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, Certification & Related Services for Bulk Carriers

## Introduction

- Required Classification & Statutory Services
  - Design Analysis, Plan Review & Approval
  - Surveys During Construction
  - Surveys After Delivery
  - Classification for Existing Bulk Carriers
  - Major Conversion Services
  - Statutory Services

## Optional Class-Related Services & Notations

- Technical & Engineering Services
- Hull & Machinery Maintenance Services
- Integrated Management Systems Certification
- Project Management Services
- Optional Notations for Bulk Carriers
- Training Services
- Information Services

## Services Provided by Companies Affiliated with ABS

- Technical & Engineering Services
- Operational Services
- Support Services
Setting Standards of Excellence
in the Classification & Certification of Bulk Carriers
ABS offers a comprehensive range of classification and related services to designers, builders, owners and operators of bulk carriers. The principal elements of the ABS Bulk Carrier program are summarized in this handbook. More complete details can be obtained from the ABS account representative at the nearest ABS office or from our specialist Bulk Carrier Ship Sector Team via email at bulkcarriers@eagle.org.

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 bulk carrier project. For new construction, ABS engineers and surveyors will work closely with an owner’s technical staff and the selected shipyard to verify conformance with the ABS Rules and applicable regulatory standards.

After delivery and for existing vessels, 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 and deliver efficient, practical and responsive service.

ABS experience covers all bulk carrier size ranges. We currently class a significant share of the existing bulk carrier fleet and our orderbook for these vessels, based on gross tonnage, is strong and growing. We stand ready to serve.
Bulk Carrier 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 marine industry and, in particular, to the bulk carrier sector.

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. 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 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 vessel types but tankers and bulk carriers predominate.
Our Bulk Carrier Fleet

Bulk carriers comprise a significant proportion of the ABS class fleet. Our experience covers all bulk carrier size ranges, from handy to capesize and very large ore carriers (VLOCs).

ABS has maintained a very strong orderbook of class contracts for new bulk carriers. The majority of these vessels are currently on order from the principal shipyards in Japan, China and Korea. However, the recent increased interest in bulk carrier construction has seen orders for ABS-classed bulk carriers in several other countries including Turkey, Denmark and India. ABS works closely with the shipbuilders and the design offices around the world, providing technical assistance from the earliest stages of the design process.

ABS applies deep technical knowledge and extensive practical experience to the challenge of establishing standards for the design and operation of bulk carriers. For new construction, ABS has in-depth knowledge of both single and double side skin bulk carrier designs and has given approval in principle to some of the latest, and as yet unrealized, ultra large ore carrier (ULOC) concepts.

ABS strives to provide pro-active leadership in the quest for improved bulk carrier safety. For example, ABS has assisted many owners to understand and apply the IACS Common Structural Rules (CSR) for Bulk Carriers as well as the many IACS Unified Requirements and SOLAS regulations pertaining to structural and operational safety for bulk carriers. And ABS was the first class society to apply the enhanced survey program (ESP) standards for bulk carriers in the early 1990s and, most recently, has worked with Intercargo to better understand the impact of high loading rates on bulk carrier structures.

Our Staff

A network of more than 2,000 ABS engineers, surveyors and operational support staff are located close to client operations around the world to support the ABS classed fleet. ABS maintains comprehensive engineering offices in Korea, Japan, China, Singapore, Greece, Italy, India, Brazil, the United Kingdom, the United States, Turkey and other centers, to facilitate the design review of the many bulk carriers on order to ABS class.

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

Our Fees

ABS services can be tailored to an owner’s fleet profile, and operational and management requirements. These approaches include Master Service Agreements and Five Year Survey Fee packages as appropriate.
A Multi-Level Approach to Service

ABS service delivery consists of three categories, tailored to meet the specific needs of all owners and operators of bulk carriers.

**Category I** consists of the range of services associated with the issuance and maintenance of the classification and required statutory certificates. Owners may then choose to select from the range of additional products and services offered in Categories II and III.

**Category II** consists of several valuable, optional, class-related services provided by ABS including elements as diverse as training and advanced structural analysis. This category also includes additional notations that may be used by the owner to demonstrate that the vessel has been designed or is being operated in accordance with standards beyond those required under Category I for routine classification and statutory certification.

**Category III** consists of several additional optional products and services provided by companies affiliated with ABS including ABS Nautical Systems LLC and ABS Consulting. These services range from comprehensive fleet management software to training courses, Condition Assessment Program (CAP) ratings and the Rapid Response Damage Assessment (RRDA) program among others.
Category I

Required Classification & Statutory Services

These services have been designed to assist an owner or shipbuilder to design, construct and deliver a bulk carrier that conforms to the applicable ABS Rules. These services have also been developed to assist an owner or operator to maintain the vessel to ABS class requirements throughout its operational life by conducting periodic and damage surveys.

When ABS is authorized to act as a Recognized Organization by the flag State, these services also include the applicable statutory inspections.

Category I Services comprise six parts:
1. Design Analysis, Plan Review and Approval
2. Surveys During Construction
3. Surveys After Delivery
4. Transfer of Class
5. Major Conversion Services
6. Statutory Services

Design Analysis, Plan Review & Approval

All bulk carriers of 90 meters or more in length, for which the contract has been placed after 1 April 2006, are to be built to Part 5B of the ABS Rules that incorporate the IACS Common Structural Rules (CSR) for Bulk Carriers.

Small bulk carriers of less than 90 m in length are to be built to the relevant sections of the ABS Rules for Building and Classing Vessels Under 90 meters (295 feet) in Length.

For vessels intended to carry dry cargo in bulk whose configurations are not within the scope of the CSR, the classification Rule criteria in Part 5C, Chapter 3 or 4, of the ABS Rules for Building and Classing Steel Vessels apply.
Common Structural Rules

The Common Structural Rules (CSR) apply to single and double side skin bulk carriers of 90 m in length and greater contracted on or after 1 April 2006. The Rules transparently define the relationship between required scantlings for design and those for renewal, and explicitly balance the demand imposed on the structure throughout its life with appropriate structural capability.

Working with the renowned shipbuilding applications company NAPA, ABS has developed the ABS Eagle CSR software for bulk carriers to simplify the application of the Common Structural Rules. Users will find the ABS Eagle CSR software to be user-friendly, logical and effective.

Since the introduction of the new Rules, ABS engineering and technical staff have provided, and continue to provide assistance to shipyards and to shipowners, to assist them in understanding the new Rules and their implementation. A wide range of CSR standard bulk carrier designs have been reviewed and approved by ABS.

Training support for the CSR for bulk carriers is available and can be arranged through the nearest ABS office. Key elements of the Common Structural Rules for bulk carriers include:

- **Design Life**
  Design criteria target a design life of 25 years for the ship in the North Atlantic environment. The actual service life will depend upon the vessel’s operational profile and maintenance.

- **Net Thickness**
  The Common Structural Rules adopt the net thickness approach to scantlings. This provides a direct link between the thickness that is used for strength calculations during the design stage and the minimum steel thickness acceptable during the operational life of the ship. The strength calculations are based on the net scantling approach. Newbuilding gross scantling requirements are calculated by the addition of an allowance for the expected wastage during the design life of the vessel.
• **CSR Direct Scantling Assessment (DSA)**
  For bulk carriers with a length of 150 m and greater, the new Rules require a mandatory finite element analysis of the midship cargo block, extending over three holds. (*Note: DSA is not required for CSR bulk carriers of less than 150 m.*) ABS Eagle CSR software for bulk carriers has been developed to conduct the DSA quickly and simply. The automatic application of the loads to the FE model increases the efficiency of the analysis of the load cases required by the Rules.

• **CSR Fatigue Assessment**
  The new Common Rules include a mandatory set of requirements for fatigue assessment using the 25-year North Atlantic design life.

• **CSR Buckling**
  Buckling is also specifically addressed. The Rules have two levels of buckling check, based on prescriptive formulations initially and a buckling check based on finite element analysis.

