Our Mission

The mission of ABS is to serve the public interest as well as the needs of our clients by promoting the security of life, property and the natural environment primarily through the development and verification of standards for the design, construction and operational maintenance of marine-related facilities.

Quality & Environmental Policy

It is the policy of ABS to be responsive to the individual and collective needs of our clients as well as those of the public at large, to provide quality services in support of our mission, and to provide our services consistent with international standards developed to avoid, reduce or control pollution to the environment.

All of our client commitments, supporting actions, and services delivered must be recognized as expressions of Quality. We pledge to monitor our performance as an on-going activity and to strive for continuous improvement.

We commit to operate consistent with applicable environmental legislation and regulations and to provide a framework for establishing and reviewing environmental objectives and targets.
Classification of Naval & Government Vessels

ABS offers a comprehensive portfolio of classification services to designers, builders and operators of Naval, Coast Guard and government vessels. The principal elements of the ABS Naval Vessel program are summarized in this handbook. More complete details can be obtained from the nearest ABS office.

Introduction

As one of the leading class societies, with a long history of service excellence, ABS is able to provide a wealth of practical and technical experience at all relevant stages of a naval vessel project. For new construction, ABS engineers and surveyors will work closely with the relevant Navy's technical staff and the selected shipyard to verify conformance with the applicable ABS Rules and other specified standards.

After delivery, a network of appropriately qualified ABS engineers, surveyors and operational support staff are located around the world to support those naval vessels that are maintained to ABS Rules, providing efficient, practical and responsive service.

ABS experience covers a wide range of naval vessels including non-nuclear combatants, high-speed naval craft, patrol vessels and all types of auxiliary ships. In addition to the United States, ABS has worked with various Navies throughout the world including Australia, Canada, Chile, Colombia, Denmark, Ecuador, Egypt, India, Israel, Italy, Mexico, New Zealand, Oman, the Philippines, Saudi Arabia, Singapore, South Africa and others.

The ABS Naval Vessel Rules are currently being used in the design and construction of the next generation US Navy destroyer, DDG 1000, and the Littoral Combat Ship (LCS) series which are high-speed multi-mission platform ships. We stand ready to serve.
Naval Vessel Classification – the ABS Advantage

The ABS experience, technology and services outlined in the following pages demonstrate our commitment to being the preferred provider of classification services to the Navies of the world.

Our Commitment

Our mission is to promote the security of life, property and the natural environment. We pursue this mission primarily through the development and verification of compliance with technical standards that encourage robust designs and the provision of solutions-oriented survey services.

Naval vessels built and maintained to these standards may be accepted into and retained in class by ABS. We are committed to providing superior technical and survey services that assist our Navy clients in conforming to these standards, thereby encouraging safe, efficient operations.

Our Fleet

ABS is one of the largest classification societies in terms of gross tons and numbers of vessels in class. The ABS fleet profile covers all principal commercial vessel types and a wide range of government controlled vessels ranging from non-nuclear naval combatants to support and auxiliary vessels.
Our Staff

A network of more than 2,000 ABS engineers, surveyors and operational support staff are located around the world to support the ABS classed fleet.

ABS maintains engineering offices that specialize in naval vessel design review in Washington DC, Houston, Texas and Sydney Australia. These engineers can also call upon the large ABS corporate research and development team for more detailed analyses such as linear and non-linear hydrodynamic analyses, complete structural direct analysis, vibration analysis and Spectral Fatigue Analysis (SFA) among many others.

Our experienced professionals provide technical support and assistance to our Navy clients from the initial design concept, through the design approval process, during construction and throughout the entire service life of the vessel.

Retention of Authority

Under the ABS Naval Vessel Rules initiative, the Navy maintains its role as the technical authority. ABS functions as an independent certification agent and executes surveys in an autonomous manner. It is expected however, that numerous situations will arise on any combatant program where the Naval Technical Authorities must be involved.

Yet, in light of the reduction of retained resources within most governments and Navies, ABS is able to provide continuity regarding the engineering aspects of certification. The objective is that the design, construction and installation of systems, equipment and components will safely meet the performance requirements.

