2017 Annual Review

IACS

International Association
of Classification Societies

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01 Preface

A year of modernisation, quality and transparency for IACS

By Knut Ørbeck-Nilssen, IACS Council Chair, CEO DNV GL – Maritime

Knut Ørbeck-Nilssen, Council Chair

Welcome to the IACS Annual Review 2017 – an overview of the organisation's most important new developments and projects over the past year. And what a year it has been. We have seen tectonic shifts in markets, regulations and technology. In my capacity as Council Chair, I am especially proud to see the progress that has been made in modernising the concept of class, to adapt to the digital transformation of our industry. In a time when the markets are laced with uncertainty, oversupply and cost pressure on the one hand and a wave of new technologies and regulations on the other, class has an ever more important role to play. In IACS, we have a responsibility to ensure that our own standards allow for innovative practices, while maintaining safety at sea.

Generating more movement on this front not only enhances the level of safety, quality and transparency in the maritime world, but also enables us to provide better support. And it is only by embracing change that we can strengthen both the role of class and the position of IACS.

Looking back to the second half of 2017, some interesting projects have been launched. For example, this year's issue includes an ongoing review of ship autonomy. In a dedicated working group, IACS has examined all the relevant Resolutions, to identify which standards present potential regulatory obstacles to autonomous ship operations. In addition, IACS is supporting the industry by leading the work on the development of a common terminology for different levels of autonomy.

To help protect the maritime community from the pitfalls of increased connectivity, IACS established and is taking the lead in an industry working group focused on cyber security. The working group addresses common safety issues with interconnected systems and shares best practices. It also helps owners and managers gain a deeper understanding of how to ensure the safety of vessel systems and keep up to date with new developments.

To facilitate the use of modern survey technology, IACS is also taking a fresh look at its survey requirements. And with benefits ranging from increased safety and efficiency, to reductions in survey and maintenance costs, the review of the relevant unified requirements and recommendations comes at a good time. Potential revisions could cover the technical development and details of advanced non-destructive testing and remote inspection techniques.

On the organisational side, IACS has reassessed its internal procedures to make sure it is fit for the future. For the first time in almost a decade, a substantial revision of the IACS Membership Criteria was undertaken, and the new criteria were introduced on 1 January 2018. The focus of the new procedures and criteria is to ensure that both new and existing members perform to the highest quality standards. A revised internal benchmarking process supports IACS Members in improving their performance, further enhancing the organisation's quality and transparency.

These are important steps towards ensuring that IACS provides consistency in its high-quality support, reinforcing its position as the leading maritime technical association. And when many in the maritime community feel like their businesses are in dire straits, IACS and its Members, the top classification societies, need to be a beacon of light setting the course ahead – with modern requirements, transparent processes and the highest quality of service.

Supporting the needs of industry

IACS is embracing change and technological advancements in tandem with its continued commitment to present-day shipping, by Robert Ashdown, IACS Secretary General

Robert Ashdown, Secretary General

The wave of complex, fast-paced and multi-faceted changes facing the maritime industry continued unabated in 2017. Yet the industry's response to those changes remains bound by broad, relatively static macro-economic and political constants that are determining the future shape of the industry: Continued global trade growth means there is more cargo to transport by sea, while society demands that growth be achieved in a manner that produces less carbon and other emissions. It is also expected that transportation of trade be undertaken with fewer accidents and incidents and that the increase in global transport systems requires the delivery of a better transport service. Helping balance these competing demands gives IACS, as the Association representing the world's leading classification societies, a key role to play in the future development of shipping technology, implementation, regulation and efficiency by bringing familiar technical assurance processes to bear against these new and unfamiliar technologies.

In parallel, it is also important that, as new technologies penetrate more deeply into the shipping industry, they are underpinned by an international regulatory regime that allows for their implementation in a globally consistent and effective manner. IACS' deep commitment to, and engagement in, the work of IMO reflects its desire to see adoption of a 'better regulation' approach that delivers safer and cleaner shipping in a manner that maximises the opportunities for innovation, the rapid take-up of new approaches and the smooth implementation of existing instruments.

Supporting regulators

In delivering this objective, IACS' activity in support of the IMO remains highly impressive both in term of substance and volume. Large numbers of submissions are made every year which, in 2017, included a number of important IACS Resolutions in support of the introduction of the International Code of Safety for Ships using gases or other Low-flashpoint fuels (the IGF Code), as well as significant contributions to the debate on engine-mapping, permitting technological advancements to be implemented while allowing operators to remain in compliance with the regulations. Other areas of engagement include support for the IMO's review of the Energy Efficiency Design Index (EEDI) review process. Having proposed, developed and implemented an EEDI database, the subsequent challenges can now be addressed, underpinned by a robust dataset. IACS has also been active in identifying additional performance and test standards for equipment and systems on board ships operating in polar waters in support of the introduction of the IMO's Polar Code.

Perhaps most significantly, IACS and its Members were also delighted to achieve full compliance with IMO Goal Based Standards during 2017. While this brings the initial verification process to a successful conclusion, this is, of course, an ongoing process. IACS continues to work closely with the IMO on developing appropriate processes for the periodic maintenance of GBS and is delivering on its commitment to report to the IMO progress on addressing the observations that were raised in the GBS audit process.

Meanwhile, as the IMO prepares itself for the regulatory challenges associated with autonomous vessels, IACS is undergoing a similar exercise; looking forward, it will be important that recognition of the possibility of greater autonomy be given full consideration when developing new instruments.

Technical leadership

It is clear from the above that class has the practical experience, expertise and resources to support the maritime industry's growing and increasingly complex regulatory oversight and to assist in the rapid introduction of new technologies and emerging new digital systems that facilitate international trade.

IACS, as an association of the leading classification societies, takes this technical leadership role very seriously and, in 2017,

embarked upon a series of measures to maintain the quality standards expected of IACS Members and to ensure that the criteria for membership of the Association reflects significant changes in the regulatory regime. The revised IACS Membership Criteria do just this and reflect the necessity for existing and future Members to comply with robust criteria that preserve IACS' status as an association of classification societies whose Members all have stringent quality rules. IACS' commitment to continuous improvement in quality matters was further reflected in 2017 in the transition of the IACS Quality System Certification Scheme (the only maritime organisation that has its own quality management system) to the ISO 9001:2015 standards with its increased emphasis on risk-based thinking. These developments, together with enhanced benchmarking for existing members, demonstrate that quality operations continue to lie at the very heart of IACS' mission.

"IACS' activity in support of the IMO remains highly impressive both in term of substance and volume"

Commitment to transparency

2017 has also seen an increased focus on IACS' commitment to transparency and to an enhanced level of dialogue with the other industry sectors. Last year saw the publication of IACS' inaugural review as well as the launch of a new website, aimed at the non-specialist and specialist alike, along with the development of the 'IACS Green Book' and enhanced mechanisms to alert stakeholders proactively to updates to IACS Resolutions. This year's Annual Review goes a stage further in transparency terms by including a Class Report with key data on each of the IACS Members.

IACS firmly believes in the added value that can be gained from listening to the expertise held in other international industry associations. To this end, IACS continues to build on the work done in 2016 to deepen its engagement with industry by establishing in 2017 a new forum for technical dialogue with the marine insurance community and establishing an Expert Advisory Group to support the maintenance process for IACS' Common Structural Rules.

As is evident from the detailed articles in this Annual Review, 2017 has seen IACS undertake new activities and adopt new approaches that ensure it remains relevant to the maritime industry it serves. As a result, IACS remains well placed to continue to deliver on its core mission of safer ships and cleaner seas well into the future.

The Role Of IACS

IACS works with all sectors of the industry and maritime regulators to ensure that the legislative framework necessary for safe, efficient and environmentally friendly ships is underpinned and enhanced by class Rules that allow for its practical implementation. Working closely with Member States in the IMO, IACS also strives to ensure that the legislation developed by that Organization can be consistently and globally applied.

The Association also delivers further consistency through the adoption of IACS Resolutions (Unified Interpretations, Unified Requirements and Procedural Requirements). Given that IACS' Members class, collectively, over 90% of the world's merchant fleet by tonnage, the adoption by IACS of any given resolution has a significant impact on the global shipping community.

The International Association of Classification Societies is, therefore, not a traditional non-governmental organisation (NGO). Rather it is a not-for-profit membership organisation of classification societies that establishes minimum technical standards and requirements. This limited scope of IACS' work is often misunderstood. IACS does not seek commercial opportunities or to improve the operating climate for its members. Many of the IACS Members undertake a wide range of activities, such as consultancy, that are never discussed within IACS as they are ancillary to classification services. Although all the IACS Members act as Recognized Organizations for many of the flag State Administrations worldwide, IACS does not discuss this aspect of its members' work either. Neither does IACS have any responsibility for enforcement which is, rightly, left to flag and port States. IACS therefore occupies an almost unique position as a technical, standards setting body, and, as such, it is crucial that IACS maintains an independent, apolitical position in the development of those standards.

02 About IACS

Working for a safe shipping industry

IACS offers a robust process for contributing to and implementing the necessary standards for ships and other floating structures, by Robert Ashdown

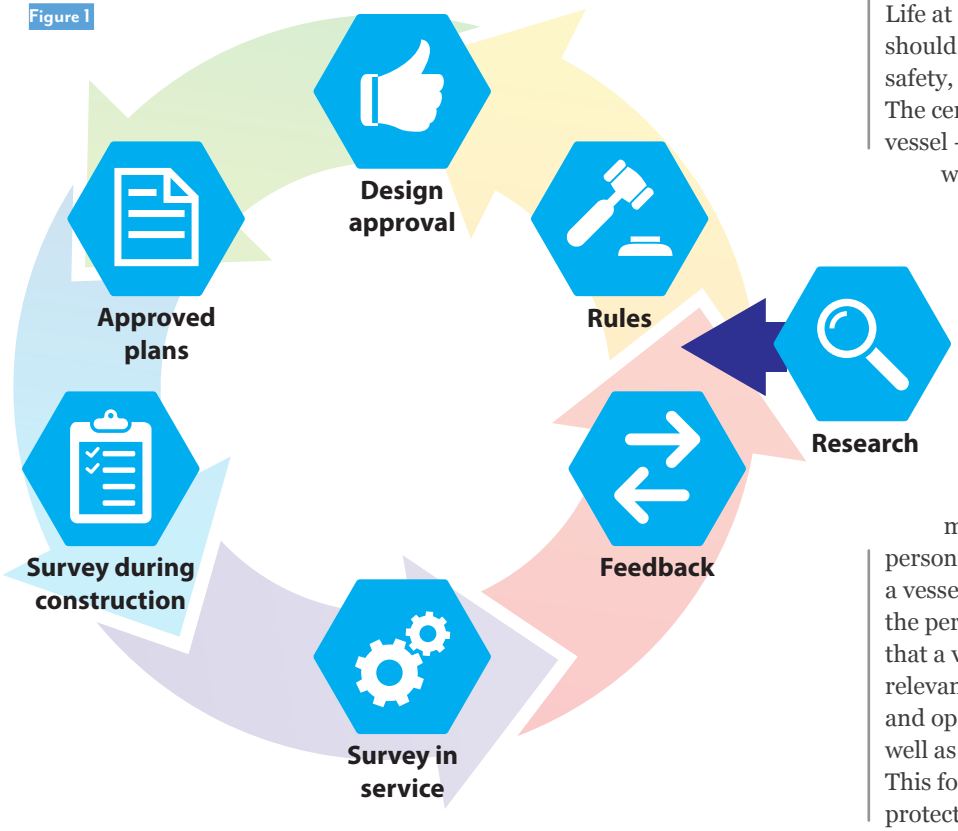
The International Association of Classification Societies' (IACS) Member classification societies are able to ensure that high standards on ships or other floating structures are maintained by way of their thorough understanding of the internationally applicable technical rules that apply to them. IACS provides its Members with a forum in which to share their in-depth technical knowledge so that unified technical requirements can be developed and other recommendations and guidance produced.

Ship classification explained

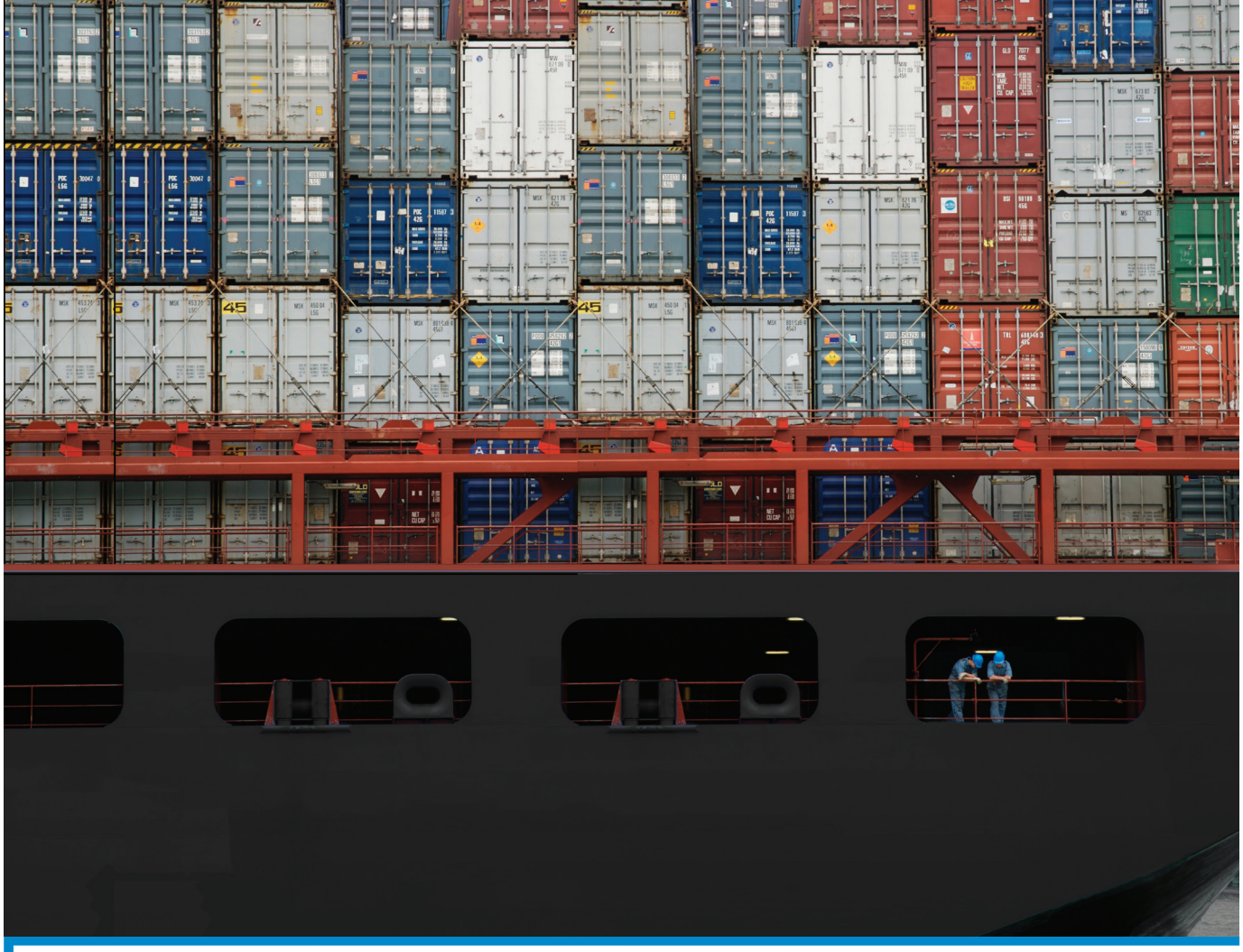
The objective of ship classification is to verify the structural strength and integrity of essential parts of a ship's hull and its appendages, as well as to authenticate the reliability and function of its propulsion and steering systems, and power generation, alongside other features and auxiliary systems built into the ship to maintain essential services on board for the purpose of safe operation of a ship. Classification societies aim to achieve this objective through the development and application of their own Rules and by verifying compliance with international and/or national statutory regulations on behalf of flag State Administrations. The vast majority of commercial ships are built to and surveyed for compliance with these Rules.

Classification and statutory certification are, except in rare cases, inextricably linked, since classification by a society recognized by the flag State Administration is usually a prerequisite for both registration of a ship with its flag State Administration and for certification of its compliance with the International Convention on Load Lines and the International Convention for the Safety of Life at Sea. However, a classification certificate should not be construed as a warrant of a ship's safety, fitness-for-purpose or seaworthiness. The certificate is simply an attestation that the vessel – at a certain date – is in compliance with the Rules developed and published by the society issuing it.