The vessel will receive the notation CSR to record compliance with the applicable Rule requirements.

**Coatings**

All bulk carriers subject to the Common Structural Rules contracted for construction on or after 8 December 2006 must comply with the Performance Standard for Protective Coatings (PSPC) established by the IMO. Smaller bulk carriers that are not subject to the CSR but are greater than 500 gross tons, contracted on and after 1 July 2008, must comply with the IMO standards. The IMO PSPC requirements apply to the dedicated seawater ballast tanks of all bulk carriers and to the double-side skin spaces of bulk carriers of 150 m in length and upwards.

ABS provides guidance to both shipowners and shipbuilders on the technical requirements of the PSPC. Contained in the ABS issued *Guidance Notes on the Inspection, Maintenance and Application of Marine Coating Systems*, the information also takes into account the IACS Procedural Requirement (PR34) that specifically addresses the application of the IMO standards.

Although the new standards place the responsibility for the proper application of the coatings on the shipyard, the ABS Guidance Notes clarify the issues and responsibilities for all parties.

Bulk carriers that are built in conformance with the requirements contained in the ABS *Guide for the Class Notation Coating Performance Standard (CPS)* will be awarded the CPS notation.
Plan Review

ABS provides responsive professional technical services to the designers, builders and owners of bulk carriers. These services are offered through a network of local engineering offices that have been strategically placed in the major shipowning and shipbuilding centers: Busan, Genoa, Hamburg, Houston, Istanbul, London, Mumbai, New Orleans, Piraeus, Rio de Janeiro, Shanghai, Singapore, Taipei and Yokohama.

Our engineering staff can work with the designer from the earliest conceptual stage of a bulk carrier project, providing advice on the application of the ABS Rules and the relevant statutory regulations. Whenever possible, these offices can also work with the shipyards to review and approve the yard's entire portfolio of standard bulk carrier designs to make it easier for an owner to specify ABS class when placing an order. ABS plan approval staff has knowledge and experience in a wide range of specializations including structures, electrical systems, automation, controls and machinery among others.

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 shipyard submits drawings in electronic format. Paper drawings are scanned into the system and the reviews are handled on screen. For 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.

Teams of ABS specialists in different engineering disciplines can all work on the design review simultaneously. When requested by the shipyard, 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, including the owner if so agreed in the contract between the owner and the shipbuilder. 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 the designers to quickly resolve questions or rule interpretations.
Surveys During Construction

Drawing from its global network of experienced surveyors, ABS will assign appropriate survey personnel to each newbuilding bulk carrier project, wherever in the world construction is to be undertaken. 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 owner to assist in reconciling questions of interpretation.

The surveyors may also attend and/or audit steel mills, engine manufacturers and foundries producing castings and equipment to verify that these are produced to the specifications contained in the applicable ABS Rules.

ABS Eagle Construction Monitoring

The ABS Eagle construction monitoring program is a classification requirement for bulk carriers of 150 m in length or greater. The structural analyses serve to identify areas in the structure subject to higher stresses. When performing these calculations, assumptions are made about the construction standards such as fit-up, alignment and welding tolerances. In areas that are highly stressed, the as-built construction tolerances should be comparable with the tolerances assumed in the design calculations and should be free from defects that may cause stress raisers.

A Construction Monitoring Plan for these high stress areas is to be prepared by the shipyard and submitted to ABS for approval prior to the start of fabrication. The plan is to include: structural drawings indicating the location of these areas as identified by the ABS review; construction standards and control procedures to be applied by the shipyard during construction; verification and recording procedures to be adopted by the shipyard at each stage of construction; and procedures for correcting defects.

During construction, ABS surveyors will verify that the construction carried out by the shipyard is in conformance with the agreed Construction Monitoring Plan. The vessel will receive the relevant Construction Monitoring notation to record compliance with this procedure.

Sea Trials

The ABS surveyor will also attend the sea trials of the vessel to verify that the trials are carried out properly and that relevant class and statutory criteria are met.
Notations

On delivery, a typical ABS class notation for a capesize bulk carrier would be:

\( \mathbf{A1} \) Bulk Carrier, CSR, CM, CPS, ESP, PMA+, GRAB[20], BC-A (holds 2, 4, 6 and 8 may be empty with maximum cargo density: 2.50 tonnes/m\(^3\)), \( \mathbf{AMS} \), \( \mathbf{ACCU} \), POT, UWILD

This defines that the:

- hull has been built under ABS survey for unrestricted ocean service (\( \mathbf{A1} \))
- ship complies with the ABS requirements for anchoring and mooring equipment (\( \mathbf{E} \))
- structure complies with the ABS classification rules that include the IACS Common Structural Rule standards for Bulk Carriers (Bulk Carrier, CSR)
- ship was subject to enhanced inspection during construction in conformance with the applicable Construction Monitoring procedure (CM)
- coatings applied to the dedicated sea water ballast tanks (and double-side skin spaces of bulk carriers of 150 m in length and upwards, where applicable) meet the requirements of the IMO Performance Standard for Protective Coatings (CPS), required by the CSR
- ship is subject to the requirements of the Enhanced Survey Program (ESP)
- permanent means of access for inspection of hull structures are provided in accordance with SOLAS II-1/3-6 and the ABS Guide for Means of Access to Tanks and Holds for Inspection (PMA)
- ship may be unloaded with a maximum unladen grab weight of 20 tonnes (GRAB[20])
- ship is a Bulk-Carrier Type-A permitted to load heavy cargoes, maximum cargo density of 2.50 tonnes/m\(^3\) with specified alternate holds empty (BC-A (holds 2, 4, 6 and 8 may be empty, maximum cargo density: 2.50 tonnes/m\(^3\)))
- ship's machinery, boilers and systems have been constructed and installed in accordance with the requirements of the ABS Rules (\( \mathbf{AMS} \))
- ship has the means to control and monitor an unmanned propulsion-machinery space in an approved manner from the navigation bridge and from a centralized control and monitoring station installed in, or adjacent to the propulsion machinery space (\( \mathbf{ACCU} \))
- fuel and lubricating oil tanks are protectively located in accordance with the ABS Steel Vessel Rules (POT)
- ship meets the ABS requirements for underwater inspections in lieu of dry-dock (UWILD)
**Surveys After Delivery**

Upon delivery and throughout its service life, an ABS-classed bulk carrier 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 year basis.

It also requires the owner to notify ABS when the vessel and or its machinery suffers damage. 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.

Prompt attendance by an ABS surveyor for the requisite periodic survey is made possible by the extensive, global network of strategically placed ABS survey offices.

**ABS Eagle Survey Manager**

To help the vessel’s owner, operator or manager plan for the required periodic surveys in an efficient, cost effective and informed manner, ABS provides the operator with 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 to ship operators to monitor the classification status of their vessels.

The ABS Eagle survey manager efficiently manages the class and statutory data for an owner’s entire ABS classed fleet in a web-based electronic format. Shipowners 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 tank condition; historical records of survey dates, locations and surveys carried out; a record of outstanding recommendations, both open and closed; and a system to integrate survey activities and review the status with the ABS planned maintenance module.

