



GUIDE FOR CLASSIFICATION OF

INDUSTRIAL SYSTEMS AND EQUIPMENT

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**American Bureau of Shipping
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Foreword

This *Guide for the Classification of Industrial Systems and Equipment* has been developed to provide requirements for class review and approval of industrial equipment that may be installed onboard a variety of vessels or offshore units.

This Guide outlines the ABS requirements for the design, construction, installation, and survey after construction of industrial equipment installed onboard ABS classed Vessels, Steel Barges or Mobile Offshore Units (MOUs).

Industrial equipment designed, constructed, and installed in accordance with the requirements of this Guide on an ABS classed vessel or mobile offshore unit, under ABS review and survey, will be classed and identified in the *Record* by an appropriate classification notation as defined herein.

In this edition of the Guide, 1-1/5.1 and Chapter 2 focus on Pipe Laying Equipment, but the concepts in the Guide can be applied to other types of industrial equipment.

The effective date of this Guide is the first day of the month of publication. The application of this Guide and referred Rules and Guides 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 September 2014 are not applicable to a vessel or unit for which the contract for construction was signed on 31 August 2014). At the Owner's request and upon agreement by ABS, this Guide may be applied to existing vessels or units or to those projects for which the contract date of construction has been signed before 1 August 2014. See also 1-1-4/3 of the *ABS Rules for Conditions of Classification (Part 1)*.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



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CHAPTER 1 Scope and Conditions of Certification

SECTION 1 General

1 Application

This Guide has been developed to provide requirements for the design, construction, installation and survey of industrial systems and equipment onboard vessels and/or mobile offshore units classed with ABS. The requirements as specified in this Guide are additional to all other relevant requirements of ABS Rules and Guides.

3 Scope

This Guide addresses the engineering and safety aspects related to industrial systems and equipment installed onboard vessels or mobile offshore units classed with ABS other than those covered by the *ABS Rules for Building and Classing Facilities on Offshore Installations*. The scope of the Guide is limited to industrial systems and equipment necessary for pipe laying operations of a dedicated offshore support vessel or unit. However, the requirements of this Guide may be applied to other types of industrial equipment installed onboard vessels and/or mobile offshore units such as cable laying, pile driving, offshore construction maintenance, or anchor handling considering equivalent recognized standards where recognized standards are referenced in this Guide.

The specialized offshore industrial systems and equipment may be permanent, temporary or portable.

5 Class Notations

5.1 ☒ IE (Pipe Lay) – Industrial Equipment (Pipe Laying)

At the request of the owner, **☒ IE (Pipe Lay)** may be assigned for industrial systems and equipment reviewed, approved and constructed under ABS Survey for installation onboard an ABS classed vessel or unit for a dedicated pipe laying service.

For example, a pipe laying vessel with a notation **☒ A1 Offshore Support Vessel (Pipe Lay)** may be assigned with industry equipment notation **☒ A1 Offshore Support Vessel (Pipe Lay), ☒ IE (Pipe Lay)**. A mobile offshore unit with notation **☒ A1 Pipe Lay Service** may be assigned with industry equipment notation **☒ A1 Pipe Lay Service, ☒ IE (Pipe Lay)**.

With appropriate modifications this Guide can also be used to class the industrial systems installed on ABS classed vessels used for other services such as but not limited to Cable Laying, Anchor Handling, Pile Driving, Offshore Construction, Maintenance / Utility. ABS is prepared to provide similar notations.

5.3 Equipment Built Under ABS Survey

The symbol “☒” (Maltese Cross) signifies that the equipment, and/or components were built, installed and commissioned to the satisfaction of the ABS Surveyor.

5.5 Equipment Not Built Under ABS Survey

Equipment, and/or components that have not been built under ABS survey, but which are submitted for Classification, will be subjected to special consideration. Where found satisfactory and thereafter approved by the Committee, they may be classed and distinguished in the *Record* by the notation described above, but the symbol “☒” signifying survey during construction will be omitted.

7 Approval Process

The ABS classification requirements for industrial systems and equipment are a four-step process as outlined below:

- i) Design Review of the Industrial Systems and Equipment, including installation.
- ii) Survey of Industrial Systems and Equipment at Vendor's Shop during manufacture.
- iii) Survey of installation and commissioning onboard the Vessel.
- iv) Survey after construction.

The ABS review process for industrial systems and equipment commences with drawings and documentation detailing the general arrangements/assembly drawings of equipment, structural fire protection of enclosures where applicable, electrical configuration, structural design, machinery and piping systems being submitted to the ABS Technical Office for engineering review. Upon completion of the technical review, the submitter will be notified, and the reviewed drawings and documentation will be made available to the attending ABS Surveyor.