Figure 1



Furthermore, Classification societies are not guarantors of the safety of life or property at sea — or the seaworthiness of a vessel — because although the classification of a vessel is based on the understanding that it is loaded, operated and maintained in a proper manner by competent and qualified personnel, the society has no control over how a vessel is operated and maintained between the periodical surveys it conducts to check that a vessel is upheld in compliance with the relevant requirements. Proper maintenance and operation by shipowners or operators, as well as the seafarers on board, is therefore key. This forms part of the overall safety net for protection of life and property at sea and for



The objective of ship classification is to verify the structural strength and integrity of essential parts of a ship's hull and its appendages

protection of the marine environment, which involves various stakeholders.

Should any defects that may affect class become apparent, or damages be sustained, the shipowner must inform the society concerned without delay. Where the conditions for the maintenance of class are not complied with, class may be suspended, withdrawn or revised to a different notation as deemed appropriate by the society when it becomes aware of the condition.

Rules and requirements

It is fundamental for classification societies to have a thorough understanding of internationally applicable statutory requirements for ships and other floating structures. IACS has therefore established a robust process for contributing to and collecting such information, primarily through its role as a non-governmental organisation of the International Maritime Organization (IMO).

Classification societies' participation in IACS in its role as a technical advisor to the IMO gives them first-hand access to development of international regulatory instruments. It provides IACS' 12 Member societies with a means to share such information with the industry and facilitate consistent implementation of the international mandatory conventions and codes as part of statutory services the societies perform under flag State Administration authorisation.

Classification Rules have been developed over many years by each society through extensive research and development as well as service experience, and they are subject to constant refinement. In addition, Unified Requirements have been agreed by IACS Members and transposed into individual Members' Rules. Classification societies' involvement with ships through their life cycles affords them the unique opportunity to utilise feedback obtained throughout the design approval process, through new construction (including the certification of materials, equipment and components) and from surveys of ships in-service in order to drive research and development, as well as the improvement of classification Rules. Utilising the opportunities afforded by this 'class cycle' (see Figure 1), in support of the purposes and objectives of classification, is a key element in IACS' work.

In the context of the global shipping industry, statutory requirements are developed at the IMO, as well as at the International Labour

Statutory requirements agreed at IMO address the safety and security of ships and those on board, as well as protection of the environment

Organization (ILO). As necessary, and to assist in the global and consistent implementation of IMO statutory requirements, Unified Interpretations (UIs) are developed and adopted by IACS.

Statutory requirements agreed at IMO address the safety and security of ships and those on board, as well as protection of the environment. On the basis of providing no more favourable treatment than others receive, they facilitate the efficiency of global trade by providing a regulatory level playing field that allows a compliant ship flying the flag of one country to trade internationally. IACS UIs are adopted Resolutions on matters arising from implementing IMO agreed provisions. Such IACS adopted UIs encourage global and consistent implementation and can address matters which in the IMO agreed texts are either left to the satisfaction of the flag State Administration or vaguely worded.

Key values in mind

IACS establishes, reviews, promotes and develops Unified Requirements (URs) in relation to the design, construction, maintenance and survey of ships on matters directly connected to or covered by specific Rule requirements and practices of classification societies. These URs are considered minimum prerequisites, but any Member remains free to set and publicise requirements that result in an equivalent or higher safety-level compared to the IACS URs. IACS also assists international regulatory bodies and standard organisations to develop, implement and interpret statutory regulations and industry standards in ship design, construction and maintenance with a view to improving safety at sea and the prevention of marine pollution.

The support that IACS can offer to regulators like the IMO and ILO, as well as to the industry, relates to the following values:

1. Leadership: the ability to be ahead and to co-operate with regulators and industry on initiatives that can effectively promote maritime safety, protection of the environment and sustainability;

2. Technical knowledge: collective and individual knowledge and experience leading to the development, adoption and implementation of technical rules and requirements reflecting current practice and changing demands of society, supporting innovation and new technologies;

3. Quality performance: commitment of Members to define and adhere to the highest global quality standards; and

4. Transparency: the ability to provide advice on the implementation of regulations, interpretations or enhancements thereof, if the need is identified, so that practical solutions can be effectively developed in cooperation and with the support of other stakeholders, increasing the trust on class.

IACS also engages bilaterally with individual flag State Administrations and regulatory bodies, as required. Regionally, the organisation is also active in Brussels, where it promotes its aims to European institutions and, where appropriate, makes technical contributions to European Union regulatory developments related to shipping. Having such a global reach means that the IACS classification society Members can be assured of peace of mind when it comes to certifying compliance with statutory regulations on behalf of authorising flag State Administrations.

In conclusion, IACS contributes significantly to the shipping industry.

Revised requirements for membership

Revised IACS membership terms reflect changes in the regulatory regime, by Robert Ashdown

IACS welcomes any classification society into membership that meets its eligibility-requirements

The International Association of Classification Societies (IACS) substantially revised its terms for organisation membership in 2017 for the first time in almost a decade, with the new criteria applicable from 1 January 2018. The changes include simplifying the application procedure, requiring Members' class rules to be compliant with International Maritime Organization Goal-based Standards (IMO GBS), introducing a requirement for Recognized Organization (RO) experience, enforcing a more robust Quality System Certification Scheme (QSCS) approval process and requiring better identification of non-compliant ships (i.e. those built and/or operated outside IACS requirements).

In developing the revised Membership Criteria, the standards and attributes required of an IACS Member have been identified, and guidance provided, to allow IACS to make a transparent, objective and justifiable assessment of whether an applicant fulfils the criteria. The revised procedures also reflect the necessity for existing and future Members to comply with robust Membership Criteria to preserve IACS' status as an association of classification societies whose Members all have stringent quality rules. The revised procedures and criteria for membership clearly demonstrate IACS' ongoing commitment to high-quality operations and to ensuring that both new and existing Members continue to perform to consistently high standards.

This significant revision of Volume 2 of the IACS Procedures was prompted by experience gained through applying the current procedures as well as in response to international regulatory developments. For example, experience revealed that the current membership procedures — with its two-stage application process – was not being used as designed, while the 'Applicant Status' previously granted was found to be not well-understood in the wider industry. One regulatory development that heavily influenced the changes was the introduction of a new International Convention for the Safety of Life at Sea (SOLAS) regulation requiring Goal Based Standards (GBS) to be applicable to bulk carriers (BCs) and oil tankers (OTs) of 150 metres or more in length whose building contracts were placed on or after 1 July 2016. Under that regulation, BCs and OTs must satisfy applicable structural rules confirmed to be in conformity with the requirements of the IMO's International Goal Based Ship Construction Standards for Bulk Carriers and Oil Tankers.

Having ships built to GBS represents a significant regulatory development for classification societies and IACS has supported this implementation by bringing compliance with GBS into its Membership Criteria.

Furthermore, the revised Membership Criteria dictate that IACS Members must be able to contribute to the establishment, review, promotion and development of technical requirements. IACS' Common Structural Rules for OTs and BCs constitute the most comprehensive output of its technical work, which needs constant review and updating. IACS' revised Membership Criteria therefore require that Members must be able to contribute to this work in pursuance of their commitment to quality and safety in shipping.

The revised Membership Criteria clearly sets out how a new IACS Member's classed fleet is to be brought into compliance with IACS Resolutions.

Simplified application process

The membership changes have also introduced a single membership application procedure, in place of a two-step process, and a requirement that any new Members' non-compliant ships (i.e. those built and/or operated outside of IACS Resolutions) must be publicly identifiable. New Members have three years to ensure that those ships fully comply with all applicable Resolutions.

Additionally, membership eligibility now places a renewed emphasis on experience in working as a classification society with five years of

history required, as well as compliance with IACS Resolutions and five years' experience as a RO, a term which means authorisation covering all elements of the primary IMO Conventions. This new membership requirement comes on top of the existing requirement for documenting experience gained within the previous 10 years demonstrating survey and design assessment capabilities.

Approval of an applicant's QSCS certificate now requires the associated vertical contract audits to cover a variety of areas, such as a minimum number of audits done on board ship, new constructions and reflection of the classed fleet's diversity. All audits must be done by an IACS-recognized, independent Accredited Certification Body.

Further, there are now additional explanations for membership requirements related to 'Design Assessment Capability' and there is a greater emphasis on the technologies an applicant uses to deliver 'Class Rules' and 'Survey Capability'.

Though the new terms will certainly be of relevance for aspiring IACS Members, all existing Members must also comply with the new criteria and are subject to periodic reviews to ensure their continued compliance with IACS' membership requirements.

New Members

A further new membership condition stipulates that within three years of being granted membership of IACS, Members must ensure that their fleet adheres to all IACS Resolutions. During that period, any vessels which do not comply with IACS Resolutions will need to be publicly identifiable, and IACS will need to be provided with a detailed plan describing how they intend to make all vessels in their registered fleet fully compliant. During the three-year period, all non-compliant ships will be subject to the requirements of IACS PR1D (Procedure for Class Entry of Ships not subject to Procedural Requirements (PR), PR1A or PR1B).

IACS will continue to make its Technical Contributions Forum open to non-IACS classification societies. However, there will still be Forum requirements to ensure that participation is limited to genuine classification societies, and these terms will be outlined in Volume 1 of the IACS Procedures.

In summary, IACS welcomes any classification society into membership that meets its eligibility requirements, and these new procedures streamline the application process and potentially reduce the time between application and acceptance.

IACS will continue to make its Technical Contributions Forum open to non-IACS classification societies

03 IACS Technical Work

Determining wave design loads

IACS' dedicated Project Team outlines its work on re-examining parameters and values for wave-induced ship responses, by Philippe Baumans, IACS Hull Panel Chair

The accuracy of design loads is important due to its significant influence on the final structural scantlings and the safety of a ship's structure. Design loads that are closely linked with the design conditions and/or operating conditions provide design bases for the hull structural strength for the entire service life of a ship. As a result of this, IACS developed practical methods of Equivalent Design Waves (EDW) which are equivalent regular waves that, when applied, generate response values of stresses equivalent to the long-term statistical direct analysis values.

IACS established a Project Team specially dedicated to reanalysing the assumptions that led to the Equivalent Design Waves parameters

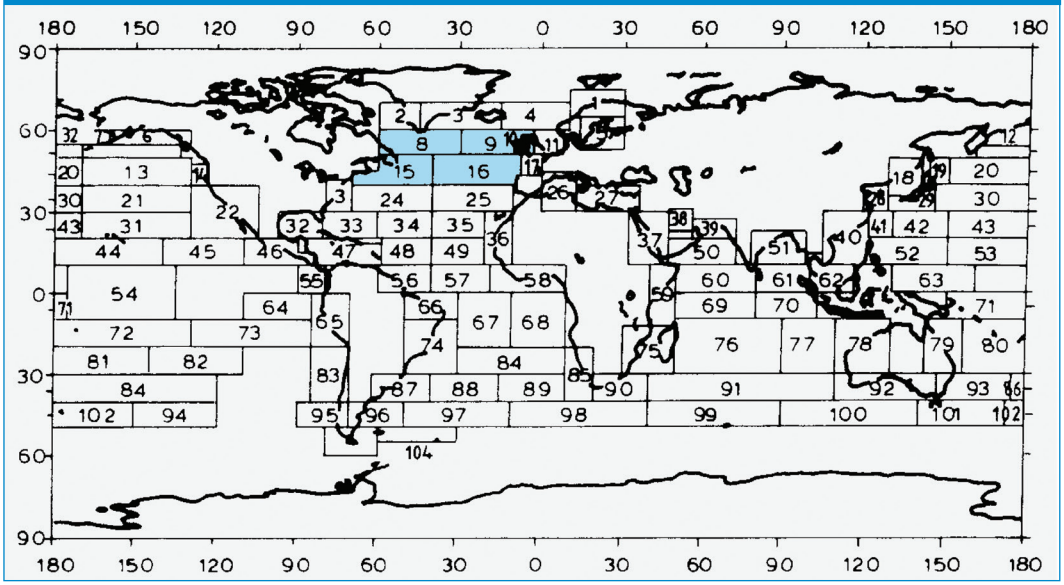
Loads and motions of a ship in waves are random processes. This process is described by a well-known mathematical probability model with variables representing any ship response to waves, such as acceleration, motion, bending moments, and so on.

The probability density functions describing phenomena such as the sea state occurrence or ship response to waves are not theoretically known. Therefore, certain assumptions for the probability distributions were made during the development of the Common Structural Rules (CSR). In the CSR BC & OT, the EDW method is used to set the design loads, which include lateral loads (external and internal pressures) and hull girder loads in still water and in waves.

During the Goal Based Standards (GBS) audit of the CSR, some assumptions, such as the equal ship heading probability distribution, were questioned. In response, IACS established a Project Team specially dedicated to re-analysing the assumptions that led to the EDW parameters, aiming to improve the accuracy of the Rules modelling of wave loads and to propose corresponding CSR Rule changes. This article explains the work performed by this IACS Project Team in 2017, which re-analysed the assumptions necessary for the extreme wave loads definition in the CSR rules.

IACS studied the conditions in relation to wave propagation in which a ship master might decide to change course to mitigate undesirable ship behaviour in waves

Figure 1. Definition of the extent of the North Atlantic



Describing ship responses

Ocean wave measurements have proved that the probability distribution of wave amplitudes is a Rayleigh distribution with narrow-band spectrum. As the narrow-banded assumption is a conservative approach, IACS maintained this conservative assumption and continued to use this distribution to describe ship responses to waves in each sea state, using a linear model to determine the ships' responses.

The probabilities of the sea state occurrence are usually given in the form of a matrix known as a scatter diagram, in which the probability of occurrence is discretised for each set [Hs, Tz], (significant wave-height, wave-period). The matrix approximates the real distribution to allow numerical computation of the long-term probabilities of the ship responses.

The scatter diagram in IACS Recommendation No. 34, was used to represent the most severe conditions which occur in zones 8, 9, 15 and 16, as shown in Figure 1. The North Atlantic is represented by a two parameter Pierson-Moskowitz wave spectrum $S(\omega)=fct\ (Hs, Tz, \omega)$, where ω is the angular wave-frequency. It is to be noted that the GBS guidelines request consideration of the sea environmental conditions of the North Atlantic for ship design but they do not specify which zones are to be used. This assumption was also maintained.

The uniform probability distribution of ship heading was used to determine the long-term ship responses and, further, to develop design formulae on ship motions and loads for CSR Rules issued in 2015. This assumption is included in IACS Recommendation No. 34 as there are no available non-uniform probability distributions of ship heading validated in relation to the direction of wave propagation.

Analysing a master's behaviour

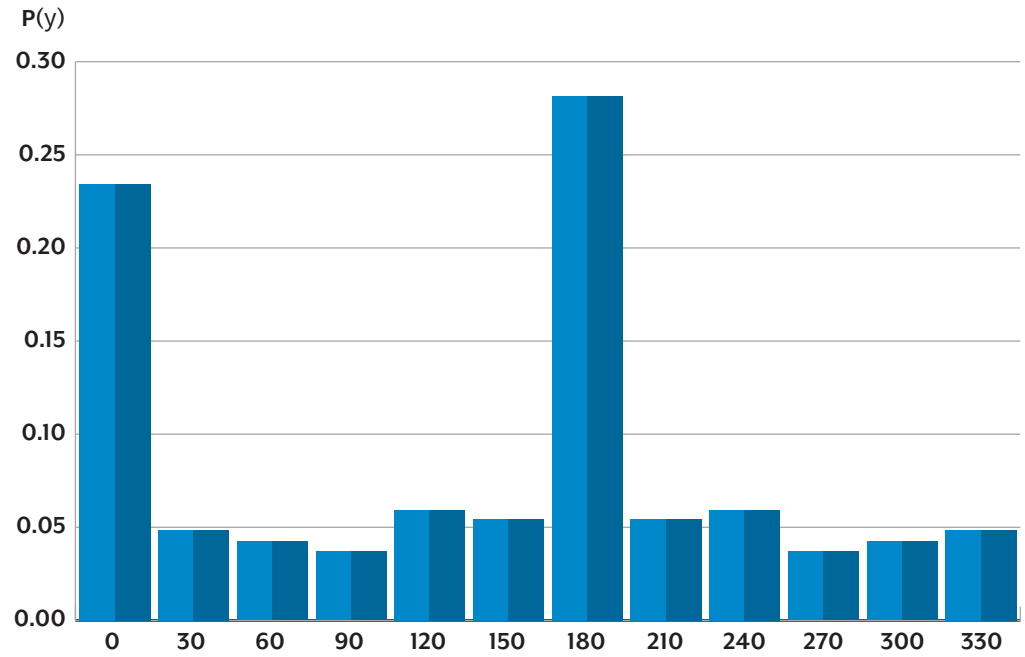
IACS studied the conditions in relation to wave propagation in which a ship master might decide to change course to mitigate undesirable ship behaviour in waves. The Project Team approached this with a mathematical criterion expressing that a change in ship direction is made when one of three conditions are met:

1. The probability of exceedance of a given roll angle or;
2. When the deck freeboard at the bow reaches a minimum limit or;
3. When the propeller immersion reaches a minimum limit.