Shipowners are able to select the interval to receive messages regarding upcoming and overdue surveys. Multicolored timelines of survey due data significantly diminish the need to view individual listings of survey items such as hull, machinery and equipment. 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.
The web-based ABS Eagle survey manager provides a wide range of informational and support services to the operator in real time from an office or onboard the vessel. Services include:

- a fleet summary and complete status of class surveys for each ABS classed vessel
- status of statutory surveys and certificates issued by ABS on behalf of the flag Administration
- timeline presentations of the class and statutory surveys completed in the previous three years, surveys in progress and surveys scheduled for the next five years including identification of grace periods
- principal particulars of each vessel
- vessel attendance history with links to related ABS reports
- an online certificate list and file containing copies of ABS issued class and statutory certificates currently onboard the vessel
- fleet level tools for budgeting within user defined periods (such as dry dockings)
- status indication of surveys completed, often before the surveyor leaves the ship
- automated onboard issue of class and statutory certificates
- an owner administration module to enable the creation of an unlimited number of new users, and to select the vessel or fleets that each individual user will view
- tools for survey planning and survey guidance, including vessel specific templates for the preparation of enhanced survey plans
- electronic booking of survey attendance and optional email progress notifications

**Port State Control**

ABS considers the Port State Control (PSC) record of vessels detained for class and/or Recognized Organization related deficiencies within the three principal PSC jurisdictions (Paris MOU, Tokyo MOU and the USCG) to be the best public accounting of the effectiveness of the ABS in-service surveys.

For many years ABS has consistently placed among the elite tier of classification societies in each of these jurisdictions with, on average, more than 99.5 percent of ABS classed ships subject to a port State inspection being found to be without class and/or Recognized Organization accountable detainable deficiencies.
Transfer of Class

While a ship is most often classed with one society during construction and throughout its service life, many do change class either on delivery, on transfer of ownership or for other reasons. It is a relatively straightforward matter to transfer a vessel, in class with another IACS Society, to ABS class while the ship is in service. Although the basic requirements are laid out by the IACS Transfer of Class Agreement (IACS PR1A), ABS has established streamlined procedures to assist an owner with the process, with minimum disruption to commercial and vessel operations. Owners can achieve significant operational and cost benefits by classing their fleet with ABS.

The owner can initiate the Transfer of Class process by contacting any ABS office. The process will then be handled by a dedicated project team who will review the ship's status and history and coordinate all the necessary requirements. The ABS project team members work closely with the owner during this process providing a single point of contact with the losing class society during the transfer.

For acceptance into ABS class, the owner of an existing ship classed by an IACS Society will be asked to submit the following hull and machinery plans:

**Main Plans**
- General arrangement
- Hydrostatic curves
- Stability documents
- Capacity plan
- Loading manual (if applicable)

**Hull Structure Plans**
- Midship section
- Decks
- Transverse bulkheads
- Hatch covers
- Scantling plan
- Shell expansion
- Rudder and rudder stock

**Machinery Plans**
- Machinery arrangement
- Propeller
- Bilge and ballast piping diagram
- Intermediate, thrust and screw shafts
- Main engine, propulsion gears and clutch systems
- Wiring diagram
- Steering gear systems, piping and arrangements
- Main boilers, superheaters and economizers (for steam turbine vessels)
A pre-inspection survey may also be necessary to confirm the overall condition of the ship. Typically, the requisite surveys to conduct a transfer of class are scheduled with current survey activities to minimize cost. As soon as the required surveys and plan reviews have been satisfactorily completed, ABS will issue an Interim Class Certificate to replace the existing classification arrangement.

ABS acts as a Recognized Organization for the major flag Administrations, issuing a range of internationally required statutory certificates on the flag Administration's behalf.

When a vessel changes class to ABS from another IACS member, certain statutory certificates may remain valid. This varies depending on the flag Administration and circumstances. The ABS project team will work closely with the owner to verify that the statutory certificates are in order. Some surveys may be required depending on the validity of the certificates.

When changing class, a change in flag may also be requested, and new statutory certificates may be required. The new flag Administration will determine which certificates are needed. The ABS project team will coordinate with the new flag Administration to facilitate the process for the owner. When the exact requirements of the new flag have been determined, ABS will conduct the necessary reviews, and surveys.

Major Conversion Services

In certain market conditions, owners have sought to convert existing vessels, designed and/or already built to alternative configurations to a configuration suitable for carrying bulk cargoes. The two most common conversion projects are from very large crude tanker (VLCC) to very large ore carrier (VLOC) and containership or multi-purpose vessel to one able to carry bulk cargoes.

ABS is familiar with the technical challenges posed by such conversion projects and is able to offer shipowners and shipyards full support in facilitating the design reviews to verify continued conformance with applicable classification and statutory standards. ABS surveyors at the principal repair and conversion shipyards are also familiar with the process and will verify that such conversions are carried out in conformance with the applicable Rules and standards.
Statutory Services

ABS is recognized by the leading international flag States and has been delegated authority to act as a Recognized Organization on behalf of more than 100 governments.

ABS carries out these responsibilities during the design stage, verifying that the design complies with the statutory requirements of the selected flag Administration, for example with respect to stability, Load Line, watertight subdivision, safety construction and safety equipment and with the applicable firefighting and lifesaving regulations as contained in the various international and national maritime Codes and Conventions.

These include the Safety of Life at Sea (SOLAS), Marine Pollution Prevention (MARPOL), Tonnage, Load Line and Anti-Fouling System (AFS) Conventions and the ISM and ISPS Codes. In addition to the national or international tonnage certificates, ABS can issue Panama and Suez Canal tonnage certificates on behalf of those authorities. Once in service, when authorized by the flag State, ABS will conduct the applicable periodic statutory inspections and issue the relevant certificates.

ISM Code Compliance

As a Recognized Organization for many flag States, ABS is authorized to act on their behalf in performing audits and issuing certificates required by the International Management Code for the Safe Operation of Ships and for Pollution Prevention (the International Safety Management – ISM Code). These include both the audits of the ship operator leading to the Document of Compliance (DOC) certificate and the audit of the ship which, when successfully completed, will result in the issuance of the Safety Management Certificate (SMC) to that ship. ABS maintains a global pool of fully qualified ISM auditors able to respond promptly to client needs.
ISPS Code Compliance

A large number of flag States have authorized ABS to act on their behalf as a Recognized Security Organization. In this capacity ABS can approve security plans, perform security audits of ships, and issue International Ship Security Certificates (ISSC) on behalf of those flag States. The ABS Guide for Ship Security (SEC) Notation has been made available to assist operators in achieving compliance with the statutory security requirements of the International Ship and Port Facilities Security (ISPS) Code and in obtaining the ABS (SEC) notation. ABS maintains a global pool of qualified ISPS auditors able to respond promptly to client needs.

US Coast Guard Assistance

ABS also maintains a strong relationship with the US Coast Guard under various, long-standing Memoranda of Understanding. These not only authorize ABS to act on behalf of the USCG on a number of issues, but also provide ABS with the experience and insight to offer specific assistance to owners trading to the United States who are seeking to demonstrate compliance with US Coast Guard requirements, particularly those related to environmental, safety and security issues. The USCG has assigned a permanent Liaison Officer to ABS, located in the ABS headquarters in Houston, to facilitate communication between the two organizations.
Category II

Optional Class-Related Services & Notations

For a variety of reasons, many owners choose to build and/or operate their ABS-classed vessels to standards established by ABS that extend beyond those required for a vessel to be accepted into class and for registration by a flag State. To assist these owners and to allow them to demonstrate that they have adopted these enhanced standards, ABS offers a range of optional services, together with accompanying notations as applicable. These services range from highly technical structural analyses to standards that address the habitability of the onboard living conditions, to enhanced safety, quality, environmental and health standards.

Category II services comprise seven parts:
1. Technical and Engineering services
2. Hull and Machinery Maintenance services
3. Integrated Management Systems Certification
4. Project Management services
5. Optional Notations
6. Training services
7. Information services

Technical & Engineering Services

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 bulk carrier project. Depending on the size and type of bulk carrier these may range from a full ship analysis using the Dynamic Loading Approach (DLA) to the analysis of individual elements such as shaft alignment and vibration.
Dynamic Loading & Spectral Fatigue Analysis

A detailed evaluation of a bulk carrier’s structure can be carried out using the well-established ABS Eagle Dynamic Loading Approach (DLA) procedure. 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.

