3-5/7;

1.11

Procedure for elevating and preloading;

1.13 *(1 February 2014)*

Loading and KG work sheets, sample calculations for each mode of operation and instructions for their use. Work sheets and instructions are to include guidance for the routine recording of lightweight alterations.

1.15

A description of the specific locations on the unit where equipment brought onboard for the purpose of conducting well test operations may be placed and any action that need be taken to safely accommodate this equipment.

1.17 *(2018)*

Procedures and/or arrangements for confirming engagement and full disengagement status of fixation system, where such systems are used.

3

The Operating Manual is to be submitted for review by the American Bureau of Shipping solely to verify the presence of the above information which is to be consistent with the design information and limitations considered in the unit's classification. The American Bureau of Shipping is not responsible for the operation of the unit.

The Operating Manual required by this section does not need to be in addition to that required by flag and coastal Administrations. These administrations may require that additional information be included in the Operating Manual.

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RULES FOR BUILDING AND CLASSING

MOBILE OFFSHORE DRILLING UNITS
2018

PART 3
HULL CONSTRUCTION AND EQUIPMENT

American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862

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Rule Change Notice *(2018)*

The effective date of each technical change since 1993 is shown in parenthesis at the end of the subsection/paragraph titles within the text of each Part. Unless a particular date and month are shown, the years in parentheses refer to the following effective dates:

(2000) and after	1 January 2000 (and subsequent years)	*(1996)*	9 May 1996
(1999)	12 May 1999	*(1995)*	15 May 1995
(1998)	13 May 1998	*(1994)*	9 May 1994
(1997)	19 May 1997	*(1993)*	11 May 1993

Listing by Effective Dates of Changes from the 2017 Rules

Notice No. 1 (effective on 1 July 2017) to the 2017 Rules, which is incorporated into the 2018 Rules, is summarized below.

EFFECTIVE DATE 1 July 2017 – shown as *(1 July 2017)*
(based on the contract date for new construction between builder and Owner)

Part/Para. No.	*Title/Subject*	*Status/Remarks*
3-2-1/1	Structural Analysis	To specify that the LRFD structural design criteria in the *Guide for Load and Resistance Factor Design (LRFD) Criteria for Offshore Structures* can be used as an alternative to those affected criteria in Part 3 of the *MODU Rules*, where the criteria are presented in the Working Stress Design (WSD) format. (Incorporates Notice No. 1)

EFFECTIVE DATE 1 January 2018 – shown as *(2018)*
(based on the contract date for new construction between builder and Owner)

Part/Para. No.	*Title/Subject*	*Status/Remarks*
3-1-2/1	Hull and Design Data	To specify that a Fiber Reinforced Plastic (FRP) layout drawing is to be submitted.
3-1-4/3.3	Extra High Strength Steel	To align the requirements with the latest IACS UR W16.
3-1-4/5.5	Selection Criteria for ABS Grades of Steel	To align the requirements with the latest IACS UR W16.
3-1-4/5.7.4	Extra High Strength Steels	To align the requirements with the latest IACS UR W16.
3-1-4/Table 2 (New)	Material Selection for ABS Extra High Strength Steel Grades	To align the requirements with the latest IACS UR W16.
3-1-A3 (Deleted)	Material Selection for ABS Grades of High Strength Quenched and Tempered Steel	To consolidate material requirements in the *Rules for Materials and Welding* (Appendix 3-1-A3 was relocated to Section 2-1-8 of the *Rules for Materials and Welding*).
3-2-2/1.5	Protection of Steel Work	To clarify the requirements of corrosion protection of steel.
3-2-2/3.3.5 (New)	Bolted Connections	To specify requirements for bolted connections on helidecks.
3-2-3/3.1.3	Secondary Application Structures (Least Critical)	To be consistent with 3-2-5/Figure 1.
3-2-4/1.7.3	Secondary Application Structures (Least Critical)	To be consistent with 3-2-5/Figure 1.
3-2-4/15	Higher-strength Materials	To align the requirements with 3-2-3/7.1 of the *Steel Vessel Rules* for higher-strength material to allow reduced plate thickness.
3-2-5/3.5.2	Secondary Application Structures	To be consistent with 3-2-5/Figure 1.
3-3-2/5.3	Watertight Integrity	To align the requirements with the IMO MODU Code.

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Part/Para. No.	*Title/Subject*	*Status/Remarks*
3-3-2/5.3.1	Internal Openings Used for Access While Afloat	To align the requirements with the IMO MODU Code.
3-3-2/5.3.1(b)	<No Title>	To align the requirements with the IMO MODU Code.
3-3-2/5.3.2	Internal Openings Permanently Closed While Afloat	To align the requirements with the IMO MODU Code.
3-3-2/5.3.4	External Openings Permanently Closed While Afloat	To align the requirements with the IMO MODU Code.
3-3-A2 (Title)	Computer Software for Onboard Stability Calculations	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/5	Types of Stability Software	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.1	Calculation Program	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.5	Warning	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.15 (New)	Computer Model	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/7.17 (New)	Further Requirements for Type 4 Stability Software	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/9	Acceptable Tolerances	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/Table 1	Acceptable Tolerances	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/11.1	Conditions of Approval of the Onboard Software for Stability Calculations	To align the Rules with IACS UR L5, Revision 3.
3-3-A2/11.5	Specific Approval	To align the Rules with IACS UR L5, Revision 3.
3-4-1/17.1	General	To relocate the requirements for the anchor windlass to Part 6.

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CHAPTER 1 General

SECTION 1 Definitions

1 General

For the purpose of these Rules, the terms have the following meaning unless stated otherwise.

1.1 Unit

A mobile offshore structure or vessel, whether designed for operation afloat or supported on sea bed.

1.3 Drilling Unit

A unit capable of engaging in drilling operation for the exploration for or exploitation of resources beneath the sea bed.

1.5 Self-Propelled Unit *(2011)*

A unit designed with means of propulsion capable of propelling the unit during long distance ocean transits without external assistance.

The declaration of the unit as self-propelled is to be requested by the Owner, specified in the contract between the Owner and the builder and confirmed by ABS and the Flag Administration.

1.7 Non-Self-Propelled Unit *(2011)*

A unit that is not a self-propelled unit. Units with machinery used exclusively for positioning, unassisted short field moves as allowed by the Flag Administration and/or Coastal State and to provide assistance during towing operations may be considered non-self-propelled units.