This criterion was used to develop 3D probability distributions dependent on ship size. Then, a simplification was developed, with a conditional 1D non-uniform ship heading probability distribution for sea states with a significant wave-height greater than 7.5 metres to approximate conservatively the 3D probability distributions. The obtained results are summarised in Figure 2, highlighting that some headings (0 and 180°) have a higher probability of occurrence than others, contrary to the initial assumption considering the uniform probability distribution of ship heading.

The impact of this non-uniform ship heading probability distribution was investigated by the

Figure 2. 1D – Non-uniform ship heading probability distribution



Project Team. All the long-term prediction values of various wave-induced ship responses given below were calculated with this new approach and compared with the CSR corresponding values:

- Hull girder forces and moments:
  - Vertical wave bending moment amidships,
  - Horizontal wave bending moment amidships,
  - Vertical wave shear force at x=0.25L from aft perpendicular (AP), and
  - Torsional wave moment regarding the bottom centreline at x=0.25L from AP;
- External pressure at the waterline amidships;
- Ship motions and
- Ship accelerations.

Prediction values

The average of long-term prediction values of various wave-induced ship responses was calculated using the two methods: 1D non-uniform ship heading probability distributions and the uniform ship heading probability distribution. The ratios between the two methods, the non-uniform and the uniform values, were calculated for the various response functions for 22 bulk carriers and 27 oil tankers for full load and normal ballast loading conditions. The results show that some ship responses increase while others decrease, depending on the load case considered. An increase between 4% and 4.5% was observed for vertical wave-bending moment amidships, vertical wave shear force, and surge and pitch accelerations in head sea situations. On the other hand, the external pressure at the waterline amidships, roll and sway, and heave and roll accelerations in beam sea conditions decrease about 4% to 4.5%. Finally, the horizontal wave-bending moment amidships and the torsional wave moment in oblique sea conditions decrease also, but by less than 2.5% to 3%. Therefore, IACS has decided to keep the values for the ship response parameters that show a decrease in their previous value determined using uniform ship heading probability distribution, since those values are conservative. However, for Head Sea and Following Sea load cases, IACS decided to introduce a coefficient of 1.05 called f_β in the CSR for amplifying the long-term values of the pressures, (external or internal, derived from accelerations), the vertical wave-bending moment and the shear force used for the hull girder assessment including hull girder ultimate strength. The coefficient of 1.05 is determined according to the results obtained with the new assumption made for the 1D non-uniform ship heading probability distributions.

The way forward for multi-mapping

With arguments both for and against multi-mapping being made, IACS has examined and offered its view on this issue to the IMO, by Carlo Aiachini, IACS Machinery Panel Chair

In the past, diesel engines were traditionally controlled by mechanical means, whereby a mechanical (centrifugal) governor converted the required speed value, as set by the throttle lever, into a fuel pump control lever/rack stroke, and by that into a quantity of fuel injected. Similarly, a factory machined camshaft imposed an injection advance (the rotation angle in advance of the piston reaching the top dead centre) that was fixed, or only slightly automatically adjusted, according to engine speed, again using a centrifugal mechanism — and the same camshaft was also used to control the opening and closing times of the intake and exhaust valves.

Multi-mapping should not be ruled out without discussion, but should be carefully evaluated by regulatory bodies in view of allowing its use while preventing abuses that could overcome environmental regulations

Both traditional diesel engines and camshafts normally work in a continuous and predictable way according to the principle that natural things and properties change gradually, rather than suddenly, as expressed also by the motto *"Natura non facit saltus"* — *"Nature does not make jumps"*, by Gottfried Leibniz. However, today's diesel engines are no longer controlled by mechanical means, but are instead operated by electronics, which are commonly used for injection control and for many other purposes including common rail systems and electronically controlled unit injectors. The big revolution introduced by the use of electronics as a replacement for mechanical means is that they can be programmed to result in discontinuous jumps in operation, making the above Leibnitz statement inapplicable. Additionally, electronics allow for a fast and easy change of the engine parameters, which was not possible when relying on mechanical means as this required installation of different components. Now, fast changing is as easy as flicking a switch or using a softkey.

A good example of this revolution can be seen in the mechanical replacement of a traditional camshaft with a different one, allowing more power to be obtained. Such an operation would entail significant financial and manpower effort, whereas using electronics the same effect could be achieved in a few seconds of programming and minimal additional costs.

Multi-mapping

In an electronic control system, the set of parameters used by the software is called the "map". The origin of this name derives from the way programmers used to visualise numbers using two-dimensional charts that were very similar to topographical maps. Multi-mapping is a control system with a number of maps inside — that is to say, many sets of parameters for controlling the same variables that may be selected on a case-by-case basis.

Selection of "map" parameters may be restricted to the manufacturer, but it is also possible to open this up to a ship operator or link it with other systems, an example being a selective catalytic reduction control system.

The low cost and ease of making changes to maps makes it attractive when there is a positive effect, such as better performance and lower fuel consumption., However, map-changing also influences emissions, opening up scenarios where a ship's engine might not comply with the mandatory requirements set out in international regulations. Under this perspective, multi-mapping may be seen as a defeat device or an irrational control strategy — that is, a device or strategy intended to infringe emissions regulations, including MARPOL Annex VI and the associated NOx Technical Code. Such cases are illegal and to be avoided.

However, there are good reasons for changing a map in an engine while it is in use, for example, to make available extra power for limited periods, adapt to different fuels (e.g. gas vs. diesel), adapt to different environmental regulations in force in different areas (Selective Catalytic Reduction (SCR) in operation vs. SCR

IACS is of the view that the regulations concerning marine engine emissions, namely MARPOL Annex VI and the NOx Technical Code, are not fully clear in allowing or preventing the use of multi-mapping

shut-down) or privilege reactivity over stability during manoeuvres.

IACS' view

IACS is of the view that the regulations concerning marine engine emissions, namely MARPOL Annex VI and the NOx Technical Code, are not fully clear in allowing or preventing the use of multi-mapping and IACS therefore deems it important to clarify the matter. In fact, it is IACS' opinion that multi-mapping should not be ruled out without discussion, but should be carefully evaluated by regulatory bodies in view of allowing its use while preventing abuses that could infringe environmental regulations.

In April 2016, the International Maritime Organization's Marine Environmental Protection Committee (MEPC), at its 69th meeting (MEPC 69), agreed to refer a proposal on multi-mapping submitted by Norway, to the Sub-Committee on Pollution Prevention and Response (PPR) for its consideration and advice. In January 2017, the PPR Sub-Committee invited MEPC 71 to approve a new output to be placed on the Sub-Committee agenda to clarify the regulatory aspects of multi-mapping. IACS contributed to the technical debate, submitting an information paper to MEPC 71. However, at the meeting in July 2017, no agreement was reached on the issue due to Member States' diverging views. The Committee instructed the PPR Sub-Committee to further consider the multi-mapping issue.

Serving ships in polar waters

IACS is working with IMO on the development of standards for lifesaving appliances and arrangements on polar operating ships to meet IMO's Polar Code, by Mikhail Musonov, IACS Safety Panel Chair

After intense work and negotiations within the International Maritime Organization (IMO), the International Code for Ships Operating in Polar Waters (the Polar Code) entered into force on January 1, 2017. The Code contains specific requirements for ship structure, installations and systems which provides for safe ship operation and the prevention of pollution by addressing risks that are present in polar waters but not adequately mitigated by other IMO documents (such as the SOLAS Convention, the MARPOL Convention and the STCW Convention).

A considerable amount of attention is paid to issues related to lifesaving appliances and arrangements including their service and maintenance in polar weather conditions. This effort should take into account the general requirements contained in the International Life-Saving Appliance Code (LSA Code) and specific requirements contained in Chapter 8 – *"Life-saving appliances and arrangements"* — of Part I-A, *"Safety Measures"*, of the Polar Code. IACS' view is that the development of additional performance and test standards for such equipment and systems on board ships operating in polar waters is absolutely necessary in support of the Polar Code. In particular, the following issues are highlighted:

Survival craft:

- The impact of ice on a survival craft's rigid hull may need to be considered on ships that are ice-strengthened in accordance with Chapter 3 of the Polar Code. In addition, impact and drop tests may have to be performed at lower temperatures;

- Lowering and use of survival craft (lifeboats) in cases where the surface of the sea around the ship is covered with ice, introduces new risks. For instance, lifeboat engines, which usually use water-cooling, may only properly operate at reduced time periods due to the ice-water mixture. Current test procedure (IMO resolution MSC.81(70)) may not address the risks during lowering safety if the boat is lowered onto ice due to differences in the nature of the impact and the fact that, at low temperatures, materials change their physical and mechanical properties;

- The LSA Code contains several regulations with reference to operating times. For example, the LSA Code requires a searchlight capable of continuous use for three hours, while the Polar Code requires continuous use of a searchlight to facilitate identification of ice (meaning, more-or-less-continuous use for five or more days). The current requirements on operating times require review when applied to survival craft to ensure that the maximum expected time requirements in the Polar Code are fulfilled;

- The LSA Code requirements for stored power (fuel or battery) need adjustment to take into account the maximum time for rescue. Additional power may also be needed for heating inside the lifeboat. It is not required that the lifeboat engine shall be able to run for a minimum of five days, but there shall be a procedure available on board describing how to portion out the available resources to ensure five days' availability.

- Temperature criteria for testing of cold engine starting, hydrostatic release units and inflatable appliances installed in ships operating in polar waters may be lower — taking into account the Polar Service Temperature (PST) —- than those required by the LSA Code; and

- Habitable environments of survival crafts should be considered, taking into account the maximum expected time for rescue with regard to enhanced ventilation, sufficient heating inside, the appropriate amount of fresh water and nutrition.

Personal lifesaving appliances:

- The LSA Code temperature test requirements for lifesaving appliances, including lifebuoys, lifejackets and thermal protective aids for survival craft, are not

lower than -30°C (in stowage) and -15°C (to remain operational), but additional test criteria, in line with PST, need to be developed.

Survival equipment:

- To support the requirement for a minimum of five days of survival upon escape and evacuation, the Polar Code mandates the carriage of group and personal survival equipment based on the number of people on board. The development of a performance standard for survival equipment for use in polar waters is also to be considered to ensure that the equipment gives the intended protection for the maximum expected time of rescue.

Protective clothing:

- The Polar Code states that adequate thermal clothing must be provided for all persons on board. A performance standard for protective clothing is to be developed. Existing performance criteria for anti-exposure suits and thermal protective aids at lower temperatures is to be reviewed.

IACS supported the further development of additional performance and test standards related to lifesaving appliances and arrangements on board ships operating in polar waters

Work within IMO

IACS took part in deliberations on the issues listed above at working groups and Plenary discussions at the recent IMO sessions of the Sub-Committee on Ship Systems and Equipment (SSE 4) and the Maritime Safety Committee (MSC 98). IACS supported the further development of additional performance and test standards related to lifesaving appliances and arrangements on board ships operating in polar waters during discussion on various papers submitted to SSE 4 Sub-committee.

Currently, IACS is actively participating in an IMO Correspondence Group, which is discussing, according to its Terms of Reference, the following issues:

1. Microclimate in totally enclosed lifeboats and possible criteria on which the new ventilation requirements should be based on for totally enclosed lifeboats (for example, humidity, temperature, threshold levels of O2 and of CO2, ventilation rates or air changes);

2. Evaluation of specific conditions, as required, to consider when approving lifesaving equipment (and fire protection equipment) that are to be used when in polar waters;

3. Preparation of a draft proposal for an interim solution (i.e. guidelines); and

4. Consideration of alternative ways to address the work, such as through the development of a separate, consolidated performance standard, development of add-ons to existing performance standards, or a resolution.

IACS' view is that the development of additional performance and test standards for such equipment and systems on board ships operating in polar waters is absolutely necessary in support of the Polar Code

Essential EEDI contributions

IACS has supported the development and implementation of the IMO's energy efficiency design index, by Bongchan KO, IACS Environmental Panel Chair

In July 2011, the International Maritime Organization (IMO) adopted mandatory measures to improve the energy efficiency of international shipping through resolution MEPC.203(62), adding a new Chapter 4, entitled *'Regulations on energy efficiency for ships'*, to MARPOL Annex VI. This includes a package of technical requirements, which applies to ships of 400 GT and above, known as the Energy Efficiency Design Index (EEDI). This sets the minimum energy efficiency level for transport work undertaken (such as gCO2/tonne-mile) for different ship types and sizes. Chapter 4 also requires every vessel of 400 GT and above, excluding mobile offshore units and ships not propelled by mechanical means, to have a ship-specific Ship Energy Efficiency Management Plan (SEEMP).

To incentivise the future design efficiency of new ships, the IMO regulation sets the allowable maximum EEDI value for specific ship types and size in a phased manner (Phase 0 to Phase 3), each progressively requiring less energy and thus less CO2 emissions to perform the same amount of transport-work. In accordance with regulation 21.6 of MARPOL Annex VI, at the beginning of Phase 1 (1 January, 2015 to 31 December, 2019) and at the midpoint of Phase 2 (1 January, 2020 to 31 December, 2024), the IMO will review the status of technological developments and, if proven necessary, will amend the time periods, the EEDI reference line parameters for relevant ship types and the reduction rates set out in regulation 21.

In support of the reviews of the implementation of the EEDI provisions as detailed in regulation 21.6 of MARPOL Annex VI, at the 65th session of the IMO Marine Environment Protection Committee (MEPC 65), IACS proposed the development of an EEDI database highlighting the challenges that would need to be addressed, and determining a dataset that would be used to populate it. IACS also explained how the database could be administered and managed, taking into account concerns about the protection of intellectual property rights and commercially sensitive information. Consequently, the IMO agreed to the minimum data requirement needed to support the review and invited submissions of this data to the IMO Secretariat, which IACS Members have done.

The IMO Secretariat has released progressive updates on the development of a database containing anonymised EEDI efficiency scores achieved by individual ships, together with reported information on any new/innovative technologies utilised. In total, IACS Members provided the necessary information for the 2,443 ships contained in the EEDI database prior to MEPC 71. In addition to the submission of this data, IACS has consistently supported the IMO throughout the EEDI review process as a key technical advisor, via associated IMO Working and Correspondence Groups (CGs) — for example through the CG for EEDI review beyond Phase 2, established at MEPC 71.

Having recognized that some ship types will have difficulty with compliance with Phase 3 requirements, IACS has advised the IMO CG of the following concerns for further consideration, with a view to finding a possible solution such as a correction factor or different reduction rate:

- Capesize bulk carriers and larger bulk carriers (including 400,000 dwt VLOCs/Suezmax tankers and larger oil tankers) will all struggle to meet Phase 3 requirements, even where additional energy saving technologies/devices have been applied and the design speed of the ship has been reduced;

- Newly constructed VLOC vessels (around the 400,000 dwt range) significantly exceed the maximum dwt value used by the IMO for the development of the bulk carrier EEDI reference lines. The largest dwt-sized bulk carrier included in the IMO regression curve has been confirmed at 327,000 dwt; and

- The MEPC 71 EEDI database (as at August 2017) listed a single 301,000 dwt bulk carrier that only complies with the Phase 1 regulatory limit. No larger-capacity bulk carriers have been verified for EEDI or reported to the IMO yet. Comparison of a VLOC's (400,000 dwt range) attained EEDI value against an extrapolation of the current bulk carrier EEDI reference lines requires further consideration and analysis.

By carrying out these activities, IACS will help to improve data collection, analysis mechanisms and tools, which will then contribute to regulatory development work on specific issues, with due consideration to intellectual property rights, confidentiality and legal issues.

The next era in surveying

New technology is making its presence felt on survey regimes, by Cui Yuwei, IACS Survey Panel Chair

Remote inspection to internal structure through drone usage

Nowadays, new technologies such as advanced non-destructive testing (NDT) techniques — i.e., phased array ultrasonic testing, time-of-flight diffraction, automated ultrasonic testing —- remote inspection techniques (RIT) such as real-time sensing devices carried by drone and remotely operated vehicles, divers and other techniques including remote monitoring and diagnosis (RMD) and condition-based maintenance (CBM) are being increasingly applied by the maritime industry. IACS Members have recognized the benefits of using new technologies in their day-to-day activities of survey and inspection, enjoying greater efficiency, higher flexibility and increased reliability.