Once a vessel for the industrial equipment notation is specified, design review for installation approval can be commenced. Upon receipt of the documentation detailing the industrial systems and equipment and the proposed location onboard the vessel, the ABS technical office can review the arrangements. Once the ABS engineers have determined that the proposed location onboard the vessel is suitable for the subject industrial systems and equipment, the proposal will be accepted and made available to the attending ABS Survey office. Upon receipt of these drawings, the ABS Surveyor will attend the vessel to confirm that the installation of the industrial equipment is in accordance with the previously approved arrangements.

9 ABS Approvals

ABS approval of industrial systems and equipment may be achieved through one of the following means:

- i) Design review, which is a review of individual materials, components, products and systems for compliance with ABS Rules, Guides or other recognized standards. This includes a review of individual components, testing and approval, per applicable ABS Rules.
- ii) Equipment approval through the ABS Type Approval Program and a system design review in which:
 - a) According to Rule requirements, individual equipment components have already had a design review and type testing resulting in a valid Product Design Assessment (PDA), these components may or may not need additional unit certification.
 - b) The system for which approval is being sought is submitted to Engineering for review which incorporates equipment in ABS Type Approval Program and are listed in the bill of materials [see 1-1-4/7.7 of the *ABS Rules for Conditions of Classification (Part 1)*].

CHAPTER 2 Pipe Laying Systems and Equipment

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CHAPTER 2 Pipe Laying Systems and Equipment

SECTION 1 General

1 Scope

Scope of classification under this Guide is limited to the equipment installed onboard necessary for supporting the pipe laying operations.

3 Definitions

Carousel. Carousels are used for storage during transportation and installation of flexible pipe, umbilicals, risers and other products for offshore applications. The carousel comprises a lower flange located on a central king pin, a hub and an upper flange. The position of the upper flange is adjustable and the flange is locked in place making use of special spacer bars.

Chute or Wheel. A part of the pipe laying system used for installing flexible pipelines, risers and in-line structures. Normally located on tower top.

Flex-Lay. A method for installing flexible pipelines, risers and in-line structures. A Flex-lay system mainly consists of a vertical ramp equipped with one or more tensioners and a chute or wheel on tower top.

Gantry, Mast or "A-Frame". A structural frame, extending above the revolving upper structure to which the boom support ropes are reeved.

Hang-Off Clamps. Hang-off clamps are used to hold the pipe when it is not suspended by other means such as tensioners or traveling blocks.

J-Lay. A method for installing subsea pipelines in deepwater. Pipe stalks with a length up to 6 joints are upended and welded to the seagoing pipe in a near vertical ramp.

Knuckle Boom. Similar to a standard crane, except that the boom articulates at the 'knuckle' near the middle, letting it fold back like a finger.

Line-Up Systems. External line-up tools are used to align new pipe with the seagoing pipe.

Overhead or Bridge Crane. Consisting of parallel runways with a traveling bridge spanning the gap and traveling hoist upon which the ropes are reeved.

Pedestal Crane. A conventional boom crane mounted on a pedestal foundation with a revolving upper structure.

Pipe Straighteners. Pipe needs to be straightened after it is spooled from the reel. It is bent over the aligner before it is overboarded.

PLET Handling System. System allows for PLET (Pipeline End Termination) handling or diameter changes when transporting the PLET from the storage position to the ramp without crane assistance.

Reel. A large spool used for storing of rigid and flexible pipe, umbilicals, risers and other products for offshore applications.

Reel-Lay. A method for installing flexible and rigid subsea pipelines. Long pipe segments are welded, tested and coated onshore and then spooled onto a large vertical pipe reel in one continuous length.

S-Lay. During the S-lay installation method, onboard welded pipe joints leave the vessel horizontally and are guided off the stern by a "stinger" (a structure on the back of the vessel that supports the seagoing pipe string to control its bend radius).

Spooling Device Tensioner. Tensioners are the central elements of most pipe laying systems. They are used onboard pipe laying vessels to keep tension in the pipeline while it is being lowered onto the seabed. The required type of tensioner depends on the pipe specifics as well as the configuration of the pipe laying system.

Tensioner. Tensioners are the central elements of most pipe laying systems. They are used onboard pipe laying vessels to keep tension in the pipeline while it is being lowered onto the seabed. The tensioner is often provided with a sophisticated electric or hydraulic system, by which the tension in the pipe can be controlled even when the vessel is subject to motions. Typical pipe lay tensioners monitor the outboard pipe tension and paid out length as part of the lay process, with feedback going to the lay speed setting or vessel DP system.