To streamline these procedures ABS has integrated the proven analysis of both DLA and SFA into a single software program. Using a self-generated or user-supplied finite element model, the program can perform a thorough DLA and SFA analysis of a ship structure. Integration of 3-D seakeeping, short and long-term statistical analysis, finite element analysis, strength evaluations and fatigue assessments are fully integrated within the program.

Bulk carrier designs that successfully undergo an ABS Eagle DLA-SFA evaluation will be awarded optional notations denoting their evaluation by this methodology, including a notation indicating the vessel’s designed fatigue life in North Atlantic conditions e.g. SFA(30).
Vibration Analysis

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

ABS provides shipowners, 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 diesel 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.

Stern vibration problems arise from unsteady cavities that attach to the surface of the propeller blades, creating an intense, fluctuating pressure impact on the ship’s hull. 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. These include:

- 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.
Shaft Alignment

Proper shaft alignment may be of interest in the design of very large ore carriers (VLOCs) and capesize bulk carriers. Inadequate shaft alignment design could manifest itself in the form of stern bearing failure, intermediate bearing failure or main engine bearing failure which could incapacitate the ship's propulsion capability. Such failures may be attributable to factors including: inadequate alignment design tools; lack of hull deflection data; lack of sufficient experience-based knowledge; and production errors.

Until recently shaft alignment has been largely experienced-based engineering as adequate hull deflection data was not available. This made alignment conditions unpredictable for certain cargo loading conditions.

ABS has addressed these issues by developing specialist software and alignment optimization tools, based on a multi-year research project, conducted with the cooperation of several leading shipyards, which collected and analyzed hull deflection data. The software can predict alignment behavior for different cargo loading conditions. ABS has the expertise and equipment to provide full scale shaft alignment services including analysis, optimization, measurements, condition evaluation, troubleshooting and failure investigation.

Typically the tail shaft can be included under a condition monitoring system in order to minimize the frequency of withdrawal. This may lead to the award of the class notation TCM.
Hull Condition Monitoring

Some owners may elect to monitor the hull stress levels throughout the vessel's service life. A series of strain gauges, accelerometers, alarms and recording devices can provide an early warning system to avoid overstressing the hull structure, allowing the ship's officers to monitor how the ship is performing relative to its design limits and how the vessel responds to changes in heading and/or speed. This approach can provide a warning on slamming, green seas, excessive ship motions and hull girder stress. The system can be integrated with a voyage data recorder allowing for the collection of a wide variety of technical information.

The approaches covered by the ABS Guide for Hull Condition Monitoring Systems extend from simple one-motion monitoring systems to sophisticated voyage data recorders covering a multitude of hull, systems and machinery parameters. The reason for fitting hull monitoring systems is to acquire, display and/or record information and then use the information as a basis for making decisions that will improve operational efficiency and/or safety.

The overall Hull Condition Monitoring process is one of: data measurement; data collection and conditioning; data processing and evaluation; and results presentation and storage. At the request of the owner or shipyard, a hull condition monitoring system which complies with the requirements of the hull condition monitoring systems Guide will be given a notation HM1, HM2, HM3, as appropriate, followed by the applicable qualifier such as Slam Warning, Green Seas Warning, Ship Motion, Hull Girder Stress, Local Load Monitoring, Fatigue Monitor, VDR, Enhanced VDR.
Maneuvering

To assist owners to quantify and document the maneuvering characteristics of a bulk carrier, ABS has carried out extensive analysis of vessels entering ports using numerical simulation tools and full-scale trial data. ABS has the tools needed to assess the maneuverability of a wide variety of bulk carrier types at the early design stage and to verify compliance with the relevant IMO criteria.

The ABS Guide for Vessel Maneuverability summarizes the procedures to be used in assessing a vessel's maneuvering performance. Minimum requirements given in this Guide are consistent with IMO standards. An optional class notation, MAN, offered for compliant vessels, could be used as evidence of adherence to the IMO standards. ABS may assign another optional class notation, MAN-A to signify demonstration of maneuvering performance that exceeds the IMO Standards.

Seakeeping & 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.

Cargo Handling

Many bulk carrier owners and operators, particularly those operating larger ore carriers, have expressed concern regarding the effect that high terminal loading rates may have on the vessel's structure. To meet the terminal loading schedules, the ship's master may also follow a ballasting regimen that may affect the vessel's trim and propeller immersion and may contribute to the stress to which the hull structure is subject during loading.

To assist industry in understanding the many factors associated with loading rates of up to 20,000 tph, ABS has joined with Intercargo to conduct a series of technical analyses based on practical operational data supplied by Intercargo members. The results of these ongoing studies are shared with Intercargo.
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 shipowners and designers based on industry-specific and 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 and notations 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. They 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.

Vessels that comply with the relevant criteria may be awarded the optional notations of Habitability (HAB) or Habitability Plus (HAB+).
Environmental Services

ABS can provide assistance to designers and owners as they seek to understand and address the increasing number of environmental regulations and challenges. Advice and guidance is available on topics as diverse as ballast water management to cold ironing, controlling emissions, handling oily bilge water residues and complying with local and regional regulations that may differ from international standards.

The ABS Guide for the Class Notation Environmental Safety (ES) has been developed with the objective of promoting environmentally safe design, construction and operation of ABS-classed vessels and marine structures. The requirements relate to enhanced environmental standards for hull anti-fouling systems, ballast water management and the prevention of oil, sewage, garbage and air pollution.

ABS Eagle Rule Manager

To further simplify the application of the relevant ABS Rules and statutory regulations at the design stage, ABS has developed the advanced, web-based ABS Eagle Rule manager. This application allows the designer and owner to easily and quickly identify and access relevant ABS Rules and statutory requirements for the vessel. The built-in search capability allows the owner, shipyard or designer to specify the scantling length, contract date, delivery date, class notations and other criteria which, in turn, highlights the relevant ABS Rule text and the IMO requirements for that specific project.

Advanced input parameters can be used to narrow the search criteria to the Rule requirements applicable to a specific system, component, structural element, item of equipment, notation or survey. Hyperlinks embedded within the text provide the user with immediate window access to other related sections of the Rules. The user can also generate check sheets that can be used to verify that applicable Rule requirements have been addressed during the design and construction phases of a project. Because of the inclusion of copyrighted IMO information, this service carries a modest access fee.
Hull & Machinery Maintenance Services

Many bulk carrier owners and operators adopt maintenance procedures that promote the life cycle integrity of a vessel. To assist them, ABS offers a variety of programs that provide a framework for maintaining the structural and mechanical condition of a vessel.

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. It shows pictorially the critical areas in the structure identified in the plan approval process and the areas known to be susceptible to damage from both industry and historical experience. The manual lays out a zonal scheme for categorization of six structural condition criteria and an inspection regime to track deterioration in these areas.

Condition criteria tracked may include cracking, coatings, corrosion, deformation, distortion and overall cleanliness. Inspections are to be carried out either by appropriately qualified ship's staff or superintendents. The data is collected in software provided by ABS. It is stored in a way that categorizes the risk to the ship for the areas being inspected based on the severity of the deterioration. This information can then be readily used by the ship's management to assess current condition as well as to view damage trends across a fleet of ships and provides an adjunct source of information for the ABS surveyor when attending the vessel for periodic surveys.

Satisfactory completion of a comprehensive training course, approved by ABS, is a requirement for operating this scheme in order to develop consistency. It can be tailored to suit the technical management needs of the client's organization by adopting different levels of usage of the data:

- The data is collected in a spreadsheet application which automatically provides a traffic light management overview of the ship's status
- Additional enhancements 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
- Dashboard data can be made available to overview fleet performance
- Seamless integration of hull and machinery inspection and maintenance data can be further enhanced through the fleet management modules provided by ABS Nautical Systems, an affiliate of ABS

The ABS class survey requirements are unchanged by this service. The class notation HIMP may be awarded to vessels that apply and maintain the system to the satisfaction of ABS.
ABS Eagle Hull Maintenance Program

The ABS Eagle hull maintenance program provides a sophisticated, advanced management and information module that can be used to track the condition of the vessel’s structure 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/reports, photos, sketches, video, etc., of structural members linked directly to each section for detailed visual and technical assessment.
- Tracks multiple anomalous 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.
- Compares actual condition data against “as-approved” or Rules scantlings for gauging evaluation as per prescribed renewal criteria.
- 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 owner/operator. RCM analysis allows an owner 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 the owner in gaining approval for its own RCM program for maintenance of class or by further assisting 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.