The declaration of the unit as non-self-propelled is to be requested by the Owner, specified in the contract between the Owner and the builder and confirmed by ABS and the Flag Administration.

3 Types of Drilling Unit

3.1 Self-Elevating Drilling Unit *(2012)*

A drilling unit with movable legs capable of raising its hull above the surface of the sea and lowering it back into the sea.

The hull has sufficient buoyancy to transport the unit to the desired location. Once on location, the hull is raised to a predetermined elevation above the sea surface on its legs, which are supported by the sea bed.

The legs of such units may be designed to penetrate the sea bed, may be fitted with enlarged sections or footings, or may be attached to a bottom mat.

3.3 Column-Stabilized Drilling Unit *(2010)*

A drilling unit with the main deck connected to the underwater hull or footings by columns or caissons.

The unit depends upon the buoyancy of columns or caissons for flotation and stability for all afloat modes of operation, or in the raising or lowering of the unit. Lower hulls or footings may be provided at the bottom of the columns for additional buoyancy or to provide sufficient area to support the unit on the sea bed.

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3.3.1 Semi-Submersible Drilling Unit

A column-stabilized unit designed for drilling operation, either afloat or supported by sea bed.

3.3.2 Submersible Drilling Unit

A column-stabilized unit designed for drilling operation solely when supported by sea bed.

3.5 Surface-Type Drilling Unit

A unit with displacement hull of single or multiple hull construction designed for drilling operation in the floating condition.

3.5.1 Ship-Type Drilling Unit

A surface-type drilling unit with propulsion machinery.

3.5.2 Barge-Type Drilling Unit

A surface-type drilling unit without propulsion machinery.

3.7 Other Types of Drilling Unit

A unit which is designed as drilling unit but does not fall into any of the above categories.

5 Dimensions

5.1 General

Dimensions such as length, breadth, depth, etc., used to define the overall size of the unit will be published in the *Record* together with other pertinent particulars.

5.3 Draft

The *Molded Draft* is the vertical distance from the molded base line to the assigned load waterline.

7 Water Depth

The *Water Depth* is the vertical distance from the sea bed to the nominal water level plus the height of the astronomical and storm tides.

9 Molded Base Line

The *Molded Base Line* is a horizontal line through the upper surface of the bottom shell, lower hull bottom shell or caisson bottom shell.

11 Bulkhead Deck

The *Bulkhead Deck* in the case of surface-type or self-elevating units is the highest deck to which watertight bulkheads extend and are made effective.

13 Freeboard Deck

The *Freeboard Deck* in the case of surface-type or self-elevating units is normally the uppermost continuous deck having permanent means of closing all openings.

15 Lightweight

Lightweight is the displacement of the complete unit with all of its machinery, equipment and outfit, including permanent ballast, required spare parts and liquids in machinery and piping to their working levels but without liquids in storage or reserve supply tanks, items of consumable or variable loads, stores or crews and their effects.

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16 Total Elevated Load *(2003)*

The *Total Elevated Load* of a Self-Elevating Unit is the combination of:

- The lightweight as specified in 3-1-1/15, but excluding the weight of the legs and spud cans,
- All shipboard and drilling equipment and associated piping,
- Liquid variables,
- Solid variables, and
- Combined drilling loads

17 Mode of Operation

A *Mode of Operation* is a condition or manner in which a unit may operate or function while on location or in transit and includes the following.

17.1 Normal Drilling Condition

A *Normal Drilling Condition* is a condition wherein a unit is on location to perform drilling or other related functions, and combined environmental and operational loading are within the appropriate design limits established for such operations. The unit may be either afloat or supported by the sea bed.

17.3 Severe Storm Condition *(2016)*

A *Severe Storm Condition* is a condition wherein a unit may be subjected to the most severe environmental loadings for which it is designed. Drilling operations are assumed to have been discontinued due to the severity of the environmental loadings. The unit may be either afloat or supported by the sea bed, as applicable.

17.5 Transit Conditions

Transit Conditions are all unit movements from one geographical location to another.

19 Weathertight

Weathertight means that in any sea condition associated with the mode of operation, water will not penetrate into the unit.

21 Watertight

Watertight means the capability of preventing the passage of water through the structure in any direction under a head of water for which the surrounding structure is designed.

23 Systems of Measurement

These Rules are written in three systems of units, (i.e., SI units, MKS units and US customary units). Each system is to be used independently of any other system.

The format of presentation in the Rules of the three systems of units, unless indicated otherwise, is as follows:

SI units (MKS units, US customary units)

25 Service Temperature *(2012)*

The service temperature of the unit refers to the minimum temperature of the steel in all modes of operation and is to be taken as the lowest mean daily average air temperature based on available meteorological data for anticipated areas of operation.

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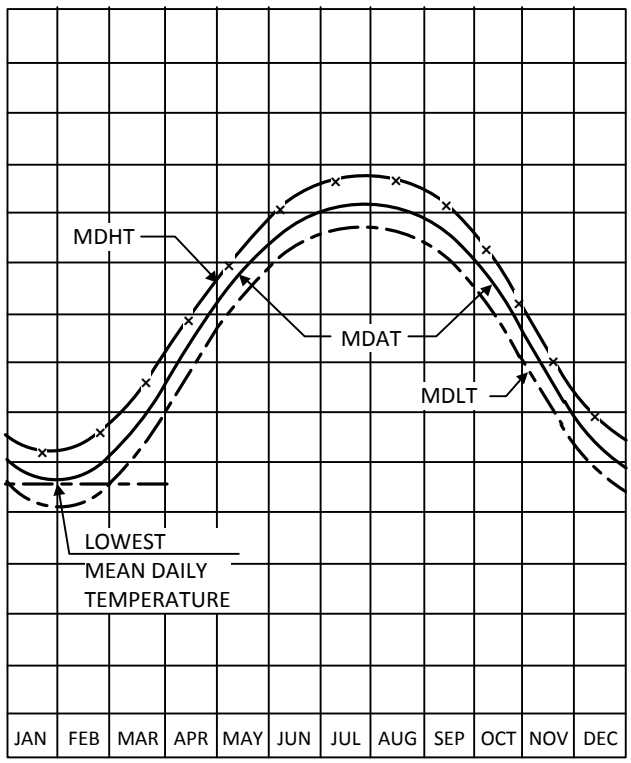
- Lowest: Lowest of the mean daily average temperatures during the year (see 3-1-1/Figure 1)
- Mean: Statistical mean of daily average values over observation period (at least 20 years)
- Daily average: Average air temperature during one day and night

For seasonally restricted service, the lowest value within the period of operation applies.