The service provided by ABS is certification to clearly defined criteria. The product is a certificate of compliance which the vendor and builder can use to demonstrate to the Navy that the requirements have been satisfied.
ABS Naval Vessel Classification Services

These services have been designed to assist Navy personnel, designers and shipbuilders to design, construct and deliver non-nuclear combatant vessels, high speed naval craft and auxiliary ships that conform to the applicable ABS Rules. During the early concept and preliminary design feasibility stage, ABS will work closely with the Navy Project Team so that the references to ABS Naval Vessel Rules are stated clearly in the ship specification and requirements documents.

These services have also been developed to assist Navy personnel to maintain the vessel to ABS class requirements throughout its operational life by conducting periodic and damage surveys. An ABS surveyor will attend to verify compliance to the applicable Rules, as necessary.

ABS Naval Vessel Classification Services can be broken into three distinct parts:
1. Design Analysis, Plan Review and Approval
2. Surveys During Construction
3. Surveys After Construction

Design Analysis, Plan Review and Approval

All non-nuclear naval combatants are to be built to the relevant criteria contained in the ABS Rules for Building and Classing Naval Vessels. These Rules have been jointly developed and are maintained by ABS and the US Naval Sea Systems Command (NAVSEA) and reflect the standards and practices required by the US Navy, the world’s largest naval power. The Naval Vessel Rules are tailored to be platform-specific by using a structured process for engineering evaluation to form the core subset of the build specifications as indicated in the ship contracts.
High speed naval vessels, such as those based on designs originally developed by entities such as Austal and Incat, are to be built to the relevant criteria contained in the ABS Guide for Building and Classing High Speed Naval Craft. Naval auxiliaries (such as fleet tankers and logistics support vessels) are to be built to the relevant sections of the ABS Rules for Building and Classing Steel Vessels.

ABS classification covers all areas that are identified for each vessel’s build specification. A general list of covered equipment and components includes:

- Hull and structures
- Propulsion and maneuvering systems
- Electrical systems
- Control and navigation systems
- Auxiliary systems
- Habitability and outfit
- Materials and welding

ABS classification also covers the following processes:

- Establishing the technical baseline
- Design review
- Material certification
- Vendor equipment certification (including diesel engines, gas turbines, generators, switchboards and other critical equipment)
- Construction, testing and trials
- In-service maintenance, repair and modification

ABS personnel are available to provide a wide range of additional engineering-related analyses and services during the design evaluation and plan review phases of a naval vessel project. Depending on the type of vessel, these may range from a full ship analysis using a complete structural direct analysis to the analysis of individual elements such as shaft alignment and vibration.
Direct Analysis and Spectral Fatigue Analysis

A detailed evaluation of a naval vessel’s structure can be carried out using a well-established procedure for the structural direct analysis. This ABS-developed first principles approach to the assessment of the hull structure has been successfully applied to a large number of vessels over the last 30 years. Central to this methodology is the use of a program based upon seakeeping theory for calculating the loads and response for a range of wave directions and loading conditions. The dynamic loads are then applied to a three-dimensional (3-D) finite element model of the complete vessel in order to assess the adequacy of the structure.

In addition, this procedure can also be used for the application of the Spectral Fatigue Analysis (SFA) method for the evaluation of structural fatigue. SFA is a rational analysis procedure for evaluating fatigue life related to local cracking of ship structures. The spectral-based method for fatigue strength evaluation, due to the wave-induced responses, is well established and has been extensively documented.

Vibration Analysis

Shipboard vibration can affect the safety, functionality and habitability of a naval vessel. Excessive vibration may result in fatigue cracking of local structural members, malfunction of machinery and equipment or adversely affect crew performance.

ABS provides designers and shipbuilders with concise guidance on concept design to help avoid excessive vibration. The critical areas addressed in the concept design are:

- Hull girder vertical vibration excited by a main engine
- Main machinery/shafting system longitudinal vibration excited by the propeller
- Superstructure fore-and-aft vibration excited by either or both aforementioned initiators

At a client’s request, or when found necessary, the guidance can include finite element based vibration analysis procedures to predict the vibration response and evaluate the design in greater detail. This takes into account loading conditions, propeller and engine excitations and free and forced vibrations.
In recent years, many innovative propulsion designs have been developed to address the vibration problems associated with propeller cavitation. ABS has developed a suite of advanced computer programs that use Computational Fluid Dynamics to better assess propeller strength and analyze vibration:

- A propeller cavitation analysis that also performs calculations of unsteady bearing forces; it evaluates propeller performance, bearing forces and sheet cavitation
- A prediction of fluctuating pressure induced by the cavitating propeller
- A ship flow simulation of the interaction between the propeller and the hull

It also includes guidance on the vibration measurement procedure at sea trials and the acceptance criteria on vibration limits based on international standards and ABS experience. ABS has established a vibration measurement procedure to evaluate the vibration of the superstructure, local structures, marine propulsion machinery and other equipment.