Machinery Condition Monitoring

Condition monitoring promotes cost effective maintenance by reducing the number of breakdowns and extending operating periods beyond those of time-based programs. Maintenance is undertaken as a result of the knowledge of the condition of the equipment. This results in better utilization of resources, the controlled replacement of wearing components and reduces the incidence of unplanned breakdown maintenance. Many maintenance procedures include condition monitoring e.g. checking and recording of vibration levels, pressure, temperature, load current, running hours, lubricating oil analysis data and fuel consumption. Intelligent use of this equipment condition data gives benefits such as eliminating the need to open up machinery, saving on human resources and expenditure on spare parts and reducing downtime and associated costs. By applying condition-based maintenance, credit can be given towards the requirements of the Continuous Survey of Machinery.
Integrated Management Systems Certification

In addition to facilitating the certification of a new bulk carrier to the applicable classification and statutory regulatory requirements, ABS offers shipowners and operators additional services that allow them to demonstrate their adoption of specific health, safety and environmental standards. Attaining certification to these optional ABS standards provides evidence that the vessel is being operated to the highest standards available to the industry. The ABS Guide for Marine Health, Safety, Quality and Environmental (HSQE) Management provides ship operators with an integrated management system model for safe operation and for demonstrating operational excellence.

ABS recognizes the positive impact that sound management practices may have upon these areas. The requirements of this Guide have been largely derived from accepted management system principles reflected in the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code), the latest ISO 9001 Quality Management Systems standards, ISO 14001 Environmental Management Systems standards and OHSAS 18001 Specification for Occupational Health and Safety Management Systems. Those standards have been marinized as appropriate for greater relevance to the practical operation of marine facilities.

Project Management Services

Professional project management, supported by unique software tools, may help to minimize the risk of unexpected delays, technical inaccuracies and cost overruns. If desired, a trained ABS project manager, experienced with bulk carrier construction, can be assigned to a project with the client’s prior agreement, at the commencement of the plan approval phase. In addition ABS can assist with familiarization with the ship design and the details of the construction inspection plan.
Optional Notations for Bulk Carriers

Although the requirements for several of the ABS optional notations for bulk carriers have been outlined in prior sections, they are summarized here together with additional notations not yet referenced. Conformance with the standards required for the award of the following optional notations allows an owner to demonstrate that a particular ship has been built or is being operated to internationally recognized standards that exceed those required solely for the issuance of the classification certificate.

**Design and Construction**

- **AT** – specified structural components incorporate additional plate thickness than the required scantlings. It will also include a designation and number to indicate the location and magnitude of the additional thickness e.g. AT(DK+0.5)
- **CPS** – the ship complies with the ABS Guide for the Class Notation Coating Performance Standard
- **ES** – ship meets the requirements specified in the ABS Guide for Environmental Safety (ES)
- **GRAB[20]** – This optional notation is assigned to bulk carriers to signify that the vessel’s inner bottom has been designed for a specific grab weight identified in parentheses
- **Ice Class A0, Ice Class A1 or Ice Class 1A** – ship complies with the ABS Rules for ice strengthening of ships navigating in first-year or multi-year ice or complies with the Finnish-Swedish Rules for navigating in the Northern Baltic in winter, respectively
- **RES** – ship has been built in accordance with the procedure and criteria for calculating and evaluating the residual strength of hull structures contained in the ABS Guide for Assessing Hull-Girder Residual Strength
- **SFA(30)** – ships comply with the requirements of enhanced dynamic analysis for the fatigue life identified in parentheses in North Atlantic conditions
- **SH-DLA** – ship complies with criteria for calculating and evaluating the behavior of hull structures under dynamic loading conditions and built in accordance with plans approved on the basis of the results of such analysis, in addition to full compliance with the other requirements of the Rules
Operational Safety

- ACCU – ship has the means to control and monitor an unmanned propulsion-machinery space in an approved manner from the navigation bridge and from a centralized control and monitoring station installed in, or adjacent to the propulsion machinery space
- HAB or HAB+ – ship complies with the ABS Guide for Crew Habitability on Ships
- HM1, HM2, HM3 followed by the applicable qualifier such as Slam Warning, Green Seas Warning, Ship Motion, Hull Girder Stress, Local Load Monitoring, Fatigue Monitor, VDR, Enhanced VDR – the ship complies with the requirements of the ABS Guide for Hull Condition Monitoring Systems and will be given the appropriate notation
- MAN, MAN-A – ship complies with the ABS Guide for Vessel Maneuverability
- NBL, NBLES, NIBS – ship complies with the relevant section of the ABS Guide for Navigation Bridge Design and Equipment/Systems
- PORT – ships complies with the ABS Guide for Automatic or Remote Control and Monitoring Systems for Vessels in Port
- PMA+ – permanent means of access for inspection of hull structures are provided in accordance with SOLAS II-1/3-6 and the design accounts for ergonomics in conformance with the ABS Guide for Means of Access to Tanks and Holds for Inspection

Ship Management

- (S), (SE), (SH), (SQ), (SQE), (SHE), (SHQ), (HSQE) – ship complies with the relevant criteria for health, safety, quality and/or environment management systems in the ABS Guide for Marine Health, Safety, Quality and Environmental (HSQE) Management
- SEC – Ship complies with the ABS Guide for Ship Security Notation

Maintenance

- HIMP – ship complies with the ABS requirements for the Hull Integrity Management program
- RCM followed by the applicable qualifiers such as (CARGO), (FIRE), (PROP) or (MACH) – ship complies with the ABS Guidance Notes on Reliability-Centered Maintenance as it applies to cargo handling, fire extinguishing, propulsion or both firefighting and propulsion, respectively
- TCM – ship complies with the requirements in the ABS Guide for Classification Notation Tailshaft Condition Monitoring
- UWILD – ship meets the ABS requirements for underwater inspections in lieu of dry dock
Training Services

ABS offers a wide range of training services to assist shipowners and operators in improving the safety and efficiency of their marine operations. We understand the need to go beyond compliance to enhance competitiveness in today’s operating environment and have developed training, tools and programs to meet the needs of bulk carrier operators.

A particular focus of the training courses offered is the various Management Systems, including the security systems required under the ISPS Code, the safety management system required by the ISM Code and the various Health, Safety, Quality and Environmental systems required to gain the relevant class notations. Other training initiatives cover topics such as:

- Classification and Statutory Requirements
- Hull Inspection and Repair
- Inspection, Application, Evaluation and Maintenance of Marine Coatings
- NDT Examination
- Gaugings for Hull Surveys
- Risk-Based Maintenance
- Root Cause Analysis
- Incident Investigation
- Cold Weather Operations
- Shaft Optimization
- Ship Design
- Fatigue and Fracture Mechanics
- Ballast Water Management

The ABS Academy provides these courses through its specialty training facilities in Houston, Piraeus, Busan, Singapore, Shanghai and by arrangement, other locations.

Training courses specifically relating to the classification and certification activities of ABS are provided by ABS. Courses that address maritime issues outside of classification and certification are provided by ABS Consulting, a subsidiary of the ABS Group of Companies and an affiliate of ABS.
Information Services

It is important for owners and operators to keep abreast of the constant flow of new regulatory and classification requirements. Through its participation at IMO as either a member of the IACS delegation, or the US delegation, ABS is able to provide its owners with in-depth coverage and insight into these changes. Future and proposed convention amendments applicable to a specific ship type/size can be searched at www.eagle.org/conventionamendments. Frequent regulatory updates are also posted to the ABS website and ABS owners receive a variety of informational newsletters and publications designed to assist their understanding of the issues. ABS Rules and current regulatory information can also be accessed on the ABS website at any time.
Category III

Services Provided by Companies Affiliated with ABS

Separate companies affiliated with ABS, specifically ABS Consulting, ABS Nautical Systems and ABS Quality Evaluations, offer a broad range of class and certification-related services that have been designed to assist shipowners and operators to manage their projects and vessels more efficiently.