5 Design of Pipe Laying Systems and Equipment

5.1 General

The designer is to evaluate pipe laying systems and equipment as a whole, considering the interfacing and interdependence of subsystems.

The required design plans and data related to the pipe laying systems and equipment are to be submitted for approval in accordance with 2-2/Tables 1 through 4.

5.3 Equipment Layout

Equipment layout and work areas associated with the pipe laying activities are to be arranged with the following objectives:

- i) Safety of personnel and operation.
- ii) Separation of fuel and ignition source as far as practical.
- iii) Minimizing the probability of ignition.
- iv) Minimizing the consequences of fire and explosions.
- v) Preventing fire escalation and equipment damage.
- vi) Providing for adequate arrangements for escape and evacuation.
- vii) Facilitating effective emergency response.
- viii) Minimizing dropped object hazards to personnel, equipment (on facility and subsea), and structure.
- ix) Protection of critical systems and equipment from damage during operation, such as:
 - Electrical cables and cableways.
 - Exhaust ducting and air intake ducting.
 - Control and shutdown systems.
 - Fire-fighting equipment is to be arranged so that it is protected from damage during operations.
- x) Equipment arrangements are to provide access for inspection and servicing and safe means of egress from all machinery spaces.
- xi) Electrical equipment in hazardous areas is to be certified-safe type, suitable for such locations. Such equipment must be type-tested and certified by a competent independent testing laboratory for installation within hazardous areas.
- xii) Combustion equipment and combustion engines are not to be located in hazardous areas.
- xiii) Equipment arrangement drawings are to show the location of all equipment, accommodations, machinery spaces, tanks, moon pools, escape routes, evacuation equipment, air intakes, openings to closed spaces, and any fire and barrier walls.
- xiv) Additional requirements related to general arrangement and equipment layout also are to consider the applicable requirements of 4-8-3/1.11.1 of the *OSV Rules*.
- xv) The pipe laying systems and equipment arrangement drawings are to indicate the hazardous areas throughout the vessel, as defined in 4-8-4/29.3 of the *OSV Rules*.

5.5 Materials

The materials for each equipment or component are to be selected with consideration of their fitness for the intended service and in accordance with the applicable codes and standards as referenced in this Guide.

The experience of the manufacturers, designers and related performance records will be specially considered with appropriate technical justifications.

5.7 Welding and Nondestructive Examination

General requirements for welding and nondestructive examination (NDE) are to be in accordance with *ABS Rules for Materials and Welding (Part 2)* or *ABS Nondestructive Inspection of Hull Welds*, as applicable.

5.9 Design Specifications

The design specification for pipe laying systems and equipment is to consider as a minimum, but not limited to, the most adverse combination of applicable loads and is to consist of design plans, drawings, data, and calculations, to substantiate the design.

In addition to the design specifications, the manufacturing specifications are to include material specifications, WPS/PQR, NDE, and testing procedures/specifications utilized in the manufacturing, installation, and commissioning of each system, subsystem, equipment, and/or component and are to comply with the applicable section of this Guide, in addition to the codes or standards used.

5.11 Design Considerations

5.11.1 Recognized Standards

The submitted design is to be in accordance with the requirements of this Guide and recognized codes and standards acceptable to ABS (see Appendix 1 of this Guide for examples of recognized standards).

5.11.2 Alternative Basis of Design

When alternate design codes and standards are proposed, justifications can be achieved through equivalency, gap analysis or appropriate risk analysis/philosophy to demonstrate that the proposed alternate design code and standard will provide an equivalent level of safety to the recognized standards.

Designs based on manufacturers' standards may also be accepted. In such cases, complete details of the manufacturer's standard and engineering justification are to be submitted for review.

- i) The manufacturer will be required to demonstrate by way of testing or analysis that the design criteria employed results in a level of safety consistent with that of a recognized standard or code of practice.
- ii) Where strain gauge testing, fracture analysis, proof testing or similar procedures form a part of the manufacturer's design criteria, the procedure and results are to be submitted for ABS review.
- iii) Historical performance data for pipe laying systems and equipment is to be submitted for justification of designs based on manufacturers' standards.
- iv) ABS will consider the application of risk evaluations for alternative or novel features for the basis of design in accordance with the *ABS Guidance Notes on Review and Approval of Novel Concepts*, *ABS Guidance Notes on Risk Assessment Applications for the Marine and Offshore Oil and Gas Industries*, and *ABS Guide for Risk Evaluations for the Classification of Marine-Related Facilities* which provide guidance to ABS clients on how to prepare a risk evaluation to demonstrate equivalency or acceptability for a proposed pipe laying system and equipment design.