FIGURE 1
Commonly Used Definitions of Temperatures *(2012)*



MDHT = Mean Daily High (or maximum) Temperature

MDAT = Mean Daily Average Temperature

MDLT = Mean Daily Low (or minimum) Temperature

27 Wind Velocity or Speed *(2012)*

The wind velocity or speed refers to the one-minute averaged wind velocity at the reference height of 15.3 m (50 ft) above still-water level.

29 Critical Structural Areas *(2012)*

Critical Structural Areas are locations which have been identified from structural analysis to be subjected to high stresses and/or high risk of buckling or fatigue damage, where the failure of these structural items would result in the rapid loss of structural integrity and produce an event of unacceptable consequence. Critical structural areas may be also identified from the service history of the unit or from similar or sister units as locations sensitive to cracking, buckling or corrosion that could impair the structural integrity of the unit.

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31 Downflooding *(2016)*

Downflooding means any flooding of the interior of any part of the buoyant structure of a unit through openings which cannot be closed watertight or weathertight, as appropriate, in order to meet the intact or damage stability criteria, or which are required for operational reasons to be left open.

Note: Unprotected openings are usually considered as downflooding points in intact and damage stability calculations.

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PART

3

CHAPTER 1 General

SECTION 2 Plans and Design Data to be Submitted *(2012)*

1 Hull and Design Data

Plans showing the scantlings, arrangements and details of the principal parts of the structure of each unit to be built under survey are to be submitted for review and approved before the work of construction are commenced. These plans are to clearly indicate the scantlings, joint details and welding, or other methods of connection.

Plans should generally be submitted electronically to ABS. However, hard copies will also be accepted. In general, these plans are to include the following where applicable.

- General arrangement
- Inboard and outboard profile
- An arrangement plan of watertight compartmentation
- Diagrams showing the extent to which the watertight and weathertight integrity is intended to be maintained, including the location, type and disposition of watertight and weathertight closures.
- Summary of distributions of fixed and variable weights for each reviewed condition.
- Type, location and quantities of permanent ballast.
- Loadings for all decks
- Transverse sections showing scantlings
- Longitudinal sections showing scantlings
- Decks
- *(1999)* Structural fire protection layout plan for decks and bulkheads
- *(2018)* Fiber Reinforced Plastic (FRP) layout drawing
- *(1999)* Plans or a booklet of joiner work details of construction for all decks, bulkheads and doors
- *(1999)* Ventilation plan showing all horizontal and vertical duct work listing all materials, duct size and gauge
- *(1999)* Penetration details through bulkheads and decks to accommodate ventilation, piping, electrical, etc.
- *(1999)* Escape plan (depicting escape routes as determined by 5-3-1/1)
- *(1996)* Helicopter deck with helicopter particulars (See 3-2-2/3.1)
- Framing
- Shell plating
- Watertight bulkheads and flats
- Structural bulkheads and flats
- Tank bulkheads and flats with level of top of overflows and air pipes
- Pillars and girders

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- Diagonals and struts
- Legs
- Structure in way of jacking or other elevating arrangements
- Structures supporting the drilling derrick
- Stability columns and intermediate columns
- Hulls, pontoons, footings, spudcans, pads or mats
- Superstructures and deck houses
- Arrangement and details of watertight doors and hatches
- Foundations for anchoring equipment, industrial equipment, etc., where attached to hull structure, superstructures or deckhouses
- Welding details and procedures
- Lines and offsets
- Curves of form or equivalent data
- Wind heeling moment curves or equivalent data
- Capacity plan
- Tank sounding tables
- Corrosion control arrangements
- Methods and locations for nondestructive testing
- Plans for conducting underwater inspections in lieu of drydocking
- A description of environmental conditions for each mode of operation, including the service temperature of the unit (see 3-1-1/25) and minimum expected sea temperatures
- Critical structural areas identified in structural analyses (see 3-1-1/29)

3 Calculations

The following calculations are to be submitted:

- Structural analysis, including fatigue analysis
- Resultant forces and moments from wind, waves, current, mooring and other environmental loadings
- Effects of icing on structural loadings and stability
- Wind resistance area of exposed structural elements
- Stability calculations, both intact and damaged
- Significant operational loads from drilling derrick, riser tensioners and other similar type significant loadings
- Calculations substantiating adequacy of structure to transmit forces between legs and hull through the jacking or other self-elevating system
- Evaluation of the unit's ability to resist overturning while bearing on the sea bed

Submitted calculations are to be suitably referenced.

Results from model tests or dynamic response calculations may be submitted as alternatives or a substantiation for required calculations.

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PART

3

CHAPTER 1 General

SECTION 3 Environmental Loadings

1 Loading Criteria

1.1 General *(2012)*

A unit's modes of operation should be investigated using anticipated loads, including gravity and functional loads together with relevant environmental loads due to the effects of wind, waves, currents, and where deemed necessary by the Owner or designer, the effects of earthquake, sea bed supporting capabilities, ambient temperature, fouling, ice, etc. Where applicable, the loads indicated herein are to be adhered to for all types of mobile offshore drilling units. The Owner is to specify the environmental conditions for which the plans for the unit are to be approved. These design environmental conditions are to be recorded in the Operating Manual [see 1-1-5/1.3i) of the MODU Rules Supplement to the ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)*].

1.3 Wind Loadings

1.3.1 General

The minimum wind velocity for unrestricted offshore service for all normal drilling and transit conditions is not to be less than 36 m/s (70 kn). All units in unrestricted offshore service are to have the capability to withstand a severe storm condition wherein a wind velocity of not less than 51.5 m/s (100 kn) is assumed. In order to comply with a severe storm condition, all units are to show compliance with this requirement at all times or have the capability to change their mode of operation. The steps to be taken to comply with the 51.5 m/s (100 kn) criteria from the 36 m/s (70 kn) criteria are the responsibility of the Owner. Units which, due to intended limited service, are not designed to meet the above criteria may be considered for restricted service classification. For any restricted classification, the minimum wind velocity is to be taken at not less than 25.7 m/s (50 kn).