ABS Consulting’s Marine Services division can provide shipowners and operators with a range of technical support and representative services that are independent of the classification approval process. ABS Nautical Systems LLC is one of the leading suppliers of fully integrated fleet management software systems specifically designed to improve an owner’s operating efficiencies. ABS Quality Evaluations is a leading international registrar providing shipowners with certification to ISO quality and environmental and OHSAS health standards. Category III services are comprised of the following:

Technical and Engineering Services

- Concept and Preliminary Design Development
- Outline Tender Specification and Evaluation of Bids
- Engineering Analyses and Plan Review
- Manuals and Studies
- Vessel Construction and Trial Attendance
- Guarantee Period Support
- Retrofitting and Modifications

Operational Services

- Life Cycle Hull Integrity Management
- Condition Assessment Program (CAP)
- Survey and Related Services
- Environmental Services
- Oil Testing
- Fleet Management Systems

Support Services

- Project Management
- Rapid Response Damage Assessment
- Integrated Management Systems Certification
- Incident Investigation
- Risk Management and Reliability Services
- Training
Technical & Engineering Services

ABS Consulting Marine Services offers a broad range of engineering and technical services for owners and operators of bulk carriers. These services are applicable from the earliest stages of the conceptual design of a new bulk carrier project and continue throughout the life cycle of the vessel.

ABS Consulting engineers can verify design specification, drawings and calculations against project requirements and regulatory standards using advanced technology, analysis and modeling as appropriate. These services can be customized to meet the unique needs of each project, including the assignment of a qualified project manager to represent the shipowner.

The new vessel construction services offered by ABS Consulting include: concept development; preliminary design development; outline tender specifications; evaluation and selection of bids; detailed plan review; construction management; testing and trials; and guarantee period support.

Concept & Preliminary Design Development

From inception through the preliminary design phase, ABS Consulting staff can assist an owner in defining the technical specifications for the vessel, drawing up realistic project requirements and providing guidance on preliminary budget estimations.

Concept development may include: industry trending and transportation studies; equipment definition, construction techniques; and statutory requirements.

During the evaluation phase, ABS Consulting can undertake an independent review of the design, taking into account both construction and subsequent operational factors that may include: suitability to owner's needs, selection of propulsion plant and operational requirements among others.
Outline Tender Specification & Evaluation of Bids

ABS Consulting staff can prepare the tender specification for a bulk carrier newbuilding project, incorporating all requirements identified by the owner. These may include factors such as: the main structural configuration, the prime mover and principal machinery systems, materials and equipment, coating specifications, navigation systems, the identification of applicable certificates and logistical support.

Once contract proposals have been received, the ABS Consulting team can assist the owner in reviewing the proposals to identify those considered most advantageous. This review is intended to reveal ambiguities, obvious omissions, incorrect requirements, future maintenance needs and potential issues associated with the deck, cargo handling and engineering operations and crew safety.

Engineering Analyses & Plan Review

ABS Consulting engineers are available to review the submitted drawings against specified industry, classification, regulatory or owner standards and requirements. If required, detailed technical analyses can be undertaken including dynamic load and spectral fatigue analysis, comprehensive vibration analysis, shaft alignment assessment, seakeeping and motion studies, maneuvering and mooring analyses, intact and damage stability analysis, failure mode and effects analysis, trim and stability calculations, human factors engineering assessment, environmental compliance assessments and a vessel specific analysis of the structural response when subject to very high loading rates.
Manuals & Studies

ABS Consulting's technical staff can prepare the various statutory and operational manuals required to be placed on board a bulk carrier. These include the following.

Shipboard Oil Pollution Emergency Plan

Shipboard Oil Pollution Emergency Plan (SOPEP) manuals are prepared according to the provisions in MARPOL 73/78 Annex I Regulation 26/37, Annex II Regulation 16/17 and MEPC 54(32) as amended by MEPC 86(44), the relevant unified interpretations and according to flag Administration requirements. The manuals include guidelines, contact points and procedures in the case of an oil pollution incident.

Ballast Water Management Plan

Ballast Water Management Plans (BWMPs) apply to all ships engaged in ballast operations according to IMO requirements as adopted by the applicable flag State. The ballast water manual is to be prepared according to the IMO “Guidelines for Ballast Water Management and Development of Ballast Water Management Plans” Resolution MEPC 127 (53), using ship specific drawings and information. The manual should provide standard operational guidance for the planning and management of the ship's ballast water and sediments and describe the relevant procedures to be followed, based on desired loading conditions, using the ship's approved loading program.

Garbage Management Plan

ABS Consulting personnel are available to prepare Garbage Management Plan in accordance with MARPOL requirements.

Fire Control and Life Saving Plan

When required, ABS Consulting can upgrade a bulk carrier's existing Fire Control & Life Saving Plan in accordance with IMO Resolutions A.952(23) and A.760(18).


Safety Training Manual

Preparation of the Safety Training Manual in accordance with SOLAS, Chapter III, Section V, Regulation 35 can be completed by the ABS Consulting Marine Services team.

Tonnage Measurement

Tonnage Measurement according to the International Conference on Tonnage Measurement of Ships, 1969, or according to National Regulations, can be assigned to the staff at ABS Consulting.

Allowable Cargo Mass Loading

Bulk carriers, ore carriers and combination carriers of 150 m length and above are to be provided with an approved loading manual describing (inter alia) the maximum and minimum required mass of cargo and the double bottom contents for each hold and for any two adjacent holds as a function of the draught at mid-hold position. For the vessels that do not comply with this, an appendix to the loading manual can be prepared, as per UR S1A requirements. The appendix should provide graphs indicating the maximum and minimum required cargo mass (as per requirements) as a function of the mean draft at the mid-hold position. The required manual and documentation can be prepared by ABS Consulting.

Trim and Stability Studies

Preparation of trim and stability booklets, loading manuals, loading-unloading sequence, grain loading manuals and others, according to applicable regulations such as IMO A.749(18), the International Code for the Safe Carriage of Grain in Bulk, the Code of Safe Practice for Ships Carrying Timber Deck Cargoes and similar instruments can be undertaken by ABS Consulting.
Vessel Construction Services including Trial Attendance

When contracted, ABS Consulting surveyors will attend the vessel throughout the period of construction and trials, providing comprehensive Owner's Representation services to verify that the vessel is constructed in accordance with the approved drawings, that the material and equipment conforms to specifications and provide other oversight as agreed with the owner. These may include inspection of fabrication procedures, machinery installation, non-destructive testing and evaluation, monitoring the installation of automation and control systems and progress monitoring.

Experienced ABS Consulting staff can confirm test requirements during builder's dock, sea and acceptance trials. This may include verification of the adequacy of deck equipment, outfitting and navigational items, in addition to the propulsion machinery and auxiliary equipment. A report detailing any areas requiring rectification can be provided to the client on the completion of the trials.

Shipyard Guarantee Period Support

As required, ABS Consulting staff can be available to monitor the performance of the vessel for the shipyard guarantee period. This may involve monitoring the repair of all warranty items including machinery, coatings, deck and navigational equipment. Under normal circumstances the engineers assigned to the vessel during the guarantee period will already be familiar with the vessel and the contractual requirements from their exposure to the project during construction. Guarantee period oversight may include verification of warranty items, recommendations for operational enhancements, vessel performance, lube oil analysis, habitability (particularly noise and vibration) and coating performance.