IACS has decided to update its survey requirements to facilitate use of advanced technology in order to make surveys safer and more economic, to decrease the fault rate and to save on the cost of maintenance. Relevant IACS Resolutions and Recommendations are being revisited and are intended to be developed to meet the demands of the latest technological advancements, focusing on:

- New Non-Destructive Testing (NDT) technologies;
- Remote Inspection Techniques (RIT); and
- Remote Monitoring/Diagnosis (RMD) for Condition Based Maintenance (CBM).

Relevant IACS Unified Requirements (URs) and Recommendations (Recs) have been reviewed for possible revisions, taking into account the technical development and the details of advanced NDT, RIT and other techniques. New IACS Recs are also under development for relevant new techniques.

Regarding the application of RIT technologies, IACS is considering referring to the use of RIT in its URs — including unmanned robot-arms, Remotely Operated underwater Vehicles (ROVs), or unmanned aerial vehicles or drones — as an alternative to close-up surveying for ships in operation. IACS has also considered developing technical requirements for the approval of firms engaged in undertaking surveys using RIT as an alternative means of in-water surveying, or close-up surveying of the structure of ships and mobile offshore units.

When application of the new technologies by the industry has matured and adequate experience has been gained with the new/revised IACS Resolutions, possible amendments to relevant International Maritime Organization instruments, such as the International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers (ESP Code), could be proposed.

Regarding RMD for CBM, some steps have already been taken towards the introduction of a planned maintenance system and CBM system by some IACS societies. The application of advanced technology is very important to IACS, especially if it is expected to be used in order to assess a ship's maintenance and condition in order to confirm the validity of its classification. With regards to this, IACS is set to develop recommendations which deal with this technology, aiming to allow their use during the survey processes as an additional source of information or even as a means of replacing several verifications that are performed by dismantling components (sometimes without any documented reason). This new frontier offered by the technology might surpass the old concepts on which the current survey system is based – that is, each component of the ship needing to be examined and assessed every 60 months (which is traditionally assumed as a reliable timeframe between one verification and the next).

To promote the application of new technologies in the survey regime, IACS will continue to work closely with the IMO, industry and flag State Administrations to update the existing survey requirements and to develop new instruments to cater for these technological advancements.

Integrating non-destructive testing methods

A dedicated IACS Expert Group is focused on conventional and advanced testing techniques, by Laurent Courregelongue, IACS Expert Group Materials and Welding Chair

Non-destructive testing (NDT) in shipbuilding plays a major role in ensuring that a vessel's hull and machinery systems are built to the required standards. NDT is a key step in all quality control plans established for machinery parts made from plates, pipes, castings or forgings, as well as all constructions with structural assemblies made using welding processes. Several non-destructive examination techniques are used. The techniques known as conventional NDT include surface inspection techniques (i.e. visual examination, magnetic particle examination or liquid penetrant examination) and volumetric inspection techniques (i.e. radiography or manual ultrasonic examination).

IACS has primarily focused its work on the collection and review of the available recognized standards and construction quality standards, which will provide a basis for the development of the requirements

The construction of large ships like container carriers, tankers, or cruise ships requires kilometres of butt and fillet weld joints for the fabrication of hull panels and sub-assemblies, the erection of blocks and, finally, their joining to form the hull. With visual examination the most widely used technique, it is worth mentioning that thousands of NDT checkpoints using other techniques in selected areas are necessary to verify the soundness of welded joints, which may be critical in the context of fatigue loading during service life.

Actions have been taken by IACS to review and update the current technical documents and recommendations in relation to the application of NDT. The IACS Expert Group (EG) on Materials and Welding (EG M&W) has been working on the development of requirements for the application of NDT technologies using IACS Recommendation 20, "Non-destructive testing of ship hull steel welds", as a basis to develop a Unified Requirement (UR). Other initiatives have been taken by the EG to work on the development of requirements for NDT Operators and NDT Suppliers who are essential in ensuring that NDT is undertaken by skilled professionals according to established procedures. A number of challenges have been met in the technical harmonisation work necessary for the development of URs. The EG has made significant progress on this task, which is close to completion.

In order to reflect current practices and to support innovation and new technologies, IACS evaluates methods known as advanced non-destructive testing, like phased array ultrasonic testing, time of flight diffraction, automated ultrasonic testing and digital radiography. Advanced NDT methods are being increasingly-applied by the industry and IACS Members in their surveys, and IACS has identified a growing need for URs. The objective is to develop requirements for the use of these methods and to identify any IACS technical documents that need to be revised. IACS has primarily focused its work on the collection and review of the available recognized standards and construction quality standards, which will provide a basis for the development of the requirements.

An integrated framework for conventional and advanced non-destructive testing methods has been set up through the above work, and other new state-of-the-art methods will be introduced into the framework gradually to meet the needs of industry.

IACS' work on URs for NDT and the associated technical documents represents a significant contribution to the building of better and safer ships.

Autonomous ships: removing regulatory barriers

IACS has initiated a review of its Resolutions currently in force to address possible requirements that may hinder technical development of autonomous ships,
by Sverre J Dahl, IACS General Policy Group Chair

The prospect of autonomous, self-navigating and possibly unmanned ships represents a radically new development in shipping. These smart ships may rely on artificial intelligence, advanced sensors, data fusion and advanced algorithms to provide safe and cost-efficient shipping services, possibly with little or no human intervention.

The International Maritime Organization (IMO) has recognized that the use of Maritime Autonomous Surface Ships (MASS) creates a need for a regulatory framework for such vessels, including their interaction and co-existence with conventionally manned ships. A regulatory scoping exercise has been initiated, intended to establish the extent of the need to amend the current regulatory framework to enable safe, secure and environmentally-friendly operations of MASS within the existing IMO instruments.

Credit: Kongsberg

A computer generated image of the *Yara Birkeland*, the world's first crewless, fully electric and autonomous container ship

IACS, in general support of the IMO initiative, has initiated a similar review of IACS Resolutions currently in force to address possible requirements that may hinder technical development of autonomous ships. This covers a review of all IACS Unified Requirements (including Common Structural Rules), Unified Interpretations and Procedural Requirements.

Based on an initial screening, the IACS initiative has tentatively identified a significant number of IACS Resolutions which contain requirements that only a human presence on board a vessel can fulfil. Obstacles for autonomy are mainly identified in IACS Resolutions related to machinery and electrical systems, safety systems, hull structures and survey procedures.

IACS has initially chosen to focus on hindrances for completely autonomous ships, assuming a self-navigating ship without crew or remote controls. Following the initial screening exercise, IACS intends to commence a pilot project aimed at removing all barriers for complete autonomy in a few selected Resolutions. The intention is that the focus on complete autonomy may reveal all possible barriers and facilitate a discussion on priority and relevance of requirements for lower levels of autonomy. To limit the scope, IACS has, in the first instance, focused on hindrances for autonomy in Resolutions containing requirements for conventional cargo ships only. Moreover, when developing new IACS Resolutions in the future, IACS will aim at avoiding requirements that may hinder technical development of autonomous ships.

IACS is committed to working with IMO initiatives and keeping pace with technical developments, while, as always, maintaining its dedication to providing support for safe ships and clean oceans.

04 Quality & Safety

Half a century of excellence

IACS continues to deliver on its original objective of promoting high standards of safety and pollution prevention, by Peter Williams, IACS Quality Secretary

IACS will celebrate its 50th birthday in 2018, having been formed in 1968 to promote high standards of safety and pollution prevention in the maritime industry. The organisation has never wavered from that objective, and with the inception of its Quality System Certification Scheme (QSCS) in 1991, its ability to work to high standards and drive standards of survey and certification upwards took a step change. Since then, IACS Members have been unstinting in their commitment and dedication to further improving QSCS, which has now evolved into the 'gold standard' for classification societies. More than 90% of the world's cargo-carrying tonnage is classed by IACS' 12 Members, who are authorised to deliver statutory and certification services on behalf of the majority of the 172 International Maritime Organization (IMO) Member governments.

"By agreeing to a series of concrete actions that build on these values, IACS once again reaffirms its centrality to the maritime industry and the added value it provides"

Quality within and at all levels of the shipping industry is critically important. Over 80% of internationally traded goods are transported by sea. The 2017 World Bank report on the Blue Economy states that if our oceans are not healthy and resilient, they cannot support economic growth. If societal demands for the health of the oceans and the safety of our seafarers are to be safeguarded, it is inevitable that the necessary, contemporary regulatory framework that shipping operates in will be complex and

continuously evolving. In the Winter 2017 edition of IMO News, the IMO Secretary-General Kitack Lim commented that "the rules and regulations adopted at [the] IMO can be difficult or challenging for the industry to comply with".

The chain of responsibility in ensuring that ships comply with applicable national and international requirements lies primarily with the shipowner, followed by the flag State Administration. To a greater or lesser extent, the shipowner and flag State Administration rely on classification societies to ensure a ship complies with applicable regulations in the most efficient and cost-effective manner. Without well-structured, comprehensive and dynamic systems, ensuring that ships comply with all the latest applicable legislation would at best be extraordinarily difficult and at worst impossible.

+90%

More than 90% of the world's cargo-carrying tonnage is classed by IACS' 12 Members

IACS' QSCS, which is constantly reviewed and updated by the organisation, provides an all-embracing and structured framework that all IACS Members must comply with. The scope of QSCS remains relevant for the entire life of a vessel, from its design and plan approval of classification, statutory matters and its surveys (during both construction and service), to its responsible disposal and recycling at the end of its time on the seas. Experience gained by IACS Members' 8,000-plus surveyors, combined with feedback from shipowners, managers and industry partners, serves as invaluable data and information that is used to regularly update and improve classification rules and requirements in a virtuous circle of self-improvement. This enables IACS to deliver – in a practical and tangible way – on its original objective of promoting high standards of safety and pollution prevention in the maritime industry.

Without well-structured, comprehensive and dynamic systems, ensuring that ships comply with all the latest applicable legislation would at best be extraordinarily difficult and at worst impossible

At the December 2017 IACS Council meeting in London, the organisation reaffirmed the vows it made to the industry 50 years ago. Following that meeting, IACS Chair Knut Ørbeck-Nilssen said in a press release: "IACS Members have once again demonstrated a clear commitment to the key values that drive [the organisation's] activities: Quality, Transparency, Technical Knowledge and Leadership. By agreeing to a series of concrete actions that build on these values, IACS once again reaffirms its centrality to the maritime industry and the added value it provides."

The industry can be confident that IACS' resolve and commitment to quality are undiminished and that it has set a course for further improvement of its gold standard Quality System Certification Scheme for the next half-century.

Safety of converted VLOCs

IACS has evaluated the need for work on converted very large ore carriers,
by Sverre J Dahl, IACS General Policy Group Chair

In accordance with IACS' commitment to safety and transparency, the organisation has encouraged internal review and information-sharing among Members with similar vessels in class

The tragic loss of a converted very large ore carrier (VLOC) with 22 hands at the end of March 2017 drew attention to the safety of such ships. Immediately following the accident, individual IACS Members took initiatives to reassure themselves of the structural integrity and fitness for purpose of similar converted vessels classed to their Society.

In accordance with IACS' commitment to safety and transparency, the organisation has encouraged internal review and information-sharing among Members with similar vessels in class.

With this background in mind, IACS Members have reported on investigations, and extraordinary inspections and surveys, of converted VLOCs in class, as well as the outcomes of these activities. Furthermore, information, such as fleet statistics, service experience and technical observations, was collected from IACS Members with VLOCs in class in order to develop a solid, technical, non-commercial and scientific justification for potentially including purpose built or converted vessels in any IACS work on VLOCs.

Based on Members' experiences with converted or purpose-built-VLOCs, it was concluded that there is no need to extend any scope of work to purpose-built carriers.

For the converted VLOCs, the detailed reports provided by those Members with converted VLOCs in their class showed that no safety-related critical structural damages have been identified and there is no clear justification for any IACS work on these vessels. However, IACS will carefully review the report of the accident investigation into the loss of the converted VLOC currently undertaken by the authorities when it becomes available and the organisation will then re-assess whether there are elements that warrant IACS initiatives.

05 Competence Building

Enhancing competence

IACS Members' transition to the ISO 9001:2015 standard offers further opportunities to deliver higher levels of customer and stakeholder satisfaction, by Steve Hryshchyshyn, IACS QC Chair

IACS Members are at various stages of transitioning from the International Organization for Standardization (ISO) 9001:2008 standard to the ISO 9001:2015 standard and look forward to attaining the benefits that the transition will bring. ISO 9001 is the international standard that specifies requirements for a quality management system (QMS). Importantly, IACS' Quality System Certification Scheme (QSCS) makes use of the standard as a foundational document, as certification to the standard demonstrates the ability to consistently provide services and products that meet customer and regulatory requirements. The 10th issue of IACS' Quality Management System Requirements (QMSR) has been revised and is now compatible with the ISO 9001:2015 standard. All IACS Members must have completed their transition by the time the transition period ends in September 2018.

The changes that have been implemented in the standard are designed to improve organisational QMSs by addressing the growing need for risk-based thinking. Risk-based thinking means that when an organisation decides to change something, there are choices, consequences, opportunities and — of course — risks to consider. It encompasses the varying acceptable degrees in which organisations choose to manage risk. IACS Members have long been making use of risk-based thinking, which is evident in their Rules —- so the transition may come more easily to classification societies compared with other organisations. Since a QMS touches virtually every part of a classification society, applying risk-based thinking allows classification societies to assess the value of their decision-making processes.

"Changes introduced in the QMSR revision sought to ensure that the requirements continue to adapt to the changing environments in which IACS Members operate"

Changes introduced in the QMSR revision sought to ensure that the requirements continue to adapt to the changing environments in which IACS Members operate. Some of the key updates include restructuring of the requirements, an emphasis on risk-based thinking to enhance the application of the process approach, improved applicability for services and increased leadership requirements. In making the changes, the IACS Quality Committee was mindful of the requirements contained in the International Maritime Organization's Code for Recognized Organizations and ensured that the latest QMSR retained its compatibility with this Code.

Notwithstanding the important major changes to the requirements, a clause on organisational knowledge was introduced, which complements the revised clause on competence and is especially relevant to the work of classification societies. The new clause requires the organisation to determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services. While in actual application these clauses apply to the individual classification society, stakeholders will see the continued output from classification societies, not only in the form of individual Members' rules but also in the many IACS Resolutions that the Association is well known for putting in the public domain in order to encourage safer and cleaner shipping. Together, these clauses will form inputs from the classification society's QMS, as they advance new service offerings, which may include cyber systems or automated ships, or enhance existing work on extreme wave loads or new technologies associated with survey regimes.

IACS Members welcome these changes as they provide further opportunities for continual improvement of QMSs with the intention of delivering higher levels of customer satisfaction. The changes are a good fit with the IACS Chair's and Council's commitment to the key values that drive the organisation's activities: quality, transparency, technical knowledge, and leadership.

06 International and Inter-Industry Relations

Expanding a symbiotic relationship

The evolving ties between IACS and the IMO are deepening and becoming more important to both bodies, by Paul Sadler, IACS Accredited Representative to IMO

The symbiotic relationship between the International Association of Classification Societies (IACS) and the International Maritime Organization (IMO) has been in place for what is now approaching 50 years. Not only is it well-established, it is also continuously evolving, deepening and becoming more important to both IACS and the IMO. The purposes and aims noted in the IACS Charter state that IACS: "Assists international regulatory bodies and standard organisations to develop, implement and interpret statutory regulations and industry standards in ship design, construction and maintenance, with a view to improving safety at sea and the prevention of marine pollution."

The primary international regulatory body is the IMO. Since 1969, when first granted IACS consultative status as a non-governmental organisation (NGO), IACS has maintained a focus on delivering its role as the IMO's principal technical advisor.

"By virtue of the technical expertise and experience of its Members, IACS is unique in the support it offers the IMO"

IACS has a dedicated Accredited Representative supported by representatives from IACS Members, who are world-leading technical experts in matters considered by the IMO. IACS submits papers to, and actively participates in, all the meetings of IMO's technical bodies. These experts not only contribute technical input to the development of new, and amendments to, existing IMO requirements; they also provide an unparalleled degree of insight and feedback on the implementation of the IMO-agreed regulatory framework. This is because IACS Members are not only classification societies; they also act as Recognized Organizations (ROs). In this latter capacity, they act on behalf of flag State Administrations to verify compliance with IMO's ('statutory') regulations and requirements on ships that fly the flag of those States.