1.3.2 Wind Pressure

In the calculation of wind pressure, P, the following equation is to be used and the vertical height is to be subdivided approximately in accordance with the values listed in 3-1-3/Table 2.

$$P = f\, V_k^2\, C_h\, C_s \quad \text{N/m}^2\ (\text{kgf/m}^2,\ \text{lbf/ft}^2)$$

where

f	=	0.611 (0.0623, 0.00338)
V_k	=	wind velocity in m/s (m/s, kn)
C_h	=	height coefficient from 3-1-3/Table 2
C_s	=	shape coefficient from 3-1-3/Table 1

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TABLE 1
Values of C_s *(2013)*

Shapes or combinations of shapes which do not readily fall into the specified categories will be subject to special consideration.

Spherical	0.4
Cylindrical shapes (all sizes)	0.5
Hull (surface type)	1.0
Deck house	1.0
Isolated Structural shapes (cranes, angles, channels, beams, etc.	1.5
Wires	1.2
Under deck areas (smooth surfaces)	1.0
Under deck areas (exposed beams and girders)	1.3
Small parts	1.4
Rig derrick (each face)	1.25

TABLE 2
Values of C_h

The height, *h*, in m (ft), is the vertical distance from the design water surface to the center of area, *A*, defined in 3-1-3/1.3.3.

Height (Meters)	*Height (Feet)*	C_h
0.0–15.3	0–50	1.00
15.3–30.5	50–100	1.10
30.5–46.0	100–150	1.20
46.0–61.0	150–200	1.30
61.0–76.0	200–250	1.37
76.0–91.5	250–300	1.43
91.5–106.5	300–350	1.48
106.5–122.0	350–400	1.52
122.0–137.0	400–450	1.56
137.0–152.5	450–500	1.60
152.5–167.5	500–550	1.63
167.5–183.0	550–600	1.67
183.0–198.0	600–650	1.70
198.0–213.5	650–700	1.72
213.5–228.5	700–750	1.75
228.5–244.0	750–800	1.77
244.0–259.0	800–850	1.79
259.0 and above	850 and above	1.80

1.3.3 Wind Force

The wind force, *F*, is to be calculated in accordance with the following equation for each vertical area and the resultant force and vertical point of application is to be determined.

$$F = PA$$

where

F = force, in N (kgf, lbf)

P = pressure, in N/m^2 (kgf/m^2, lbf/ft^2)

A = projected area, in m^2 (ft^2), of all exposed surfaces in either the upright or heeled condition

In calculating the wind forces, the following procedures are recommended:

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1.3.3(a) In the case of units with columns, the projected areas of all columns are to be included (i.e., no shielding allowance is to be taken).

1.3.3(b) Areas exposed due to heel, such as underdecks, etc., are to be included using the appropriate shape coefficients.

1.3.3(c) The block projected area of a clustering of deck houses may be used in lieu of calculating each individual area. The shape coefficient may be assumed to be 1.1.

1.3.3(d) Isolated houses, structural shapes, cranes, etc., are to be calculated individually using the appropriate shape coefficient from 3-1-3/Table 1.

1.3.3(e) Open truss work commonly used for derrick towers, booms and certain types of masts may be approximated by taking 30% of the projected block areas of both the front and back sides, i.e., 60% of the projected block area of one side for double sided truss work. The shape coefficient is to be taken in accordance with 3-1-3/Table 1.

1.5 Wave Loadings

1.5.1 General

Wave criteria specified by the Owner may be described by means of wave energy spectra or by deterministic waves having shape, size and period appropriate to the depth of water in which the unit is to operate. Waves are to be considered as coming from any direction relative to the unit. Consideration is to be given to waves of less than maximum height where due to their period, the effects on various structural elements may be greater.

1.5.2 Determination of Wave Loads

The determination of wave loads for use in structural design is to be based on acceptable calculations, model tests or full scale measurements. For structures comprised of slender members which do not significantly alter the incident wave field, semi-empirical formulations such as Morison's equation may be used. For calculations of wave loads on structural configurations which significantly alter the incident wave field, diffraction methods are to be used which account for both the incident wave force (i.e., Froude-Krylov force) and the forces resulting from wave diffraction and radiation.

In general, Morison's equation may be used for structures comprised of slender members the diameters (or equivalent diameters giving the same cross-sectional areas parallel to the flow) of which are less than 20% of the wave lengths being considered and are small in relation to the distances between structural members subject to wave loading (e.g., self-elevating units in the elevated condition and most column-stabilized units).

For each combination of wave height, wave period and water depth being considered, a range of wave crest positions relative to the structure is to be investigated to ensure an accurate determination of the maximum wave force on the structure.

1.5.3 Morison's Equation

The hydrodynamic force acting normal to the axis of a cylindrical member, as given by Morison's equation, is expressed as the sum of the force vectors indicated in the following equation:

$$F_W = F_D + F_I$$

where

F_W = hydrodynamic force vector per unit length along the member, acting normal to the axis of the member.

F_D = drag force vector per unit length

F_I = inertia force vector per unit length

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The drag force vector per unit length for a stationary, rigid member is given by:

$$F_D = (C/2)\, D\, C_D\, u_n\, |u_n| \quad \text{kN/m (tf/m, lbf/ft)}$$

where

C = 1.025 (0.1045, 1.99)

D = projected width, in m (ft), of the member in the direction of the cross-flow component of velocity (in the case of a circular cylinder, D denotes the diameter)

C_D = drag coefficient (dimensionless)

u_n = component of the velocity vector, normal to the axis of the member, in m/s (ft/s)

$|u_n|$ = absolute value of u_n, in m/s (ft/s)

The inertia force vector per unit length for a stationary, rigid member is given by:

$$F_1 = C\,(\pi D^2/4)\, C_M\, a_n \quad \text{kN/m (tf/m, lbf/ft)}$$

where

C_M = inertia coefficient based on the displaced mass of fluid per unit length (dimensionless)

a_n = component of the fluid acceleration vector normal to the axis of the member, in m/s^2 (ft/s^2)

For structures which exhibit substantial rigid body oscillations due to wave action, the modified form of Morison's equation given below may be used to determine the hydrodynamic force.

$$F_w = F_D + F_I$$
$$= C/2\, D\, C_D\, (u_n - u_n')\, |u_n - u_n'| + C\,(\pi D^2/4) a_n + C\,(\pi D^2/4)\, C_m\, (a_n - a_n')$$

where

u_n' = component of the velocity vector of the structural member normal to its axis, in m/s (ft/s)

C_m = added mass coefficient (i.e., $C_m = C_M - 1$)

a_n' = component of the acceleration vector of the structural member normal to its axis, in m/s^2 (ft/s^2)

For structural shapes other than circular cylinders, the term $\pi D^2/4$ in the above equations is to be replaced by the actual cross-sectional area of the shape.