Retrofitting & Modifications

ABS Consulting's Marine Services personnel have extensive experience advising owners and undertaking detailed engineering studies for major retrofit and modification projects. Representative projects include major conversion studies for hull tanker conversions to very large ore carriers (VLOCs), assessment of new fuel oil tanks for the carriage of low sulfur fuels for use in SECA zones, including studies for the related modifications of engine room piping systems; the retrofitting of cargo cranes and the installation of emergency towing arrangements, among many others.
Operational Services

ABS Consulting Marine Services is available to provide worldwide technical support to the owner throughout the operational life of the bulk carrier. ABS Consulting staff can be made available to conduct condition surveys and to assess the need for and approach to subsequent repairs including the preparation of repair specifications and inspection of any repair work undertaken.

ABS Consulting staff can also conduct through-life technical analyses of the vessel, in particular analyses of remaining fatigue life, using advanced dynamic based evaluation programs that are proprietary to the ABS organization.

Life Cycle Hull Integrity Management

Many bulk carrier owners and operators adopt maintenance procedures that promote the life cycle integrity of the vessel. To assist them, ABS Consulting offers a ship-specific 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 Consulting upon request. The manual creates a routine and framework for shipowners' inspections. It shows pictorially the critical areas in the structure identified in the plan approval process and the areas known to be susceptible to damage from both industry and historical experience. The manual lays out a zonal scheme for categorization of six structural condition criteria and an inspection regime in order to track deterioration in these areas. This system is coupled with critical areas associated with each zone.

Condition criteria tracked may include cracking, coatings, corrosion, deformation, distortion and overall cleanliness. Inspections are to be carried out either by appropriately qualified ship's staff or superintendents. The data is collected and stored in software services provided by ABS Consulting that helps categorize the risk to the ship for the areas being inspected based on the severity of the deterioration. This information can then be readily used by the ship's management to assess current condition as well as to view damage trends across a fleet of ships.

Seamless integration of hull and machinery inspection and maintenance data can be further enhanced through the fleet management modules provided by ABS Nautical Systems LLC, an affiliated company specializing in fleet management software solutions.
Condition Assessment Program for Bulk Carriers

As a vessel ages, the manner in which the hull structure and principal machinery and equipment has been maintained is a critical element in determining the likelihood of accidents and failures. An older ship may be structurally sound but casualty statistics indicate that ships over the age of 20 are as much as four times more likely to be involved in an accident.

The ABS Consulting Condition Assessment Program (CAP) provides a charterer with a technical evaluation of the standard to which an older bulk carrier has been maintained. CAP is the recognized method for a shipowner to demonstrate the quality and suitability of a vessel for charter.

Cargo owners and many of the largest charterers either require or prefer a CAP 1 or CAP 2 rating for all older vessels fixed to carry their cargo. Some charterers also require a detailed fatigue analysis as part of the CAP assessment. Using proprietary software, ABS Consulting includes fatigue assessment in its CAP program.

The ABS CAP program for bulk carriers is accredited by the RightShip® bulk carrier vetting organization.

An ABS Consulting CAP survey may include:
- a detailed survey, including gauging of the vessel’s structure
- a sophisticated strength and fatigue engineering analysis
- extensive testing of the vessel’s machinery, equipment and cargo systems
- a close up visual inspection of cargo and ballast spaces to determine the degree of structural deterioration
Survey & Related Services

ABS Consulting offers a wide range of survey services to the owners and operators of bulk carriers. These can be conducted to industry accepted or owner-specified standards and include:

- Pre-purchase condition surveys
- Damage surveys
- Draft and on/off hire surveys
- P&I condition surveys
- Material and equipment inspection

An owner considering purchasing a bulk carrier can also contract with ABS Consulting to conduct a comprehensive record review of the vessel’s classification history.
Environmental Services

ABS has in-depth knowledge of the implications for owners and operators of international and local environmental requirements, such as NOx and SOx levels and cold ironing, through to the more far reaching aspects of Regulatory agencies in dealing with pollution incidents.

Failure to comply with the provisions of MARPOL and national legislation such as the US Clean Water Act can result in massive fines and possible criminal penalties. Increased vigilance by the United States Coast Guard (in addition to the European Union, and many port State authorities) has led to several high profile prosecutions of shipping companies.

ABS Consulting, an affiliate of ABS, offers a wide range of environmental management, auditing and training programs to assist an owner or operator to implement an effective Environmental Management Plan. These services encourage a shipowner to fully assess the company’s environmental risk profile which include:

Environmental Management Plans (develops a voluntary disclosure program):
ABS Consulting staff can assist in identifying potential waste streams, generating a GAP analysis of existing systems and assisting in the development of a Corporate Environmental Management System.

Environmental Compliance Audits (addresses system shortcomings prior to an incident):
ABS Consulting staff can identify applicable regulations, develop compliance protocols, conduct external/internal audits and assist with the preparation of reports and documentation to confirm compliance.

Environmental Program Management (places a Corporate focus on environmental issues):
ABS Consulting staff can assist with the implementation and management of a client’s Environmental Management System (EMS), including planning, management support, document review and independent internal auditing. This may include assisting with the development and adoption of ISO 9000/14000 Quality and Environmental Management programs.

Economic, Technical and Risk Analysis (helps assess a company or vessel’s environmental risk profile):
ABS Consulting staff can conduct hazard assessments, evaluate options under consideration for environmental action and prepare regulatory analyses.
Oil Testing Services

ABS Consulting provides prompt, professional services to shipowners and operators for the analysis and management of their fuel and lube oil supplies. The comprehensive ABS Consulting Oil Test Program (OTP) can help the owner monitor deliveries, pre-test supplies, confirm quantities received and provide a detailed analysis of the fuel delivered to promote efficient operations and reduce the potential for disputes.

The ABS Consulting Oil Test Program encompasses the entire bunkering process, from pre-loading tests to machinery maintenance recommendations, with the particular service package being customizable to the individual client's needs. It includes:

- Pre-loading tests to reduce incidences of de-bunkering
- Fuel line sampling to verify that the bunkers supplied meet the operator's specifications
- Identification of fuel characteristics including density, viscosity, sulfur water, metals sediment, pentane insolubles, acidity, sediment particle count, ferrography, ignition quality and carbon residue fuel dilution
- Comparison with specified fuel standards and optional testing for specific criteria
- Verification of density for determination of delivered/invoiced quantity
- Determination of compatibility with other fuels
- Assessment of lube oil condition including additives
- Recommendations on condition maintenance and renewal of lube oils
- Machinery condition monitoring reports and performance trend analysis
- Fuel damage investigations
- Machinery damage surveys
- Preventative strategies for minimization of fuel related problems
- Impartial independent measurement of bunker quantities

Each client will be placed in direct contact with an ABS Consulting appointed project coordinator who will be responsible for arranging the speedy dispatch of the fuel samples and efficient delivery of results. User-friendly forms have been created for the ship's crew to simplify the collection and dispatch of the samples. Results are normally available electronically within 24 hours of receipt of the samples at the laboratory. A rapid alert service is initiated when the quality of the fuel does not meet the desired specifications.
ABS Nautical Systems LLC, an ABS affiliate, is a leading provider of fleet management software for the marine and offshore industries. Marketed as a suite of products called NS 5, the software modules can function on a stand-alone basis, or as a fully integrated management solution that addresses every element of a fleet manager's daily operational functions.

A complete suite of NS 5 modules handles every aspect of operational management – from regulatory requirements to payroll, to stock control, planned maintenance and quality and compliance programs. Fully integrated, the modules eliminate the need for repetitive data entry, share information and allow the user to move rapidly from one to another.

NS 5 makes fleet management easier and more efficient, providing increased productivity and more effective cost control flow from the system's ability to link management, operations, and onboard personnel, into a seamless information stream.