**Human Factors Engineering**

Ergonomic principles, criteria and design processes can be effectively integrated with engineering activities to improve human performance on board ships and contribute towards a reduction in the likelihood of accidents or incidents attributable to human error.

ABS has developed extensive guidance for designers based on internationally-applicable ergonomic principles and criteria. Criteria have been established that address equipment, workstation and system design, including guidance for the ergonomic design of navigation bridges, as well as occupational health and safety concerns.

Design guidance takes account of personnel capabilities, limitations and needs so that the arrangement and orientation of the onboard work environment meets the needs of the crew members regardless of their cultural background and physical dissimilarities.

ABS criteria also address the issue of crew habitability or the acceptability of conditions onboard a ship in terms of vibration, noise, lighting, indoor climate and physical and spatial characteristics. The criteria have been developed to support effective human performance, mental alertness and basic levels of comfort that promote the general well-being of the crew members and, as a consequence, the efficient and safe operation of the vessel.
ABS Eagle Engineering Manager

ABS has implemented the advanced, secure, electronic ABS Eagle Engineering Manager Plan Review system. Using ABS Eagle, all plans are handled electronically. Wherever possible, the designer or shipyard submits drawings in electronic format. Paper drawings are scanned into the system and the reviews are handled on screen. For designers and shipyards directly using the system, ABS Eagle Engineering Manager provides online, web-based interaction between the shipyard’s design team and the ABS engineers undertaking plan review of the structure and machinery.

When requested by the Navy, the number and identity of the reviewing engineers can be restricted and their actions are fully traceable as part of the system’s built-in security safeguards. For each drawing or information package submitted, the status of all comments can be viewed in real time by any of the involved parties.

Compared to the traditional paper-based plan review process, the system offers faster overall review time and improves the lines of communication between ABS and Naval personnel to quickly resolve questions or rule interpretations.

Seakeeping and Motion Studies

Assessments of seakeeping and motions can be provided at several levels from strip theory to 3-D and non-linear methods depending upon the specific engineering need.
Surveys During Construction

Drawing from its global network of experienced surveyors, under the direction of the ABS Assistant Chief Surveyor of Naval Programs, ABS will assign appropriately vetted and qualified survey personnel to each newbuilding naval vessel project.

These surveyors will verify that construction is in accordance with the Rules and approved plans. They will work closely with both the shipyard and the assigned Navy personnel to assist in reconciling questions of interpretation.

The surveyors will also attend steel mills, engine manufacturers and foundries producing important castings and equipment to verify that these are provided to the specifications contained in the applicable ABS Rules.

Sea Trials
The ABS surveyor will attend the sea trials of the vessel to verify that the trials are carried out properly and that relevant class and other applicable criteria are met.
Surveys After Construction

Upon delivery and throughout its service life, an ABS-classed naval vessel is subject to the asset integrity management requirements of the ABS class survey regime. This imposes a requirement for the vessel to be subject to a series of periodic surveys – Annual, Intermediate, Special and Docking – on a rotating five or six year basis depending on the specific Rules to which the vessel is being built and maintained.

It also requires the operator to notify ABS when the vessel's hull and or its machinery suffers damage which could affect ABS classification. An ABS surveyor will arrange to attend the vessel as promptly as possible and will verify that the vessel remains in, or is returned to, a condition that is in conformance with the applicable Rules.

ABS Eagle Survey Manager

To help the vessel's naval operations team to plan for the required periodic surveys in an efficient, cost effective and informed manner, ABS provides access to the advanced, web-based ABS Eagle Survey Manager program.

The ABS Eagle system has been in use for several years (formerly under the ABS SafeNet name), and has been subject to frequent enhancement and expansion. Positive user feedback gives us the confidence to consider the ABS Eagle Survey Manager system to be the most advanced, useful and easy-to-use system currently available for monitoring the classification status of a vessel.