The contribution of IACS, as an NGO, to the work of the IMO is unparalleled. Every two years, the IMO determines whether the continuance of the consultative status of the NGOs "is necessary and desirable". In March 2017, as part of this biennial review of the NGOs, the IMO Secretariat collated information on their attendance at IMO meetings and the papers they had submitted to those meetings. While it had attended as many meetings as any other NGO, IACS had submitted 123 papers, nearly three times as many as the next most active NGO.

In further recognition that they share common goals and objectives regarding safe, secure and environmentally sound shipping, the IMO and IACS have in place a Memorandum of Agreement, which is a living document. Currently, work is being undertaken to deliver tangible results in three focus areas:

- Cyber safety
- The ongoing maintenance of the verification process of the IACS Members' Rules with IMO's Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers; and
- Improvements to the relevant modules of the IMO's Global Integrated Shipping Information System (GISIS) that will facilitate the analysis of accident data to be used in the development of risk-based input to the IMO's decision-making processes.

Progress in these areas will deliver a further strengthening of the bond between IACS Members, in their capacities as ROs, and the IMO Member States on whose behalf they act — for the benefit of the membership of both the IMO and IACS.

By virtue of the technical expertise and experience that its Members provide at all stages of a ship's life, IACS is therefore unique in the support it offers the IMO. For many years, the voice of IACS at IMO has been its Accredited Representative,

The Commandant of the United States Coast Guard (centre) presents Paul Sadler (right) with the Distinguished Public Service Award. On the left is the current US Ambassador to the UK, Woody Johnson

Paul Sadler, described by the IACS Chair as "one whose unfailing professionalism, courtesy and skill in engaging with both the IMO Member States and the Secretariat has been fundamental to IACS' relationship with the IMO". During the 30th session of the IMO Assembly (A30) in December 2017, IACS was deeply honoured that Mr Sadler's contribution to the IMO was recognized by the United States government, when the Commandant of the United States Coast Guard presented him with the Distinguished Public Service Award. In the citation, it was stated that he is "a tireless supporter of the IMO, diligently advocating that shipping, as an international business, needs to be regulated on a global basis by the IMO." In response to receiving this award, Mr Sadler commented: "It is an honour to receive this award that also recognises the world-class technical expertise that IACS provides to the IMO."

2017 – another successful year

At the 98th session of the IMO's Maritime Safety Committee in June 2017 (MSC 98), it was confirmed that the limited number of identified non-conformities from the initial Goal Based Standards (GBS) verification audit process of IACS Members Rules had been rectified and that the whole process of the initial GBS verification audit had been successfully completed. In practice, this means that only the Rules of the IACS Members can, at this time, be used in the design and construction of new oil tankers and bulk carriers of 150m in length and above.

In his closing remarks at MSC 98, Kitack Lim, IMO Secretary-General, commented: "I would like to express my sincere appreciation to all Member States and auditors, and all IACS classification societies involved, for the high level of cooperation for bringing the initial verification to a successful conclusion." This outcome was the result of a lengthy and intensive period of work for IACS and its Members. However, the GBS-related work has not been completed with this decision of MSC 98. As agreed by the MSC, IACS has undertaken further work to address the limited number of minor findings that were identified by the IMO audit teams that had reviewed the Rules of the IACS Members. This work has continued to receive priority within IACS, and the Association will provide an update at the MSC 99 meeting in May 2018. Additionally, in recognition of the evolutionary nature of classification society Rules and to take account of technological advances, research and development, and feedback from ships in service, IACS and its Members will be submitting, for verification by the IMO, the updates to their Rules that have been adopted since the Rules were initially submitted for GBS verification in December 2013.

Oversight of Recognized Organizations

IACS has pioneered a system that flag State Administrations could use in their oversight of IACS Members acting as ROs, by Peter Williams, IACS Quality Secretary

For the past two decades, shipowners and managers have been audited, either by or under the responsibility of their vessels' flag State Administrations, for compliance with the International Safety Management (ISM) Code to verify that the shipping company's Safety Management System enables company personnel to effectively implement their company's safety and environmental protection policy.

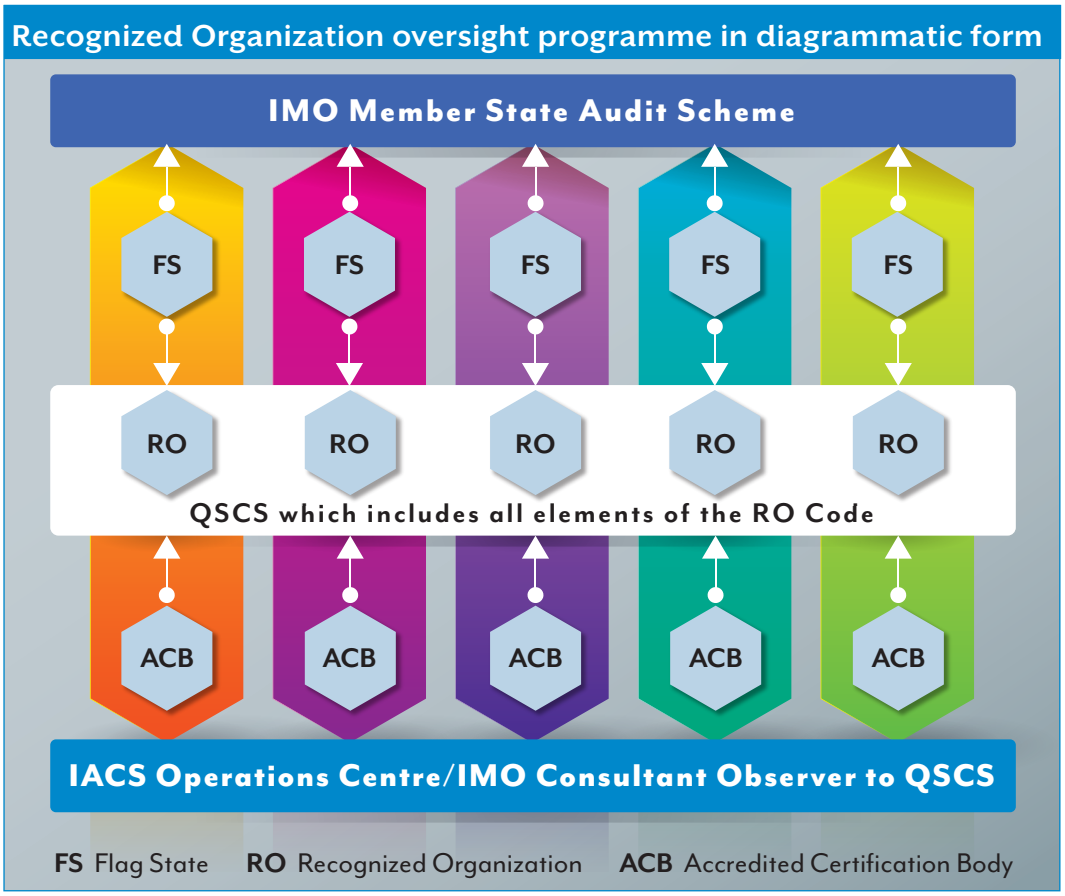
"Without an agreed, rational and structured international framework, the current large number of Member governments, in fulfilling their obligations, is likely to duplicate very significantly the practical conduct of their oversight responsibilities in respect of IACS Members"

The facility for a flag State Administration to entrust the necessary inspections and surveys to organisations recognized by it has long been a feature of SOLAS. Where the flag State Administration entrusts or authorises a classification society to conduct statutory and certification services on its behalf, the flag State Administration remains responsible for the completeness and efficiency of inspections and surveys and shall ensure the necessary arrangements are in place to satisfy this obligation. In short, the flag State Administration can delegate authority but not responsibility.

In January 2015, the International Maritime Organization's (IMO) Code for Recognized Organizations (RO Code) entered into force. The principles in this Code embrace and build upon the International Association of Classification Societies' (IACS) Quality System Certification Scheme (QSCS) and other management standards such as the International Organization for Standardization's 9001 standard (ISO 9001) and ISO 17020. The purpose of the RO Code is to serve as the international standard containing minimum criteria against which classification societies are assessed in respect of their recognition and authorisation by flag State Administrations. IACS' QMSR 10th Issue incorporates all elements of the RO Code. Consequently, all IACS Members, being audited for and in compliance with IACS QSCS, will also comply with the requirements of the RO Code.

In 2016, the IMO Instruments Implementation Code (III Code) entered into force. Both the RO and III Codes specify that each flag State Administration should establish or participate in an oversight programme of its Recognized Organization(s) (ROs) to ensure that its international obligations are fully met. Importantly, SOLAS Chapter XIII, which entered into force in January 2016, requires that every Contracting Government shall be subject to periodic audits by the IMO in accordance with the audit standard (III Code) to verify compliance with and implementation of SOLAS, which includes the establishment of, or participation in, an oversight programme of its ROs.

The establishment of these three management standards (ISM Code, RO Code and III Code) is significant as, combined, it now means that the shipowner, the flag State Administration and the RO must demonstrate compliance with the respective international standard. However, the vast majority of the 172 IMO Member governments authorise the 12 IACS Members to deliver statutory and certification services on their behalf. Therefore, without an agreed, rational and structured international-framework, it would be logical to anticipate that the current large number of Member governments, in fulfilling their obligations, is likely to duplicate very significantly the practical conduct of their oversight responsibilities in respect of IACS Members. Such duplication of effort is inefficient in both time and cost for flag State Administrations as well as for the ROs accommodating and facilitating these oversight activities.



IACS therefore sought to raise awareness at the fourth session of the IMO's Sub-Committee on Implementation of IMO Instruments (III 4) through the submission of a paper describing a proposed RO Oversight Program (ROOP) based on IACS' QSCS and which flag State Administrations can opt to use when conducting oversight of their ROs that are IACS Members. This is offered without prejudice to the rights of flag State Administrations to conduct oversight of their ROs as they consider appropriate and necessary.

The objective and intention of ROOP, shown here in diagrammatic form, is to establish a clear, agreed and common international framework that addresses the concerns described above by rationalising the oversight process in a manner beneficial to flag State Administrations and IACS Members. At the same time, it satisfies the requirements of the III Code. In its simplest form, therefore, the intention is two-fold:

(a) to rationalise the use of resources by reducing the need for numerous flag State Administrations to frequently attend the offices of the ROs they authorise by placing reliance on the IACS QSCS and the audits that Accredited Certification Bodies undertake of IACS Members, observed by the IACS Operations Centre; and

(b) to reduce the burden on IACS Members that, while recognising the value of the attendance of flag State Administrations at their IACS Members' offices, must utilise resources to facilitate and accommodate such attendance that could otherwise be used in other continuous improvement tasks of the RO.

IACS has begun a positive and constructive dialogue with both the IMO and the European Commission to discuss ROOP with a view to agreeing on an oversight programme that will meet the needs of all interested parties in a logical, efficient and proportionate manner.

Boosting growth and engagement

IACS has in place a robust programme of industry meetings that facilitate technical- and policy-level dialogue across the maritime sectors, by Robert Ashdown

IACS held a private roundtable in 2017, which brought together senior industry leaders from across the maritime sectors

International Association of Classification Societies (IACS) continues to emphasise its commitment to regular dialogue with its industry association partners — both to better understand their positions and concerns and to elucidate clearly the work and rationale behind the many IACS activities that may impact their sectors. In line with IACS' commitment to its core value of transparency, IACS also now proactively distributes, to industry and interested stakeholders, details of newly published or revised IACS Resolutions.

The last year has seen the organisation further expand its outreach programme with industry. Having, in 2016, re-established the IACS/industry technical-level meetings, in 2017, IACS inaugurated the first of what will be annual technical meetings with the International Union of Marine Insurance (IUMI). Classification and insurance have a long and common history and, today, the insurance industry looks to IACS to provide analysis of the technical risks they are asked to insure. As such, a closer working relationship between the two organisations is mutually beneficial. This deeper, technical engagement with the insurance industry is also evident in an agreement to provide specific briefings to the Lloyd's of London Joint Hull Committee on current technical matters of interest.

Following a series of ad-hoc meetings with industry to discuss the Rule Change Proposals and Urgent Rule Changes Proposals to the IACS Common Structural Rules (CSR) that emanated from the International Maritime Organization's (IMO) Goal Based Standards' requirements (and that were hence subject to the IMO's timetabling), there has now been a transition to a regularised dialogue with industry. Facilitating this dialogue is in recognition, by IACS, of the value of having industry comment at an early stage on the draft rule changes to the CSR proposed for the upcoming year, so that their views can be given due consideration before launching the rule changes that will be proposed for the forthcoming year. Therefore, in 2017, IACS reactivated its External Advisory Group (EAG), whose purpose is to provide a forum to support the maintenance process of CSR — with ongoing advice from experts in modern tanker and bulk carrier structural design, construction and operation. These experts, selected based on their experience and background in design, construction and/or operation of tankers and/or bulk carriers, make significant contributions to the future maintenance of these rules. Members of the EAG act in their individual capacity, relying on their own experience and expertise.

IACS also held a private roundtable in 2017, which brought together senior industry leaders from across the maritime sectors to seek their input on the future of ship classification and the future role, purpose and strategic direction of the organisation in the maritime industry. Insights offered were extremely valuable and IACS will continue to hold roundtables in different geographic areas.

Further to these new areas of activity, IACS continues to deepen its dialogue with industry through its existing programme of engagement. This includes the annual IACS/Industry Technical Meeting in May/June, the annual IACS Council/Industry meeting in December (for policy matters), the IACS Council Chair's series of meetings with industry association leaders in early September and visits to various national shipowning and shipbuilding organisations. IACS also continues to be a full and active member of Tripartite and, in 2017, engaged heavily in the working group set up to ensure that Tripartite continues to add value and remains relevant into the future.

Working together for enhanced cyber security

IACS has prioritised cyber security concerns through a joint working group to determine how best to manage cyber risk, by George Reilly, IACS Cyber Systems Panel Chair

The industry Joint Working Group on Cyber Systems (JWG/CS) is chaired by IACS. The Group's primary purpose is to provide a forum for active communication among industry groups involved in the production and operation of maritime cyber-enabled systems, with the aim of developing a common understanding and a sense of how the technology is developing. The intelligence pooled is also intended to assist the IACS Cyber Systems Panel by contributing to direction and strategy as IACS considers how best to serve the industry with regard to upcoming changes in digital technologies. Cyber Systems' potential applications are vast and their implications profound. However, given the widespread industry awareness and concerns regarding cyber security, it was clear that this topic needed to be made a priority.

Plotting a course for addressing risk

As the Cyber Panel set about developing guidance text of the various subjects that make up the required controls for cyber security, the JWG/CS expertise helped identify the most appropriate risk model to use as the basis for IACS' approach to managing cyber risk.

Ships do not all have the same levels of cyber-related risk, so the JWG/CS discussed this over the course of several face-to-face and online meetings during 2017. The JWG/CS worked under the direction of a facilitator, Professor Paul Dorey who has extensive cyber security experience and has already worked in other industries to reconcile their operational technology and information technology differences.

Various options, including a review of the available cyber attack data and an identification of the threat actors, were discussed. Ultimately, it was considered that the most usable risk approach should take into account:

- a vessel's vulnerabilities or 'attack surface', as represented by the extent of connectivity and digitisation of a vessel's systems; and
- severity impact on at-risk systems if an event occurs.

Attack surface drivers could consider the number of network nodes, the number of logon points, the amount of networks and the criticality of a digitised system. Severity impact drivers could include environmental factors, safety factors, commercial factors, factors relating to the size of a vessel and nature of the cargo[1].

The commonalities between the International Maritime Organization Guideline (MSC-FAL.1/Circ.3) headings of 'Identify, Protect, Detect, Respond and Recover', and other industry standards such as the National Institute of Standards and Technology (NIST) framework, suggest convergence of understanding and assist in a common application of requirements.

Co-ordinating implementation activities

The discussions in the JWG/CS frequently highlighted risks associated with gaps in any cyber security approach in the event that any of the stakeholders are not fully engaged, and that a full information security management system would require action and ownership (such as training and integration with company processes) beyond the scope of IACS' work. It was agreed that any such factors identified should be captured and that any assumptions made should be retained for use in other relevant maritime forums.