Values of u_n and a_n for use in Morison's equation are to be determined using wave theories appropriate to the wave heights, wave periods and water depths being considered. Drag and inertia coefficients vary considerably with section shape. Reynold's number, Keulegan-Carpenter number and surface roughness are to be based on reliable data obtained from literature, model or full scale tests. For circular cylindrical members at Reynold's numbers greater than 1×10^6, C_D and C_M may be taken at 0.62 and 1.8, respectively, provided that marine fouling is prevented or periodically removed.

1.7 Current Loading

1.7.1 Current Associated with Waves

When determining loads due to the simultaneous occurrence of waves and current using Morison's equation, the current velocity is to be added vectorially to the wave particle velocity before the total force is computed. When diffraction methods are used for calculating wave force, the drag force due to current should be calculated in accordance with 3-1-3/1.7.2 and added vectorially to the calculated wave force.

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The current velocity is to include components due to tidal current, storm surge current and wind driven current. In lieu of defensible alternative methods, the vertical distribution of current velocity in still water and its modification in the presence of waves, as shown in 3-1-3/Figure 1, are recommended, where:

$$V_c = V_t + V_s + V_w\,[(h - z)/h], \qquad \text{for } z \le h$$

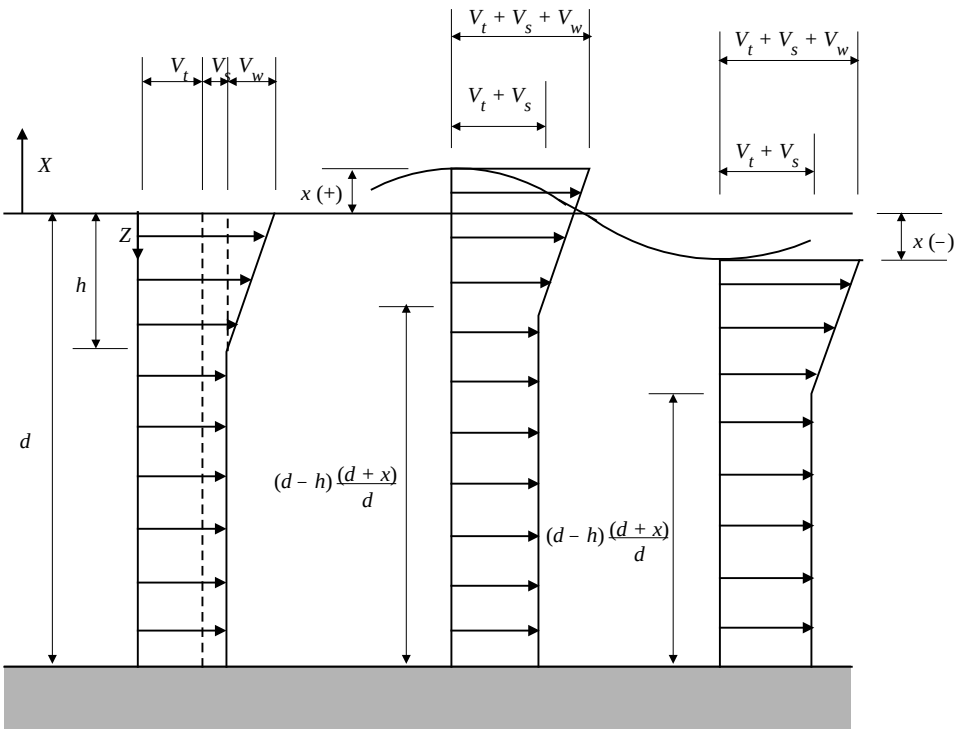
$$V_c = V_t + V_s \qquad \text{for } z > h$$

where

V_c	=	current velocity, m/s (ft/s)
V_t	=	component of tidal current velocity in the direction of the wind, m/s (ft/s)
V_s	=	component of storm surge current, m (ft)
V_w	=	wind driven current velocity, m/s (ft/s)
h	=	reference depth for wind driven current, m (ft). (in the absence of other data, h may be taken as 5 m (16.4 ft).
z	=	distance below still water level under consideration, m (ft)
d	=	still water depth, m (ft)

In the presence of waves, the current velocity profile is to be modified, as shown in 3-1-3/Figure 1, such that the current velocity at the instantaneous free surface is a constant.

FIGURE 1
Current Velocity Profile



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1.7.2 Drag Force

When calculating the drag force on submerged parts of the structure due to current alone, the following equation may be used.

$$f_D = C/2\ D\ C_D\ u_c\ |u_c|$$

where

f_D = current drag force vector per unit length along the member, acting normal to the axis of the member in kN/m (tf/m, lbf/ft)

u_c = component of the current velocity vector, V_c, normal to the axis of the member

C, D and C_D are as defined in 3-1-3/1.5.3.

All of the above values are to be taken in a consistent system of units, C_D being dimensionless. Drag coefficients in steady flow vary considerably with section shape, Reynold's number and surface roughness and are to be based on reliable data obtained from literature, model or full scale tests.

1.9 Loadings due to Vortex Shedding

Consideration is to be given to the possibility of flutter of structural members due to vortex shedding.

1.11 Gravity and Functional Loads *(2008)*

1.11.1 General

The gravity loads are steel, equipment and outfitting weights, liquid and solid variables, and live loads and should be taken into account in the design of the structural strength and stability. The load effects due to operations such as drilling (rotary/hook loads and tensioner loads), work over and well servicing should also be taken into account.

1.11.2 Combinations of Gravity and Functional Loads for Design

For all modes of operation, the combinations of gravity and function loads are to be specified by the Owners or Designers as per the operations designed. However, maximums (or minimums) of the combinations that produce the most unfavorable load effects in the strength or stability of the unit should be taken for design.