The integrated architecture makes adding modules simple. Each module is valuable on its own but a complete NS 5 system provides the most powerful, single-source fleet management tool available. NS 5 is an easy-to-use Windows®-based program with full replication capability.

Available ABS Nautical Systems fleet management modules include:

- Maintenance and Repair
- Purchasing and Inventory
- Quality and Compliance
- Crew Management
- Crew Payroll
- Hull Maintenance
- Incident Investigation
- Vessel Drawings

Full information on how the ABS Nautical Systems fleet management software can improve operating efficiency can be found at www.abs-ns.com
Support Services

ABS Consulting Marine Services takes a holistic approach to the development of products and services designed to assist shipowners and operators to manage their fleets more efficiently. These services range from a comprehensive curriculum of technical, safety, quality and environmental training courses, to detailed HAZID and HAZOP studies and the development of effective reliability-centered maintenance strategies. From the time the vessel is first conceived by the designer to its final demise in the scrapyard, the global team of ABS Consulting Marine Services professionals are available to provide or develop practical, effective support services that promote operational safety and efficiency.

Project Management Services

ABS Consulting can provide a bulk carrier owner with tailored project management services that may promote efficiencies and help to minimize the risk of unexpected delays, technical inaccuracies and cost overruns. These services can be made available for new construction projects, for major modifications or repairs or to evaluate potential projects for their feasibility prior to being undertaken.
Coastal States are showing an increased intolerance towards marine incidents and ship source pollution. Yet operational perfection is simply not possible, particularly in the hostile marine environment in which the international shipping industry must operate. Proactive owners mitigate the potential risks associated with an incident by enrolling in a Rapid Response Damage Assessment (RRDA) program.

ABS Consulting provides 24 hour, 365 days per year emergency support services to shipowners and operators with vessels enrolled in the program. Currently the program covers more than 1,200 vessels that are engaged in international trading. Computer models of these vessels are held in the system and, upon notification of a casualty, detailed stability calculations can be made using the established HECSALV program. This information can be used to provide immediate guidance to the owner and master of the vessel, and the salvor as needed, regarding appropriate responses including ballasting, cargo transfer and transshipment options.
Integrated Management Systems Certification

ABS Consulting is affiliated with ABS Quality Evaluations, a leading international registrar for the auditing and certification of management systems that conform to various international standards such as ISO 9001 quality standards, ISO 14001 environmental standards and the OSHAS 18001 Specification for Occupational Health and Safety Management Systems.

Conformance with these and other internationally-recognized standards allows a shipowner or operator to demonstrate it has adopted specific health, safety and environmental standards that go beyond those required by the flag State of the bulk carrier. Attaining certification to these standards provides evidence that the vessel is being operated to an enhanced standard.

ABS Consulting can provide a bulk carrier owner with the guidance needed to develop and implement management systems that conform to these international standards. The ABS Consulting staff can also assist a bulk carrier owner to develop and implement management systems that can be audited by the flag State or its Recognized Organization for compliance with the International Safety Management (ISM) Code and the International Ship and Port Facility Security (ISPS) Code.

ABS Consulting offers review of a bulk carrier owner or operator's existing management systems and can prepare new manuals according to a client's request. The manuals and plans are prepared according to the ISM Guidelines and other applicable industry standards, using ship specific information.

ABS Consulting can also deliver specific training through concise in-house training courses to raise shore-based staff awareness concerning the organization's Management System to maintain an increased level of safety environmental awareness throughout the company. Crew training is provided to familiarize and raise crew awareness concerning the ISPS Code.

An ABS Consulting internal audit of the vessels in the client's fleet can help identify any weak areas for improvement as well as prepare the crew for forthcoming external audits. One of the main goals is to identify best practices on board vessels and promote these fleet-wide. ISPS shipboard internal security audits conducted by ABS Consulting are designed to reflect the level of implementation of the relevant code in conjunction with flag State requirements as these are incorporated in the Ship’s Security Plan (SSP).
Incident Investigation

Determining the root cause of incidents is fundamental to improvement. The ISM Code requires it as do several prominent flag States. ABS has published *Guidance Notes on the Investigation of Marine Incidents* and developed specific software designed to facilitate assessment of incidents so that future repetition of undesirable circumstances can be avoided. The Guidance Notes offer proven, standard methods for analysis and reporting.

ABS Consulting can assist with training and the application of the analytical methodology to your company. This has several outcomes including cost saving and a method of demonstrating continuous improvement.
Risk Management & Reliability Services

ABS Consulting is one of the world's leading providers of risk assessment, management and mitigation services. These services span a wide gamut from HAZID and HAZOP studies to detailed risk assessments associated with prevailing weather conditions, blast impact studies and process safety management. Services particularly tailored to the marine sector include the following.

Formal Safety Assessment of Marine Applications

ABS Consulting personnel can prepare a report for the marine, safety or reliability related aspects of a shipowner's operations in accordance with the IMO Guidelines on Formal Safety Assessment (FSA). The 5-Step FSA procedure incorporates customary techniques as well as novel safety and reliability methodologies in order to identify, measure and mitigate possible risks and their respective consequences.

Risk Assessment Manuals for Engineering Systems, Structures and Processes

ABS Consulting prepares risk assessment manuals on request to address the onboard engineering systems, including structures and processes, required by the operator which can identify the following:

- The major hazards related to the installation, operation or maintenance of the item examined
- The risks related to the hazards identified and the severity of their respective consequences in more than one area, if applicable
- The immediate and future preventive risk reduction controls required
- An assessment of the financial aspect of the application of the controls proposed
- A conclusion of the controls and the course of action required in order to minimize the risks

Reliability-Centered Maintenance Strategies

ABS Consulting can provide guidance for the identification of effective maintenance strategies for either a specific piece of machinery, an engineering system or a complete engine room. The use of analytical reliability methodologies, combined with engineering and operational experience, can reveal actions required to minimize failures. These actions can reduce the overall vessel's downtime due to engineering delays and increase the respective life expectancy and safety of the items examined.

Reliability-Centered Maintenance Plan for Marine Applications

ABS Consulting can prepare a reliability-centered maintenance (RCM) plan for identification of optimal maintenance intervals, with pro-active engineering to help reduce overall expenses used for maintenance purposes. An RCM plan addresses maintenance as a benefit for additional savings and not as an extra cost.

HAZID and HAZOP Studies

With many years experience in HAZID and HAZOP studies, ABS Consulting can facilitate an assessment of safety and reliability elements relating to the design or operation of a bulk carrier. Systems, structures, processes or piping networks can be described and hazards can be identified.
Training Services

ABS Consulting offers a comprehensive curriculum of technical, safety, quality and environmental courses for the marine industry. Both public and customized courses are offered through ABS Consulting’s specialized training facilities in Houston, Busan, Piraeus, Shanghai and Singapore or on-site at a client’s location.

Courses are frequently added. Current course offerings and locations can be found on the ABS Consulting website. Typical courses address topics such as:

- Marine Internal Auditor Training
- ISM, ISO, ISPS and STCW-Related Training
- Marine Root Cause Analysis and Incident Investigation
- Maritime Security Implementation and Security Officer Training
- Coating System Evaluation
- Hull Inspection and Repair
- Non-Destructive Testing and Examination
- Hull Thickness Measurements
- Reliability-Centered Maintenance Strategies
- Ballast Water Management
- Ship Design
- Cold Weather Operations
Classification & Certification Services

For more information on the classification and statutory certification services provided by ABS, please contact the ABS office nearest you. A full listing of all ABS offices with contact information can be found on the ABS website at http://absapps.eagle.org/absoffices/searchemp.do

Related Services

General inquiries regarding products and services provided by ABS Consulting can be sent to info@absconsulting.com or please refer to the website to contact representatives at http://www.absconsulting.com/contactUs.html

For further information on the products and services provided by ABS Nautical Services please contact the ABS Nautical Systems office nearest you. A full listing of the ABS NS offices can be found on the website at http://www.abs-ns.com/locations/
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