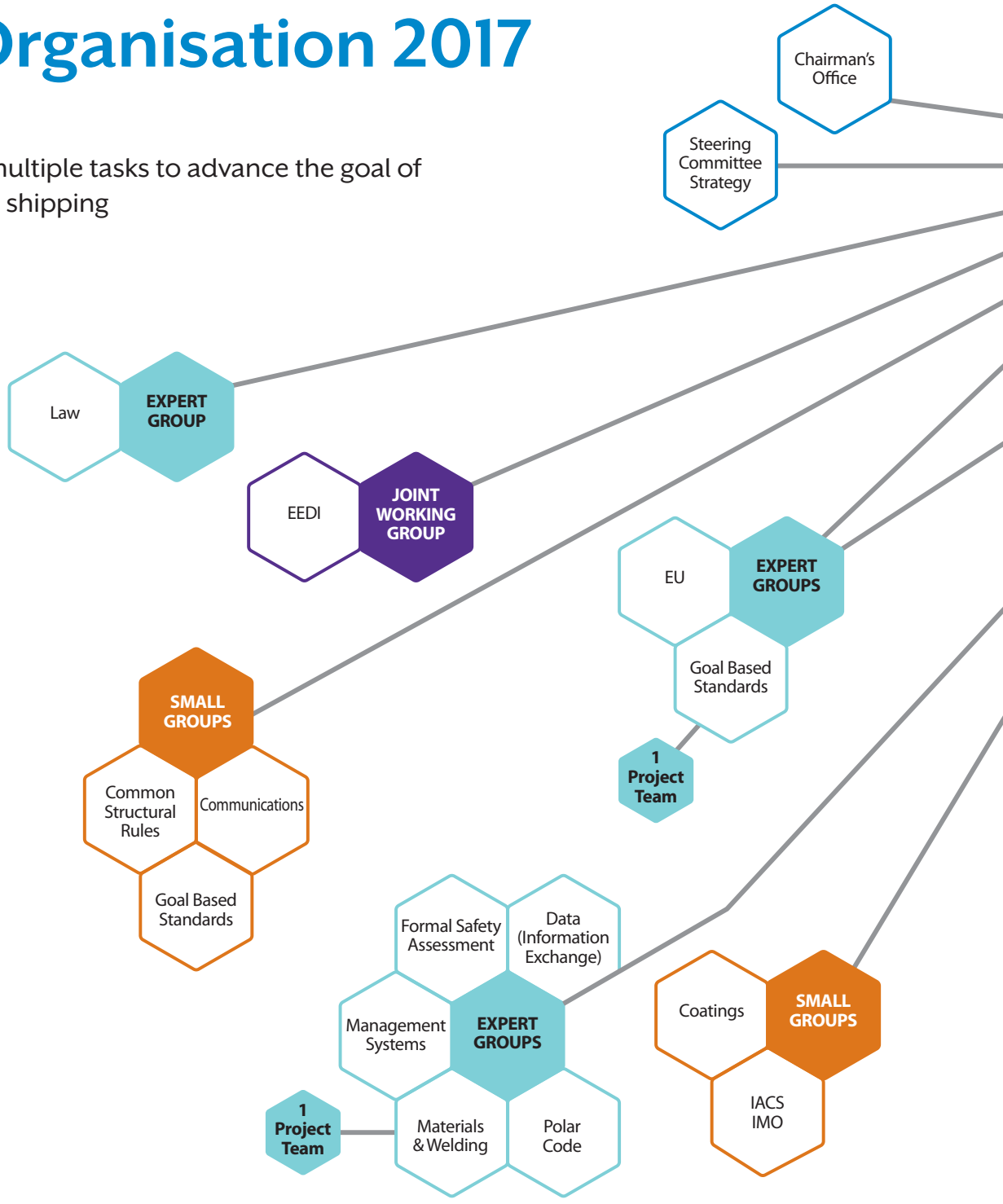
The JWG/CS has been well supported by industry, with a great deal of valuable technical advice contributed. We are grateful for industry's ongoing co-operation in helping IACS to deliver practical and effective solutions that will be vital during the implementation of the cyber security requirements. They will also be central to the future work of the Cyber Systems Panel as digital technologies have an ever-greater impact on the maritime industry.

[1] Commercial factors are not necessarily a direct consideration for IACS Members, but as most operators would only have one cyber policy to cover the whole of a vessel, including commercial interests, it may be most practical to recognise this and encourage a holistic approach to all cyber risks.

07 IACS Organisation 2017

IACS Organisation 2017

IACS deals with multiple tasks to advance the goal of safer and cleaner shipping



Our working panels explained

Hull Panel – 9 Project Teams:

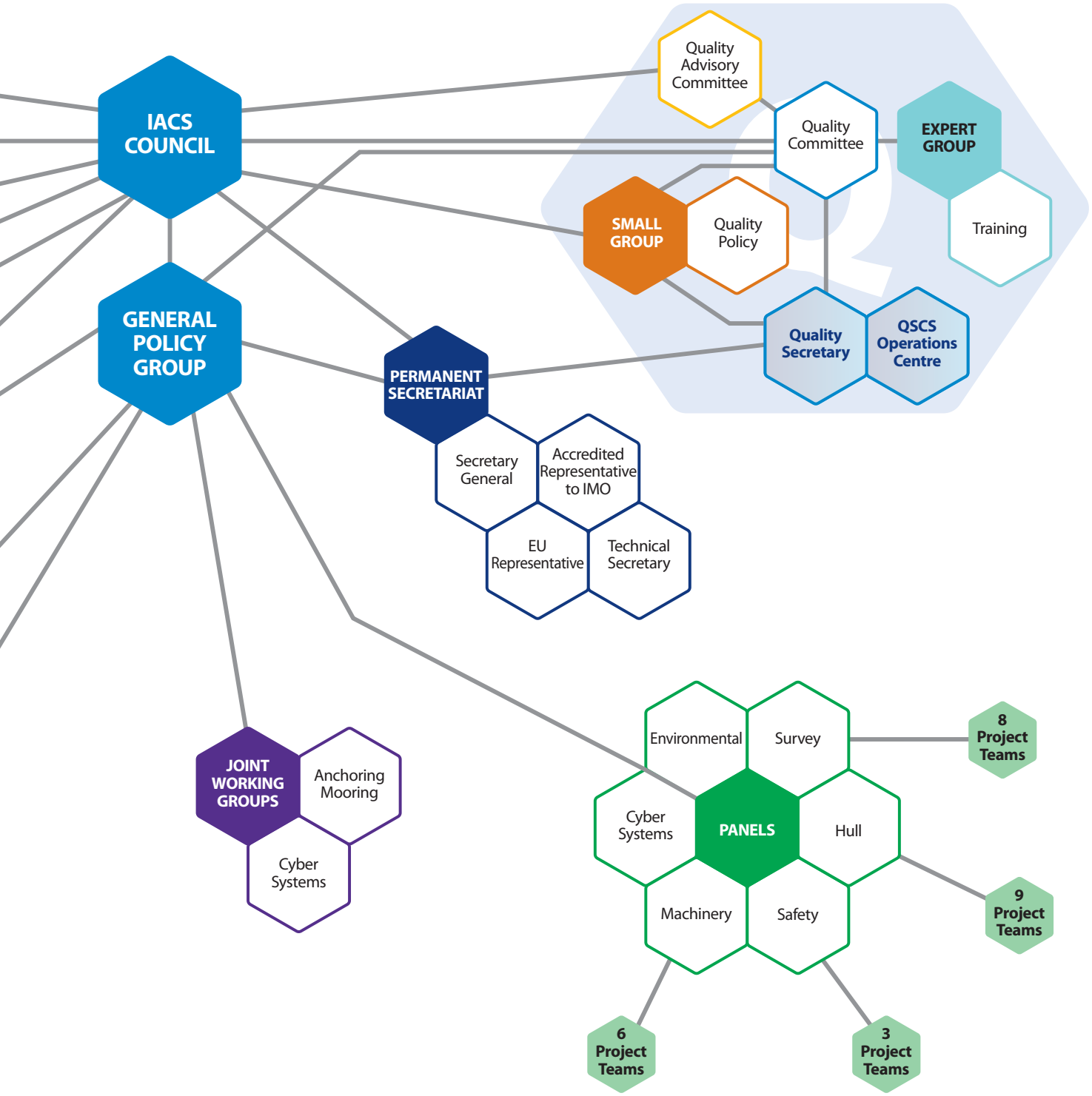
- Polar Code issues
- CSR Maintenance Team
- GBS issues on loads
- GBS issues on Safety Factors
- GBS issues on fatigue
- Whipping on Containerships
- BC cargo holds coatings
- Wave data investigations
- GBS issues on Human elements

Machinery Panel – 6 Project Teams:

- IGF development
- Treatment of fuel on-board
- Polar code issues for icebreakers
- Barred speed range investigations
- Shaft alignment investigations
- Retrofitting issues for BWM

Safety Panel – 3 Project teams

- HAZID investigations for LNGs
- SOLAS Unified interpretations
- IGC Code issues



Survey Panel – 8 Project teams:

Survey for Gas Fuelled ships
Containerships structures
GBS survey compliance
Passenger & Cargo ship survey requirements
ESP Code
Survey of BHD penetrations
Effect of new technology on surveys
IGC Code Loading & Discharge

Expert Group – Materials and Welding – 1 Project team:

NDT Techniques

Expert Group – Goal Based Standards – 1 Project team:

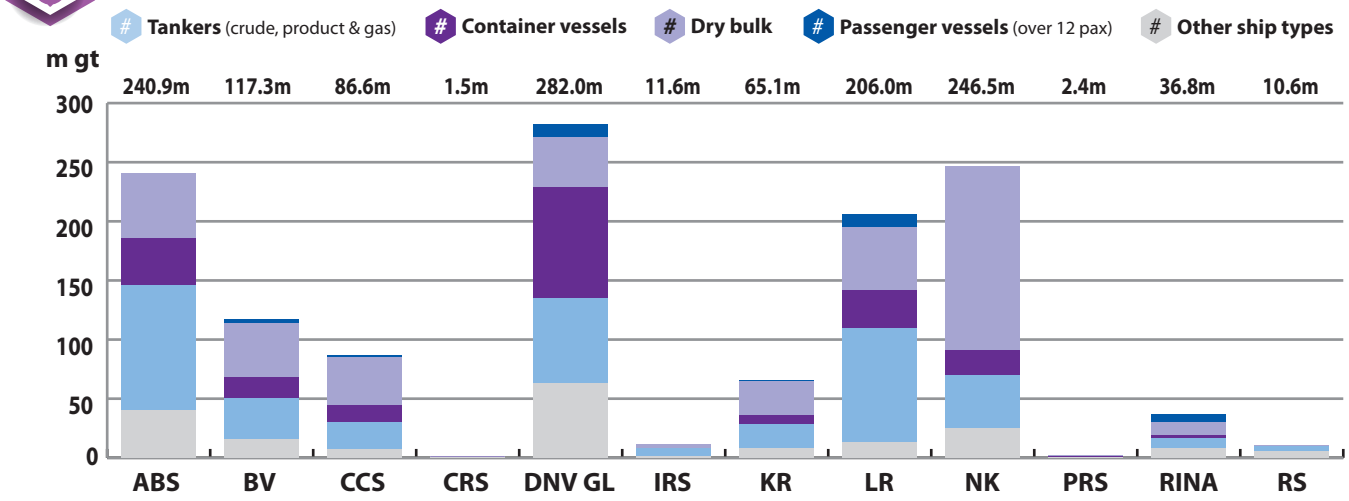
GBS Maintenance

08 Class Report

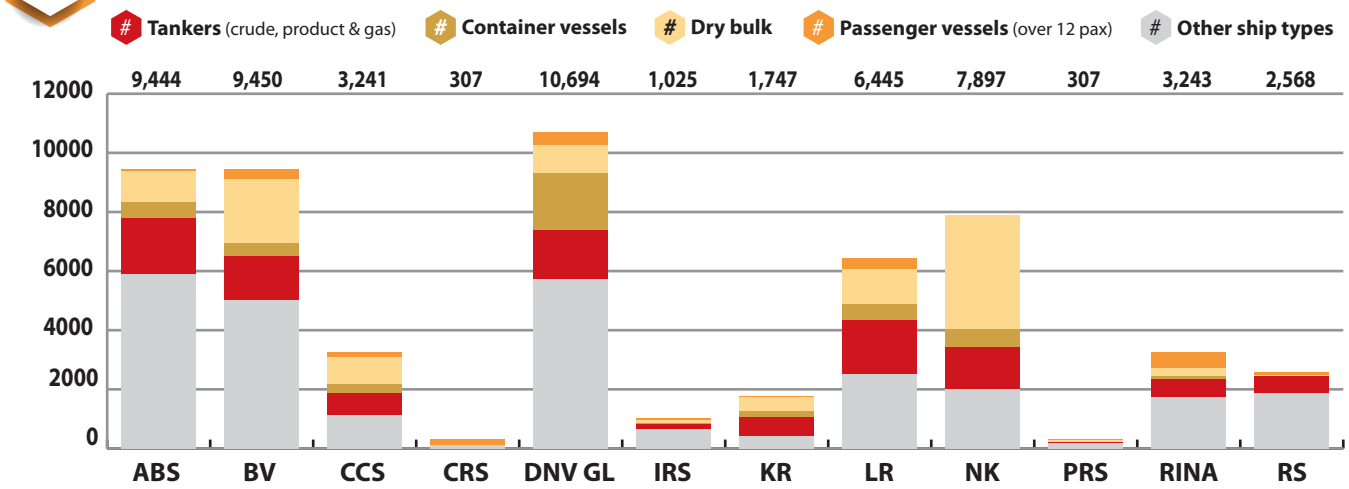
IACS Class Report Data 2017

Classed fleet figures include ocean going self-propelled ships of 100 GT and over, excluding fishing vessels, military vessels and pleasure craft, with dual classed ships counted at 100%.