1.11.3 Deck Loadings

As indicated in 3-1-2/1, a loading plan is to be prepared for each design. This plan is to show the maximum uniform and concentrated loadings to be considered for all areas for each mode of operation. In the preparation of this plan, the following loadings are to be considered as minimums.

Crew spaces (walkways, general traffic areas, etc.)

4510 N/m^2 (460 kgf/m^2, 94 lbf/ft^2) or 0.64 m (2.1 ft) head

Work areas

9020 N/m^2 (920 kgf/m^2, 188 lbf/ft^2) or 1.28 m (4.2 ft) head

Storage areas

13000 N/m^2 (1325 kgf/m^2, 272 lbf/ft^2) or 1.84 m (6.0 ft) head

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CHAPTER 1 General

SECTION 4 Material Selection

1 Materials

1.1 General *(2016)*

This Section covers materials used for the construction of mobile offshore drilling units. Structural materials are to be suitable for intended service conditions. Preferably, materials used in the construction of the hull of drilling units are to be in accordance with the ABS *Rules for Materials and Welding (Part 2).*

Non-ABS grade steels to other recognized specifications, can be considered for hull structure application and other structural members, subject to witnessed testing and approval in accordance with 3-1-4/3.7.

Note: The tensile specification requirement for ABS Grades of steel plate and sections remains constant with increased thickness.

1.1.1 Cast Nodes Used as Special or Primary Application Structure

Cast nodes used in special or primary application structure are to be produced by an ABS approved foundry and witness tested by an ABS surveyor.

1.1.2 Rack and Chord Elements used as Primary Application Structure of Legs for Self-Elevating Units.

Welded assemblies of rack and chord elements used as primary application structure in lattice type leg members are to be produced by an ABS approved mill and witness tested by an ABS Surveyor.

1.1.3 Seamless and Welded Steel Pipes used as Primary Application Structure of Legs for Self-Elevating Units and Column-stabilized Units.

Seamless steel pipes and welded steel pipes used as primary application structure of tubular leg members are to be produced by an ABS approved mill and witness tested by an ABS Surveyor.

1.1.4 Seamless and Welded Steel Pipes used as Secondary Application Structure of Legs for Self-Elevating Units

Seamless steel pipes and welded steel pipes used as secondary application structure of legs on a self-elevating unit need not be produced by an ABS approved mill nor witness tested by an ABS Surveyor. Material Test Reports (MTR) representing each member are to be available to the Surveyor before fabrication.

1.3 Characteristics

Materials used are required to exhibit satisfactory formability and weldability characteristics. For materials other than those indicated in 2-1-2/Tables 1 through 4 and 2-1-3/Tables 1 through 4 of the above-referenced Part 2, evidence of satisfactory formability and weldability are to be submitted for review.

1.5 Toughness

Materials are to exhibit fracture toughness which is satisfactory for the intended application, as evidenced by previous satisfactory service experience or appropriate toughness tests.

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1.7 Materials Other than Steel

When material other than steel is used as a structural material, documentation is to indicate the mechanical properties, toughness, fatigue, and corrosion characteristics of the proposed material. Where such materials are used in combination with steel, galvanic effects should be taken into account, as applicable.

1.9 Service Temperature *(2012)*

Drilling units intended for unrestricted service are to have a service temperature (see 3-1-1/25) equal to or below 0°C (32°F). When the service temperature of the drilling unit is above 0°C (32°F), the drilling unit is to have the notation **Restricted Service**.

3 Hull Steel Grades

3.1 Ordinary and Higher Strength Steel

2-1-2/Tables 1 through 4 and 2-1-3/Tables 1 through 4 of the ABS *Rules for Materials and Welding (Part 2)* show the chemical, mechanical properties, and heat treatment specifications for the various grades of ABS ordinary and higher strength hull structural steel.

3.3 Extra High Strength Steel *(2018)*

2-1-8/Tables 1, 2, 3, 4a, 4b, 5a and 5b of the ABS *Rules for Materials and Welding (Part 2)* show the chemical and mechanical properties for the various grades of ABS extra high strength hull structural steel and are to be used for reference when considering material selection for self-elevating and column stabilized units.

3.5 Additional Requirements

In cases where principal loads from either service or weld residual stresses are imposed perpendicular to the plate thickness, the use of special plate with improved through thickness (Z direction) properties may be required.

3.7 Other Grades *(2014)*

Materials, test specimens and mechanical testing procedures having characteristics differing from those prescribed herein may be approved upon application, due regard being given to the material specification proposed, the steel manufacturer, the manufacturing process, the established practices in the country in which the material is produced and the purpose for which the material is intended.

Note: The tensile specification requirements for steel plate of several widely applied recognized standards, permit the properties to decrease with increased thickness, and this must be accounted for in the design phase.

Non-ABS Grades are to be Charpy impact tested in accordance with 3-1-4/5.7.

5 Selection of Grades

5.1 General *(2012)*

For the classification of self-elevating, column-stabilized, and surface-type drilling units, it is necessary to take into account service temperature of the unit and structural element category when selecting structural materials. The various parts of self-elevating, column stabilized, and surface-type units are grouped according to their material application categories. The structural elements falling into these categories are described, in general, in 3-2-3/3.1, 3-2-4/1.7 and 3-2-5/3.

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5.3 Material Application Categories *(2012)*

The structural elements are grouped into the following categories depending on the criticality of the application:

5.3.1 Special Application (Most Critical)

Failure of special application structural elements may cause catastrophic structural damage to the unit with high risk of loss of life and environmental pollution. The special application structural elements are most critical for the survivability of the unit.

5.3.2 Primary Application (Intermediate)

Failure of primary application structural elements may cause significant structural damage to the unit with moderate risk of loss of life and environmental pollution. The primary application structural elements have an intermediate criticality for the survivability of the unit.

5.3.3 Secondary Application (Least Critical)

Failure of secondary application structural elements may cause minor structural damage to the unit with low risk of loss of life and environmental pollution. The secondary application structural elements are the least critical for the survivability of the unit.