The ABS Eagle Survey Manager efficiently manages the class data in a web-based electronic format. Naval operators have access to the data from multiple locations – in the office, onboard a vessel or from remote sites such as a repair yard.

The ABS Eagle Survey Manager includes a record of the condition of the vessel; historical records of past survey dates, locations and surveys carried out; a record of past outstanding recommendations, both open and closed; and a system to integrate survey activities and review the status with the ABS planned maintenance module.

The easy-to-use Survey Planning Document displays precise gauging, tank testing and close-up inspection requirements for each vessel, based on the vessel's age and type.
ABS Hull Integrity Management Program

The maintenance management of the ship’s structure can be enhanced through the use of a ship specific manual created by ABS upon request. The manual creates a routine and framework for in-service inspections. It shows pictorially all the critical areas in the structure identified in the plan approval process and the areas known to be susceptible to damage. The manual lays out a zonal scheme for categorization of six key structural condition criteria and an inspection regime in order to track any deterioration in these areas. This system is coupled with critical areas associated with each zone.

Condition criteria tracked includes cracking, coatings, corrosion, deformation, distortion and overall cleanliness. The data is collected and stored in a way that categorizes the risk to the ship for the areas being inspected based on the severity of the deterioration.

The scheme can be tailored to suit the technical management needs of the Navy’s organization by adopting different levels of usage of the data. The data can be collected in a spreadsheet application which automatically provides a traffic light management overview of the ship’s status. Additional enhancements will allow the data to be interpreted and displayed in a 3-D model of the ship’s structure using the ABS Eagle Hull Maintenance program.

The ABS class survey requirements are unchanged by this service.
ABS Eagle Hull Maintenance Program

The comprehensive ABS Eagle Hull Maintenance program provides a sophisticated Hull Maintenance management and information module that can be used to track the condition of the structure of the vessel throughout its service life. Users can store gaugings, coating and anode information, damage incidents and repair data which can be presented in visual form through CAD drawings as well as through a library of digitized photographs.

The actual condition of any part of the structure can be assessed at any time from the stored data and condition and then used to predict remaining fatigue life. A report on structural diminution for any part of the vessel can be generated automatically. Repair costs can be generated for user specified scenarios.

The benefits of the ABS Eagle Hull Maintenance system include:

• Interlinks structural information with other data relating to the same vessel, such as Survey Status or Vessel Drawings once the basic definition of the vessel has been stored within the ABS Eagle System.
• Develops a compartmentalized model giving the user the ability to see compartment data and highlighting specific sections for more detailed review.
• Links this compartmentalized description with a full CAD format of the vessel. Presents any portion of the hull structure in 2-D.
• Stores multiple file types such as documents and reports, photos, sketches, video of structural members linked directly to each section for detailed visual and technical assessment.
• Tracks multiple types of conditions such as damages, fractures, buckling, grooving and pitting.
• Holds a life history of gauging information to facilitate analysis of past structural degradation and anticipated future degradation using built-in trending tools.
• Tracks coating application and condition through the lifetime of the vessel. Stores the location and condition of anodes.
• Generates coating material estimates, including cost, for user-defined scenarios.
• Highlights areas of substantial corrosion using color codes. Areas with user defined degradation levels can be shown.
• Generates steel weight, cost data, and bill of materials for isolated repairs or different repair scenarios.
Reliability-Centered Maintenance of Machinery

The application of reliability-centered maintenance (RCM) allows maintenance programs to be evaluated and applied in a rational manner that provides the most value to an operator. RCM analysis allows an operator to optimize maintenance programs by first identifying functional failures within machinery systems that have the highest risk and then proactively determining the optimum maintenance tasks and strategies that mitigate such potential failures to an acceptable level. In this way, maintenance programs are created which focus on critical components and proper maintenance strategies.

By applying RCM principles, maintenance strategies are evaluated and applied in a rational and systematic manner. ABS can assist in preparing and implementing an effective RCM Program for the machinery on the vessel.

The ABS Guide for Survey Based on Reliability-Centered Maintenance contains the RCM program requirements and the ABS Guidance Notes on Reliability-Centered Maintenance provides the maintenance theory and philosophy of RCM.

For further information on the classification and certification services provided by ABS for Naval and government vessels, please contact the ABS office nearest you. Full contact information for all ABS offices can be found at www.eagle.org.
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