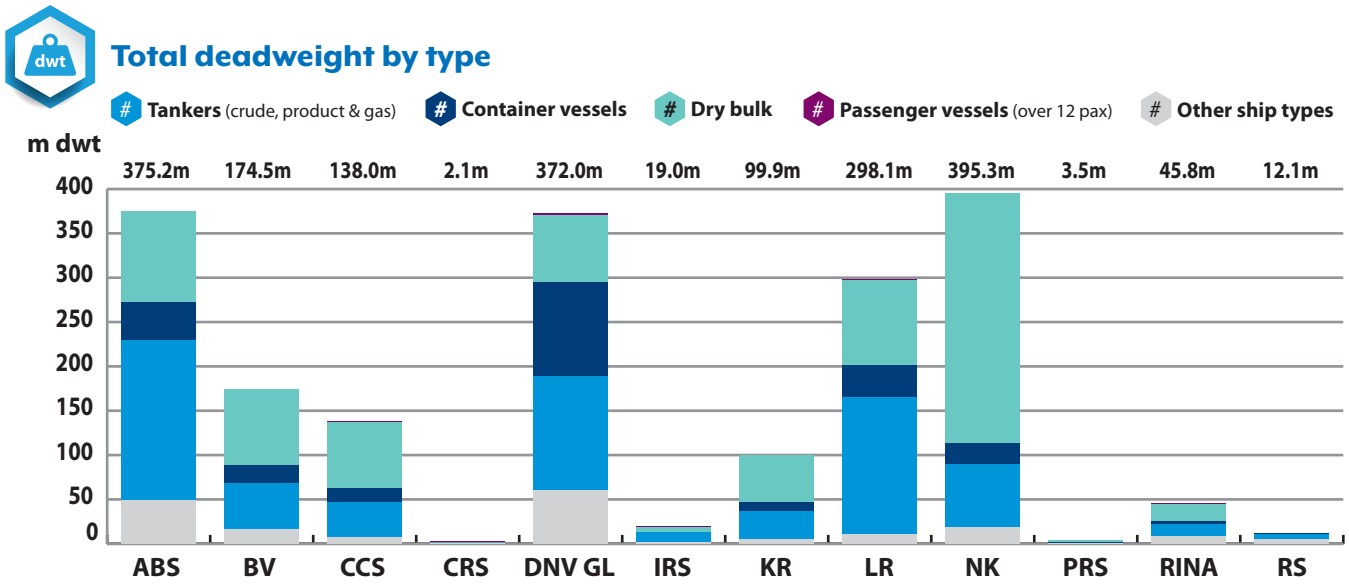
Total gross tonnage by type



Total number of vessels by type



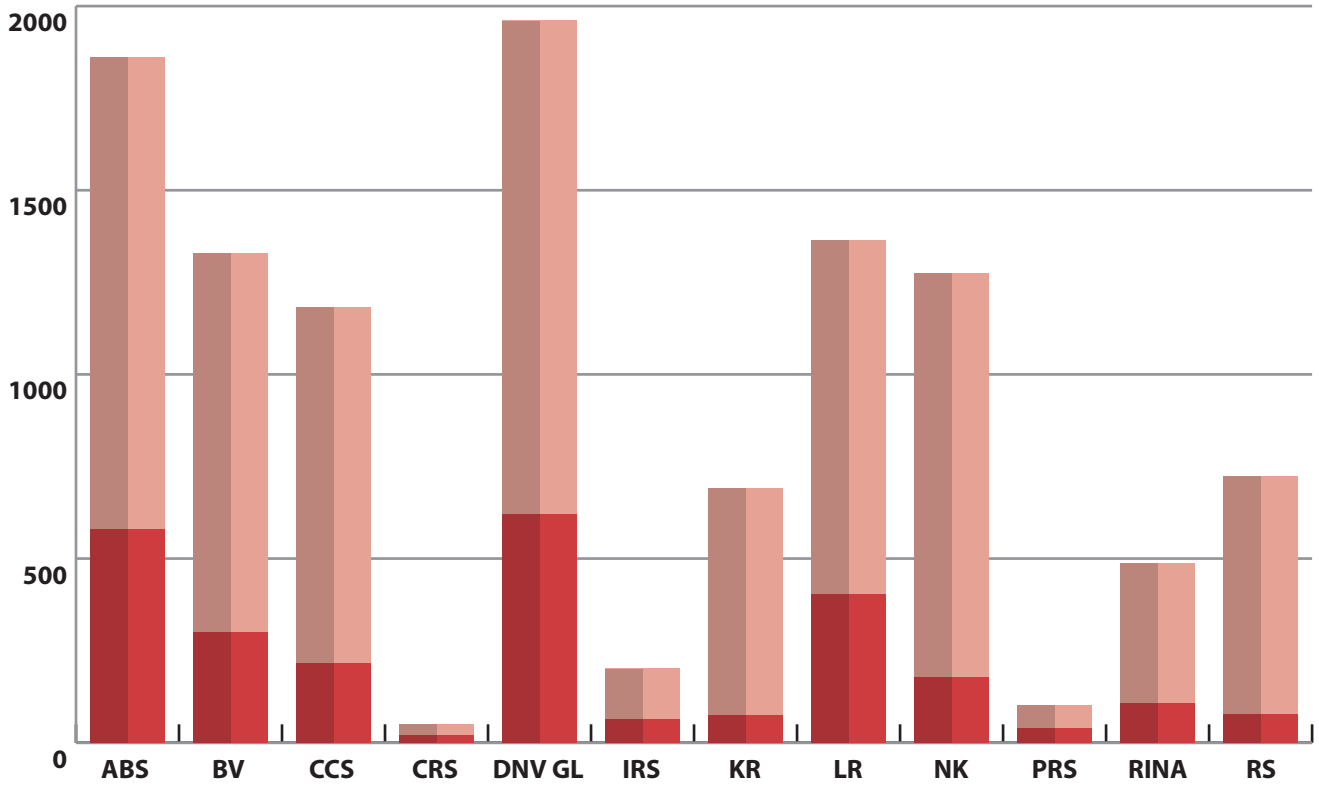
Total deadweight by type



Number of surveyors*

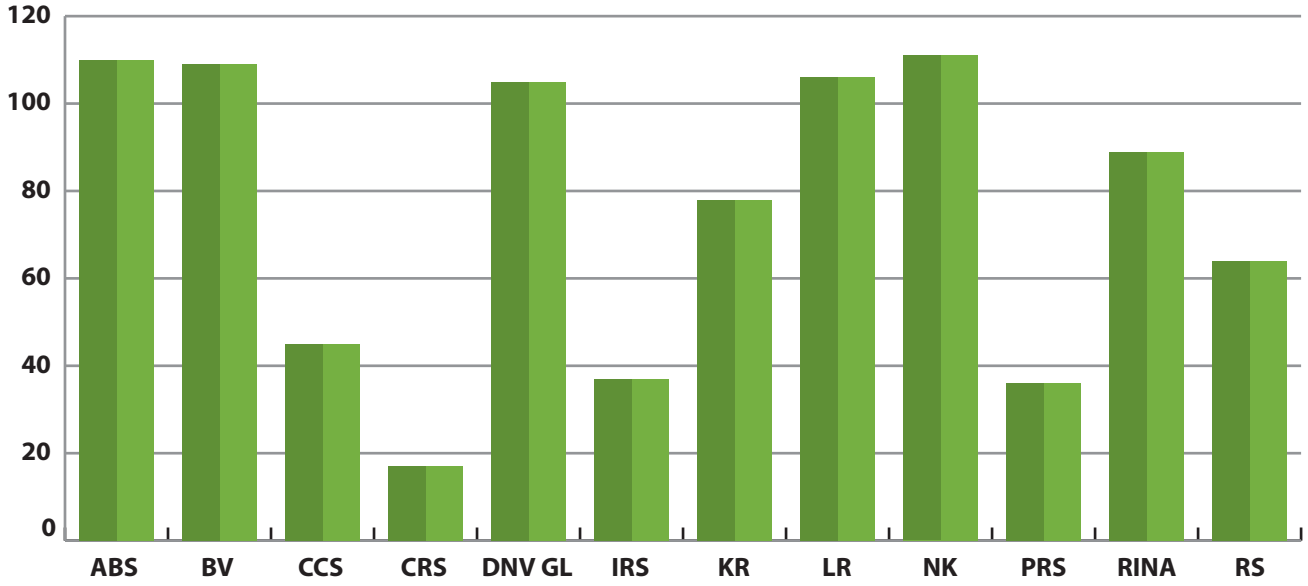
Plan approval engineers

Exclusive surveyors involved in surveys on ships



*Combined total number of surveyors, consisting of **the number of exclusive plan approval engineers** (RO Code A1.1.2 Plan approval staff are the personnel authorized to carry out design assessment and to conclude whether compliance has been achieved), and **the number of exclusive surveyors involved in surveys on ships** (RO Code A1.1.1 Survey staff are the personnel authorized to carry out surveys (in operation and under construction), and to conclude whether or not compliance has been achieved.)

Number of flag Administrations with which the class society has agreements*



*Number of flag Administrations with which the class society has agreements to act on their behalf as a recognized organization.

09 IACS Publications

Staying abreast of market developments

IACS Resolutions cover technical, regulatory and operational topics throughout the industry

The development and continuous review of IACS Resolutions and Recommendations is an essential part of the Association's work. Keeping this large body of material up-to-date is vital to maintain their ongoing relevance while the production of new Resolutions in response to technical, regulatory or operational advances demonstrates IACS technical leadership and responsiveness. The selection below represents only a small part of the work undertaken in 2017 and highlights IACS' activity across the maritime sphere. A list of the IACS Resolutions amended or developed in 2017 can be found in the Appendix which starts on page 60.

Putting safety first

IACS commitment to safer shipping continues to be resolute. In 2017, IACS published a number of new and revised safety-related Resolutions and Recommendations to help meet this commitment:

UR A3

IACS developed the Unified Requirement A3 for mooring and anchoring equipment. The development of this publication has taken into consideration the causes of catastrophic failures of mooring equipment and made suggestions for requirements to improve safety. These include requirements for the windlass, consideration of different windlass types, requirements for the operator's station or the required location of the operator's station, material requirements and overpressure arrangement in the hydraulic system and more.

Rec. 72

This publication gives guidelines for confined space safe practice. Work in confined and enclosed space has a greater likelihood of causing fatalities, severe injuries and illness than any other type of shipyard work or on board ships. Confined space means a space that has limited openings for entry and exit, unfavourable natural ventilation and not designed for continuous worker occupancy. The risks associated with any particular confined space are determined by its usage and location. Different types of confined spaces include, but are not limited to, boilers, pressure vessels, cargo holds, cargo tanks, ballast tanks, double bottoms, double hull spaces, fuel oil, lube oil, sewage tanks, pump rooms, compressor rooms, cofferdams, void spaces, duct keels, inter-barrier spaces and engine crankcases. This recommendation contains checklists for Entry into Confined Spaces which improve the safety of personnel entering those spaces.

Other safety-related P ublications in 2017 included UI GC15, UI MPC51, UI SC144, UI SC191, UI SC220, UI SC242, and UR L5.

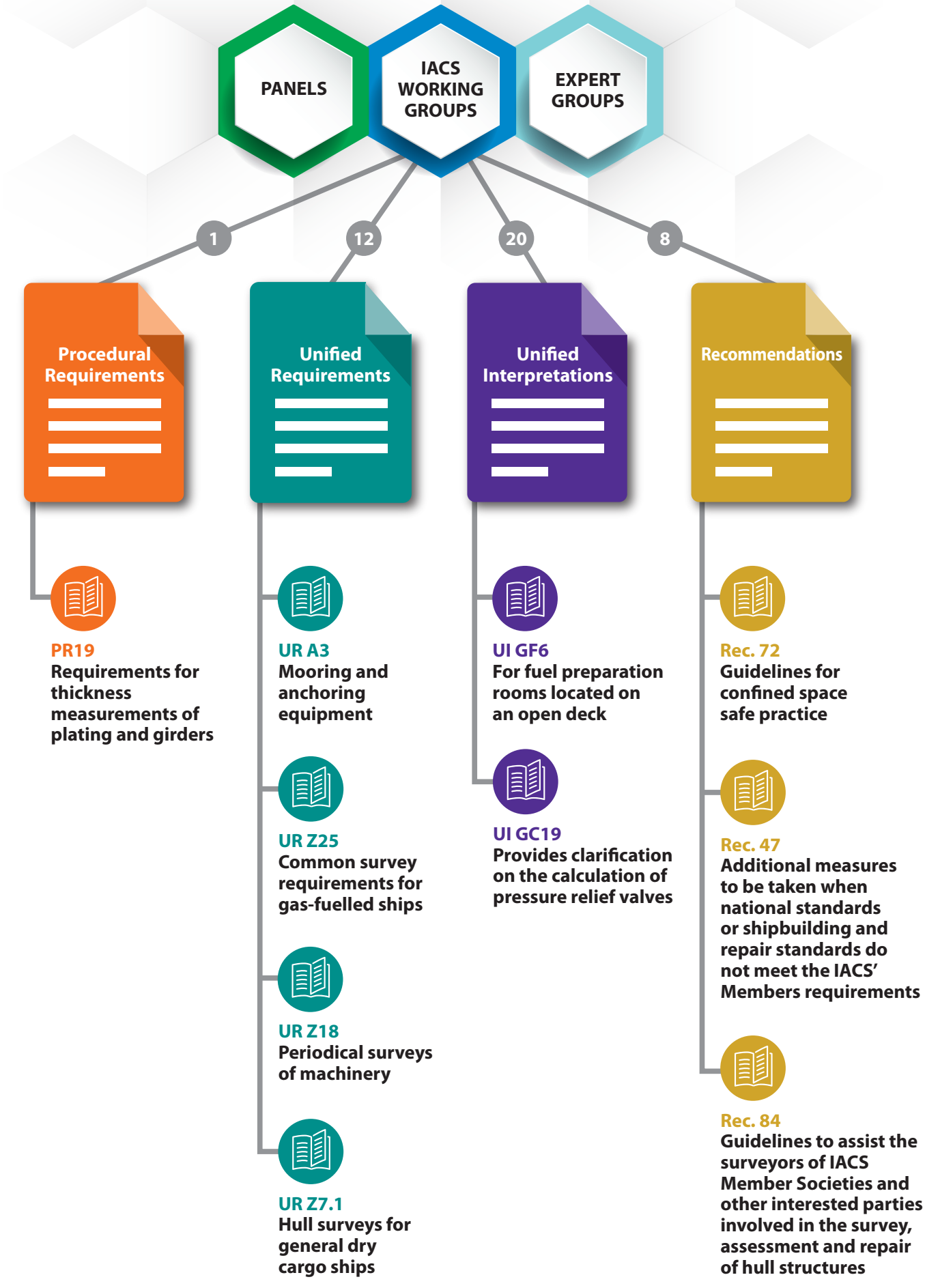
Gas-fuelled ship growth

The Maritime Safety Committee (MSC) of the IMO adopted resolutions MSC.370(93) and MSC Res.391(95) to amend the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). To enable the global and consistent implementation of this important IMO Code, IACS has developed various Unified Interpretations for the revised IGC Code, Recommendations for inspection/survey plans of these ships, and Unified Requirements for common surveys related to them.

UR Z25

UR Z25 introduces common survey requirements for gas-fuelled ships. These requirements apply to ships which utilise gas or other low flash-point fuels as a fuel for propulsion of prime mover/auxiliary power generation arrangements and associated systems. This publication deals with the surveys of control, monitoring and safety systems, fuel-handling piping, machinery, ventilating system, drip trays, hazardous areas, electrical bonding, fuel storage, bunkering and fuel supply systems. A revision was also made to the effect that all pressure release valves should be opened for

IACS new and revised documents 2017



The development and continuous review of IACS Resolutions and Recommendations is an essential part of the Association's work

internal examination and testing within the five-year survey cycle.

UI GF6

For fuel preparation rooms located on an open deck, the IGF Code does not specify any prescriptive requirements. IACS has considered the relevant functional requirement for protection of ship materials from exposure to temperatures below acceptable limits and their relevance for fuel preparation rooms, which should be arranged in the same way as a fuel preparation room below deck. Protection against cryogenic leakages and control of hazardous zones are equally relevant for open deck locations and so should be applied in such locations.

UI GC19

This UI provides clarification concerning the calculation of pressure relief valves that are to be determined, according to the revised IGC Code. This UI provides the clarity for A (Area) to be used in calculations, in particular to Prismatic tanks.

Other gas-fuelled ship Publications in 2017 included Rec. 109, Rec. 148, Rec. 149, Rec. 150, Rec. 77

UI GC18, UI GF1, UI GF2, UI GF3, UI GF4, UI GF5, UI GF7, UI GF8, UI GF9, UI GF10, UI GF11, and UI GF12.

Maintaining quality

Helping to facilitate and enable high-quality operations at sea is of the upmost importance to IACS and as such, IACS has continued to introduce new or revised Publications in this area.

PR19

PR19 contains requirements for thickness measurements of plating and girders. Thickness measurements of all longitudinal structural members taken mainly to evaluate the extent of corrosion, which may affect the hull girder strength, are to be carried out in a systematic manner. Thickness Measurements require the surveyor to be on board, while the gaugings are taken. This Publication is revised to include the applicability in Mobile Offshore Drilling Units (MODU). The Publication states that prior to commencement of the Intermediate or Special survey, a meeting is to be held between the attending surveyor(s), the master of the ship or mobile offshore unit or an appropriately qualified representative appointed by the master or Company, the owner's representative(s) in attendance and the thickness measurement firm's representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out on board.

Rec. 47

Rec.47 gives the recommendations for additional measures to be taken when national standards or shipbuilding and repair standards do not meet the IACS Members requirements. It is divided into two parts. Part A provides guidance on shipbuilding quality standards for the hull structure during new construction and the remedial standard where the quality standard is not met. Part B provides guidance on quality of repair of hull structures and permanent repairs of existing ships.

Other quality Publications in 2017 included UR W11.

Practical implementation progress

IACS collaborates with many sectors of the industry and maritime regulators to ensure that the legislative framework required for safe, efficient and environmentally friendly ships is supported by class Rules that allow for its practical implementation. IACS also works closely with the International Maritime Organization (IMO) with the view to ensuring that adopted legislation can be globally applied in a consistent manner.

UR Z18

UR Z18 deals with the periodical surveys of machinery. It stipulates the requirements for special surveys, annual surveys and continuous surveys. This UR also deals with surveys of steam boilers, propulsion steam turbines and machinery verification runs. This revision has added survey requirements for on board test of propulsion systems and their controls to the publication.

UR Z7.1

UR Z7.1 deals with Hull Surveys for General Dry Cargo Ships. The requirements apply to surveys of hull structure and piping systems in cargo holds, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area, and all ballast tanks. This revision introduced the criteria for the steel renewal which belongs under the S series Unified Requirements , related to the net scantling approach, and clarifies the applicability of hybrid cargo hold arrangements.

Rec. 84

IACS introduced guidelines to assist the surveyors of IACS Member Societies and other interested parties involved in the survey, assessment and repair of hull structures. An important feature of the guidelines is the inclusion of sections with examples which illustrate structural deterioration and damages related to each structural area and gives advice on what to look for, possible causes, and recommended repair methods, as appropriate. The so-called Early Warning Scheme will enable the analysis of problems as they arise and facilitate amendments of these guidelines.

Other practical implementation Publications in 2017 included Rec. 151, UR Z10.2, UR Z10.5.