5.5 Selection Criteria for ABS Grades of Steel *(2018)*

3-1-4/Table 1 shows selection criteria for each structural element category for ABS grades of ordinary and higher strength hull structural steels to be used in self-elevating and column-stabilized drilling units expected to experience service temperatures as low as –30°C (–22°F). Requirements for selection of ABS extra high strength steels are given in 3-1-4/Table 2. Service temperature refers to the minimum temperature of the steel. See 3-1-1/25. Where the steel temperature in specific structural areas is shown to be warmer than the service temperature of the unit, the warmer temperature may be applied. Where the minimum steel temperature is 0°C (32°F) or warmer, the material requirements indicated for 0°C (32°F) are generally applicable. In addition, where material being considered is located in close proximity to, or below, the minimum waterline, the material selection may be based on that indicated for the 0°C (32°F) temperature.

These requirements are applicable for units that are limited to areas of operation where ice strengthening is not required.

Where it is desired to use steels other than those in 3-1-4/Table 1 and 3-1-4/Table 2 or thicknesses above the maximum indicated in 3-1-4/Table 1, they are to be specially considered.

5.7 Criteria for Other Steels

5.7.1 General *(2012)*

Appropriate supporting information or test data is to indicate that the toughness of the steels will be adequate for their intended application in the unit's structure at the service temperature of the unit. In the absence of supporting data, tests are required to demonstrate that steels would meet the following Charpy V-Notch (CVN) impact requirements.

5.7.2 CVN Requirements *(2014)*

Steels in the 235 to 420 N/mm^2 (24 to 43 kgf/mm^2, 34 to 61 ksi) yield strength range are to meet the following CVN requirements:

Specified Minimum Yield Strength (2)			*Longitudinal CVN Joules (kgf-m, ft-lbf) at 2 mm (0.08 in.) Sub-surface Thickness mm (in.)* (1, 4)				
N/mm^2	*kgf/mm^2*	*ksi*	*$t \le 50$ ($t \le 2.0$)*	*$50 < t \le 70$ ($2.0 < t \le 2.8$)*	*$70 < t \le 100$ ($2.8 < t \le 4.0$)*	*$100 < t \le 150$ (2) ($4.0 < t \le 6.0$)*	*$150 < t \le 200$ (2) ($6.0 < t \le 8.0$)*
235	24	34	27 (2.8, 20)	35 (3.6, 26)	42 (4.3, 31)	48 (4.9, 35)	54 (5.5, 40)
275	28	40	27 (2.8, 20)	35 (3.6, 26)	42 (4.3, 31)	48 (4.9, 35)	54 (5.5, 40)
355	36	51	35 (3.6, 26)	42 (4.3, 31)	48 (4.9, 35)	54 (5.5, 40)	60 (6.1, 44)
420	43	61	42 (4.3, 31)	48 (4.9, 35)	54 (5.5, 40)	60 (6.1, 44)	66 (6.7, 49)

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Notes:

1 For thicknesses above 40 mm (1.6 in.) the Charpy tests are to be taken at $^1/_4t$.

2 *(1 July 2014)* For plate over 100 mm (4.0 in.) thick, in addition to note 1 Charpy tests at mid *t* are to be carried out and are to achieve at least $^2/_3$ of the required Joule value indicated in the above table for sub-surface specimens. Alternatively the mid *t* test can be carried out at 10°C (18°F) above the specified CVN test temperature to achieve the same Charpy value specified for the sub-surface specimen. Mid t Charpy testing may not be required in cases where it has been established by first article testing and satisfactory manufacturing production control, that adequate mid thickness Charpy values and internal quality are maintained, and the necessary supporting documents are submitted to ABS Materials department for review. However in such cases, when deemed necessary by ABS Materials department, random mid t Charpy sampling may be required.

3 For intermediate yield strength values, the CVN values are based upon the Yield MPa/10 up to 50 mm (2.0 in.) and then incremented by the same scale for thickness increase.

4 For thickness above 200 mm (8.0 in.), in general the same CVN criteria for 150 mm to 200 mm (6.0 in. to 8.0 in.) applies to $^1/_4t$ and mid *t*, see Note 2. However, the criticality and component detail for each application is to be assessed and alternative criteria may be accepted or requested.

5 *(2017)* Steel for appurtenant or secondary structure fabricated to recognized Standards, is to be verified by, or tested to the satisfaction of the ABS Surveyor, and may be used in ABS Grade A applications without additional CVN test provided:

i) Service temperature is -10°C (14° F) or above

ii) Max thickness is 12.5 mm (0.5 in.) for plate, and 19 mm (0.75 in.) for sections

iii) The structure does not contribute to the hull watertight integrity or leg structural integrity.

5.7.3 CVN Temperatures

The CVN requirements are to be obtained when tested at the following temperatures:

Secondary application structure:	service temperature
Primary application structure:	10°C (18°F) below service temperature
Special application structure:	30°C (54°F) below service temperature

5.7.4 Extra High Strength Steels *(2018)*

Steels in the 460 to 960 N/mm^2 (47 to 98 kgf/mm^2, 67 to 139 ksi) yield strength range are to meet the following CVN requirements at the following test temperatures.

Specified Minimum Yield Strength (3, 5)			*Longitudinal CVN Joules (kgf-m, ft-lbf) at 2 mm (0.08 in.) Sub-surface Thickness, mm (in.)* (1, 4)	
N/mm^2	*kg/mm^2*	*ksi*	*$t \le 100$ ($t \le 4.0$)*	*$100 < t \le 200$* (2) *($4.0 < t \le 8.0$)*
460	47	67	46 (4.7, 34)	46 (4.7, 34)
500	51	73	50 (5.1, 37)	50 (5.1, 37)
550	56	80	55 (5.6, 41)	55 (5.6, 41)
620	63	90	62 (6.3, 46)	62 (6.3, 46)
690	70	100	69 (7.0, 51)	69 (7.0, 51)
890	91	129	69 (7.0, 51)	69 (7.0, 51)
960	98	139	69 (7.0, 51)	69 (7.0, 51)

Notes:

1 For thicknesses above 40 mm (1.6 in.) the Charpy tests are to be taken at $^1/_4t$.

2 *(2018)* For plate over 100 mm (4.0 in.) thick, in addition to note 1 Charpy tests are to be carried out at mid *t* and are to achieve at least $^2/_3$ of the required Joule value indicated in the above table for sub-surface specimens. Alternatively the mid *t* test can be carried out at 10°C above the specified CVN test temperature to achieve the same Charpy value specified for the sub-surface specimen.

3 For intermediate yield strength values, the CVN values are based upon the Yield MPa/10.

4 For thickness above 200 mm (8.0 in.), in general the same CVN criteria for 100 mm to 200 mm (4.0 in. to 8.0 in.) applies to $^1/_4t$ and mid *t*, see Note 2. However, the criticality and component detail for each application is to be assessed and alternative criteria may be accepted or requested.

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Application (per 3-1-4/5.1, 3-1-4/5.3 and 3-1-4/5.5) and Test Temperature

Service Temperature	*Secondary*	*Primary*	*Special*
0°C (32°F)	–10°C (14°F)	–20°C (–4°F)	–30°C (–22°F)
–10°C (14°F)	–20°C (–4°F)	–30°C (–22°F)	–40°C (–40°F)
–20°C (–4°F)	–30°C (–22°F)	–40°C (–40°F)	–50°C (–58°F)
–30°C (–22°F)	–40°C (–40°F)	–50°C (–58°F)	–60°C (–75°F)
–40°C (–40°F)	–50°C (–58°F)	–60°C (–75°F)	–70°C (–94°F)
–50°C (–58°F)	–60°C (–75°F)	–70°C (–94°F)	–80°C (–112°F)

Note: For service temperatures lower than –40°C (–40°F) consideration can be given to alternative testing requirements subject to consultation with the steel mill.

5.7.5 Alternative Requirements

As an alternative to the requirements in 3-1-4/5.7.2 and 3-1-4/5.7.4, steels may comply with the following.

i) For transverse specimens, $^2/_3$ of energy values shown for longitudinal specimens

ii) For longitudinal specimens, lateral expansion is not to be less than 0.5 mm (0.02 in.). For transverse specimens – lateral expansion is not to be less than 0.38 mm (0.015 in.).

iii) Nil-ductility temperature (NDT), as determined by drop weight tests, is to be 5°C (9°F) below the temperature specified in 3-1-4/5.7.3.

iv) Compliance with 3-1-A3/Table 5 for ABS grades of quenched and tempered steels.

5.7.6 Additional Requirements *(2014)*

It is to be noted that Coastal Authorities may have specific toughness requirements that exceed the minimum requirements of the ABS Rules. If such requirements exist, reference to the additional requirements is to be made in order to establish the required testing criteria.

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TABLE 1
Material Selection Requirements for ABS Ordinary and Higher Strength Steels *(2015)*

Numbers in table are maximum thicknesses in mm (in.)

Blank areas indicate no application

	Service Temperature °C (°F)																	
Grade	*Secondary Applications*						*Primary Applications*						*Special Applications*					
	0 (32)	–10 (14)	–20 (–4)	–30 (–22)	–40* (–40)*	–50* (–58)*	0 (32)	–10 (14)	–20 (–4)	–30 (–22)	–40* (–40)*	–50* (–58)*	0 (32)	–10 (14)	–20 (–4)	–30 (–22)	–40* (–40)*	–50* (–58)*
A	100 (4.00)	19 (0.75)	12.5 (0.50)	—	—	—	19 (0.75)	12.5 (0.50)	—	—	—	—	—	—	—	—	—	—
B	100 (4.00)	25 (1.00)	19 (0.75)	12.5 (0.50)	—	—	25 (1.00)	19 (0.75)	12.5 (0.50)	—	—	—	16 (0.63)	—	—	—	—	—
D	100 (4.00)	35 (1.375)	35 (1.375)	22.5 (0.89)	12.5 (0.50)	—	35 (1.375)	35 (1.375)	22.5 (0.89)	12.5 (0.50)	—	—	22.5 (0.89)	16 (0.63)	—	—	—	—
DN	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	22.5 (0.89)	16 (0.63)	100 (4.00)	100 (4.00)	27.5 (1.08)	22.5 (0.89)	16 (0.63)	—	27.5 (1.08)	22.5 (0.89)	16 (0.63)	—	—	—
E	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	16 (0.63)	100 (4.00)	100 (4.00)	27.5 (1.08)	16 (0.63)	12.5 (0.50)	
AH	100 (4.00)	25 (1.00)	19 (0.75)	12.5 (0.50)	—	—	19 (0.75)	19 (0.75)	12.5 (0.50)	—	—	—	19 (0.75)	—	—	—	—	—
DH	100 (4.00)	100 (4.00)	100 (4.00)	19 (0.75)	12.5 (0.50)	—	100 (4.00)	100 (4.00)	19 (0.75)	12.5 (0.50)	—	—	19 (0.75)	16 (0.63)	—	—	—	—
DHN	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	22.5 (0.89)	16 (0.63)	100 (4.00)	100 (4.00)	27.5 (1.08)	22.5 (0.89)	16 (0.63)	—	27.5 (1.08)	22.5 (0.89)	16 (0.63)	—	—	—
EH	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	16 (0.63)	100 (4.00)	100 (4.00)	27.5 (1.08)	16 (0.63)	12.5 (0.50)	—
FH	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	100 (4.00)	100 (4.00)	100 (4.00)	100 (4.00)	27.5 (1.08)	16 (0.63)

Note: Material selection/testing proposal is to be submitted to ABS Materials Dept. for review, in case:

- Steels with thicknesses above maximum indicated in the table are selected
- Design service temperature is lower than –50°C (–58°F)

TABLE 2
Material Selection for ABS Extra High Strength Steel Grades(1) *(2018)*

Service Temperature °C (°F)	*Secondary **	*Primary*	*Special*
0 (32)	AQ43 to AQ70	DQ43 to DQ70	EQ43 to EQ70
–10 (14)	EQ43 to EQ70	EQ43 to EQ70	EQ43 to EQ70
–20 (–4)	EQ43 to EQ70	EQ43 to EQ70	EQ43 to EQ70
–30 (–22)	EQ43 to EQ70	EQ43 to EQ70	EQ43 to EQ70
–40 (–40)	FQ43 to FQ70	FQ43 to FQ70	FQ43 to FQ70
–50 (–58)	FQ43 to FQ70	FQ43 to FQ70	—
* For Secondary members, toughness criteria may be relaxed.			

Note:

1 Selection of grades 91 and 98 will be specially considered depending on the application and weldability.

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