Definitions

UR

Unified Requirements are adopted Resolutions on matters directly connected to or covered by specific Rule requirements and practices of classification societies, and the general philosophy on which the rules and practices of classification societies are established.

Subject to ratification by the governing body of each IACS Member, Unified Requirements should be seen as minimum requirements to be incorporated in the Rules and practices of Members within one year of approval by the IACS General Policy Group.

While each Member remains free to set more stringent requirements, the existence of a UR does not oblige a Member to issue respective Rules if it chooses not to have Rules for the type of ship or marine structure concerned.

CSR

The IACS Council adopted the **Common Structural Rules** for Double Hull Oil Tankers (CSR-OT) and Common Structural Rules for Bulk Carriers (CSR-BC) on December 14, 2005, for implementation on April 1, 2006, on the basis that these Rules were founded on sound technical grounds, and achieved the goal of more robust and safer ships.

These two sets of Rules were developed independently, and in order to remove variations and achieve consistency, IACS decided to harmonise these Rules to create a single set of Rules – "*Common Structural Rules for Bulk Carriers and Oil Tankers*" (CSR BC & OT). This comprised two parts: Part One gave requirements common to both bulk carriers and double hull oil tankers and Part Two provided additional specialised requirements specific to either bulk carriers or double hull oil tankers.

PR

Procedural Requirements are adopted Resolutions on matters of procedures to be incorporated in the practices and procedures of IACS Members within the periods agreed by the IACS General Policy Group.

UI

Unified Interpretations are adopted Resolutions on matters arising from implementing the requirements of IMO Conventions or Recommendations. The Resolutions can involve uniform interpretations of Convention Regulations or IMO Regulations on matters that are unclear.

Interpretations are circulated to the flag State Administrations concerned or sent to IMO for information. They are also designed to aid the development of regulations that are clear, unambiguous and can be easily applied by IACS Members to ships whose flag State Administrations have not issued definite instructions on the interpretation of the IMO regulations concerned, amid statutory certification on behalf of those flag Administrations.

Recommendations

IACS produces **recommendations** and guidelines related to adopted Resolutions that not only deal with matters of class but also offer some advice to the marine industry.

10 Major Events 2017

IACS 2017 – the year at a glance

JANUARY — Gdansk

ACB Refresher Training

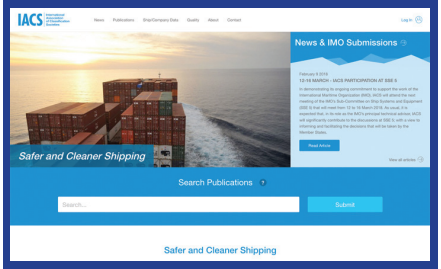
IACS commitment to continuous improvement in Quality Operations reflected in the annual refresher training for certifying bodies.

FEBRUARY — London

IACS/Industry CSR Meeting

IACS meets with Industry to explain the process and contents of the 2017 Rule Change Proposals.

FEBRUARY



New IACS Website Launched

IACS launches a new website designed for both specialist and non-specialist users, with significantly enhanced functionality.

MARCH — Brussels

European Shipping Week

IACS hosts a workshop on the *Digitalisation of Maritime Transport* with presentations covering cyber-related challenges to safety and the environment, using Digitalisation to improve the efficiency of ships, unifying data exchange formats, the use of e-certificates, integrating drones into ship inspections, and the pathway to autonomous ships.

MARCH — Malta

Maltese High Level Ministerial/ Stakeholders Conference on Maritime Affairs

IACS Secretary General speaks at the Conference outlining IACS' position regarding decarbonisation and emissions reductions in the maritime sphere.

MARCH — Hamburg

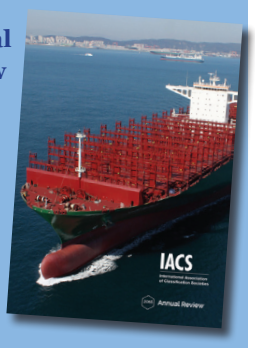
IUMI Technical Conference

IACS Quality Secretary highlights to the insurance industry the key role the IACS Quality System Certification Scheme (QSCS) plays in ensuring that all Members have stringent quality rules.

APRIL

IACS Inaugural Annual Review Published

In line with IACS ongoing commitment to Transparency, IACS publishes its inaugural Annual Review.



JUNE — London

IACS/IUMI Technical Meeting

As part of efforts to further strengthen the links between IACS and marine insurers, IACS initiates detailed technical discussions on matters of mutual interest.

JUNE — London

IACS/Industry Technical Meeting

As part of its ongoing efforts to engage regularly in dialogue with industry partners, IACS meets with Industry to follow up on key items and identify new work areas.

JUNE — London

IMO MSC98

IACS and its Members achieve full compliance with IMO Goal-Based Standards and reaffirm their commitment to reporting progress on addressing the GBS observations.

JUNE — Beijing

High-Level Workshop on International Maritime Strategy

Attended by senior representatives from the IMO, flag States, shipbuilders and shipowners, the future IMO strategy was discussed along with the role of class and IACS in supporting its successful delivery.

AUGUST — Maldives

Indian Ocean MoU

IACS Quality Secretary provided the IOMOU with a series of case studies on PSC activity including detentions related to ISM Deficiencies and interpretations of the Maritime Labour Convention.

SEPTEMBER — London

London International Shipping Week

In support of LISW, IACS hosts an intimate Roundtable of key stakeholders to discuss the future role and strategic direction of class and the role of IACS in supporting the maritime industry.

SEPTEMBER — Tokyo

IUMI Annual Conference

In further support of the marine insurance industry, IACS Secretary General participates in the IUMI Annual Conference.

OCTOBER — Panama City

IMO World Maritime Day Parallel Event

IACS Accredited Representative to the IMO attends two-day conference on *'Connecting Ships, Ports and People'* in support of World Maritime Day.

OCTOBER

New Membership Criteria Published

IACS publishes revised procedures and criteria for membership as part of its ongoing commitment to high-quality operations and to ensuring that both new and existing Members continue to perform to consistently high-standards ahead of entry into force on 1 January 2018.

OCTOBER — Singapore

End User Workshop

This annual event enables IACS Members, their ACB's and other interested parties, to reflect on their joint experiences of IACS QSCS and to discuss possible adjustments deemed appropriate to ensure QSCS continues to fully meet the demands and needs of all stakeholders for the robust and consistent certification of IACS Members.

NOVEMBER — Tallinn/Estonia

Digital Transport Days

IACS Cyber Systems Panel Chair gives a presentation at the session on *'Cybersecurity in transport: what are the main challenges ahead and how are they being addressed – and by whom – in terms of prevention, preparedness, response, resilience?'*

NOVEMBER — Nantong

Tripartite

IACS again plays a leading role in the Tripartite discussions focused on decarbonisation of ships, safe design, and digitalisation, and how these areas will lead to the creation of a more efficient seaborne transport system.

NOVEMBER — London

IACS Accredited Representative to the IMO is awarded the US Coast Guard Distinguished Public Service Award in recognition of his significant contributions to IMO over many years.

DECEMBER — Shanghai

Senior Maritime Forum, Marintec China

IACS Chair delivers keynote speech to the Senior Maritime Forum, Marintec China, on classification in the age of disruption.

DECEMBER — Brussels

IACS Reception

IACS hosts a reception for the many EU Representatives and industry stakeholders that work with IACS on European issues that impact international shipping.

DECEMBER — London

IACS/Industry High-Level Meeting

IACS hosts the traditional policy level meeting with key industry stakeholders.

11 IACS Members

IACS Members

IACS consists of 12 member societies, details of which are listed below. Chairmanship of IACS is on a rotational basis with each member society taking a turn.

The current chairmanship is as follows:

Chair of Council	Mr. Knut Ørbeck-Nilssen	DNV GL
Vice-Chair (incoming Chair)	Mr. Jeong-kie Lee	KR
Vice-Chair (immediate past-Chair)	Dr. Licheng Sun	CCS

ABS
American Bureau of Shipping
www.eagle.org

BV
Bureau Veritas
www.veristar.com

CCS
China Classification Society
www.ccs.org.cn/ccswzen/

CRS
Croatian Register of Shipping
www.crs.hr

DNV GL
www.dnvgl.com

IRS
Indian Register of Shipping
www.irclass.org

KR
Korean Register of Shipping
www.krs.co.kr

LR
Lloyd's Register
www.lr.org

NK
Nippon Kaiji Kyokai
www.classnk.or.jp

PRS
Polish Register of Shipping
www.prs.pl

RINA
RINA Services S.p.A.
www.rina.org

RS
Russian Maritime Register of Shipping
www.rs-class.org/en/

12 Appendices

Appendix I

Summaries of the IACS Resolutions published in 2017

SUMMARY OF NEW/REVISIONS TO IACS UNIFIED REQUIREMENTS PUBLISHED IN 2017

New Revised Corrigenda Deleted/Withdrawn

Index	Resolution no.	Revision	Adoption	Title	Implemention Date
1	UR Z25	New	Jan 2017	Periodic Survey of Fuel Installations on Ships other than Liquefied Gas Carriers utilizing gas or other low flash point fuels	01 Jan 2018
2	UR A1	Corr.2	Mar 2017	Anchoring Equipment	01 July 2018
3	UR A2	Corr.2	Mar 2017	Shipboard fittings and supporting hull structures associated with towing and mooring on conventional ships	01 July 2018
4	UR S4	Rev.4	Apr 2017	Criteria for the Use of High Tensile Steel with Minimum Yield Stress of 315 N/mm2, 355 N/mm2 and 390 N/mm2	-
5	UR W11	Rev.9	May 2017	Normal and higher strength hull structural steels	01 July 2018
6	UR A3	New	Jun 2017	Anchor Windlass Design and testing	01 July 2018
7	UR M25	Rev.4	Jun 2017	Astern power for main propulsion	01 July 2018
8	UR M53	Rev.3	Jun 2017	Calculations for I.C. Engine Crankshafts	01 July 2018
9	UR L5	Rev.3	Jun 2017	Computer Software for Onboard Stability Calculations	01 July 2018
10	UR Z18	Rev.7	Jun 2017	Survey of Machinery	01 July 2018
11	UR Z7.1	Rev.13	Aug 2017	Hull Surveys for General Dry Cargo Ships	01 Jan 2019
12	UR Z25	Rev.1	Sep 2017	Periodic Survey of Fuel Installations on Ships other than Liquefied Gas Carriers utilizing gas or other low flash point fuels	01 Jan 2019
13	UR Z10.2	Rev.34	Sep 2017	Hull Surveys of Bulk Carriers	01 Jan 2019
14	UR Z10.5	Rev.17	Sep 2017	Hull Surveys of Double Skin Bulk Carriers	01 Jan 2019

SUMMARY OF NEW/REVISIONS TO IACS UNIFIED REQUIREMENTS PUBLISHED IN 2017

1. UR Z25 (New Jan 2017):

UR Z25 is developed to introduce common survey requirements for gas fuelled ships considering the implementation of the IGF Code on ships constructed on or after 1 January 2017. These requirements apply to ships, other than those covered by the UR Z16, which utilise gas or other low flash point fuels as a fuel for propulsion prime mover/auxiliary power generation arrangements and associated systems. These requirements are in addition to the requirements of UR Z18.

2. UR A1 (Corr.2 Mar 2017):

UR A1 gives the minimum requirements for the anchoring equipment. The anchoring equipment required herewith is intended for temporary mooring of a ship within a harbour or sheltered area when the ship is awaiting berth, tide, etc. In this Corrigendum, effective date is changed from 1 January 2018 to 1 July 2018 in order to have a consistent effective date of a planned RCN/URCN which is to incorporate the updates made to UR A1, UR A2 and Rec. 10.

3. UR A2 (Corr.2 Mar 2017):

UR A2 gives the minimum requirements for shipboard fittings and supporting hull structures associated with towing and mooring on conventional ships. This is applicable to design and construction of shipboard fittings and supporting structures used for the normal towing and mooring operations. In this Corrigendum, effective date is changed from 1 January 2018 to 1 July 2018 in order to have a consistent effective date of a planned RCN/URCN which is to incorporate the updates made to UR A1, UR A2 and Rec. 10.

4. UR S4 (Rev.4 Apr 2017):

UR S4 gives the value for material factor K, for the Use of High Tensile Steel with Minimum Yield Stress of 315 N/mm2, 355 N/mm2 and 390 N/mm2. This UR does not apply to CSR Bulk Carriers and Oil Tankers. Rev.4 brings changes to the values for material factor K.

5. UR W11 (Rev.9 May 2017):

UR W11 requirements apply to weldable normal and higher strength hot-rolled steel plates, wide flats, sections and bars intended for use in hull construction. This revision introduces requirements for surface quality of plates supplied to shipyards. Other changes consist of a review of the definitions of steel delivery conditions against current industry standards, and a revision to table 9.

6. UR A3 (New June 2017):

IACS developed the Unified Requirement A3 for mooring and anchoring equipment, which would include measures to prevent the catastrophic failure of windlass hydraulic motors through over-pressurisation and over-speed. The UR includes General requirements, Application scope, Definition, Plans and documents, Material, Design requirements and Test requirements (Refence to IACS Rec.10 & ISO 4568)

7. UR M25 (Rev.4 June 2017):

UR M25 specifies the astern power for main propulsion. In this revision, Addition of M25.4 requiring on-board tests to demonstrate the astern response characteristics of essential equipment and systems for propulsion. Rearrangement of Footnote 2 as M25.5.

8. UR M53 (Rev.3 June 2017):

UR M53 stipulates the rules for the design of crankshafts are to be applied to I.C. engines for propulsion and auxiliary purposes, where the engines are capable of continuous operation at their rated power when running at rated speed. This revision introduces additional requirements covering the following items:

a. evaluation of stress concentration factors (SCF) by finite elements calculation,

b. evaluation of stress in oil bore and fillets when surface treatment process is applied,

c. evaluation of fatigue strength by experiment (fatigue tests).

9. UR L5 (Rev.3 June 2017):

This Unified Requirement is applicable to software which calculates the stability of actual loading conditions and which is installed on ships and on units subject to compliance with the 1966 Load Line Convention or the 1988 Protocol to the Load Line Convention, as amended, the IMO MODU Code and/or the 2008 IS Code. This revision is introduced to eliminate the vague expressions to prevent different applications by Societies and to amend the UR L5 with the definition and technical specification of a new Type 4 for SRtP software.

10. UR Z18 (Rev.7 June 2017):

UR Z18 deals with the periodical surveys of Machinery. It stipulates the requirements for special surveys, annual surveys and continuous surveys. This UR also deals with survey of steam boilers, propulsion steam turbines and machinery verification runs. This revision has added paragraph 4.2 to UR Z18 which aims to the provision of survey requirements for on-board test of propulsion systems and their controls and moved the "Note" in the end to paragraph 1 as "1.4 Surveys of Commercial Vessels Supporting Military Use".

11. UR Z7.1 (Rev.13 Aug 2017):

UR Z7.1 deals with Hull Surveys for General Dry Cargo Ships. The requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks. This revision introduced the criteria for the steel renewal which belongs under the unified requirements of series S and are related to the net scantling approach and is to clarify the applicability of hybrid cargo hold arrangements by adding paragraph 1.1.2.

12. UR Z25 (Rev.1 Sep 2017):

UR Z25 is developed to introduce common survey requirements for gas fuelled ships considering the implementation of the IGF Code on ships constructed on or after 1 January 2017.In this revision, it is introduced that all PRVs should be opened for internal examination and testing within the 5-year survey cycle.

13. UR Z10.2 (Rev.34 Sep 2017):

The requirements apply to all self-propelled Bulk Carriers other than Double Skin Bulk Carriers as defined in 1.1.1 of UR Z10.5. These Requirements apply to surveys of hull structure and piping systems in way of the cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks. The paragraph 5.3.4 "The use of hydraulic arm vehicles or aerial lifts ("Cherry picker")" has been inserted in the current revision of Z10.2.

14. UR Z10.5 (Rev.17 Sep 2017):

The requirements apply to all self-propelled Double Skin Bulk Carriers. The requirements apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks. The paragraph 8.1.2 "Thickness measurements Acceptance Criteria", has been inserted in the current revision of UR Z10.5.

SUMMARY OF NEW/REVISIONS TO IACS PROCEDURAL REQUIREMENTS PUBLISHED IN 2017

New Revised Corrigenda Deleted/Withdrawn

Index	Resolution no.	Revision	Adoption	Title	Implemention Date
1	PR2	Del	Jan 2017	Procedure for Failure Incident Reporting and Early Warning of Serious Failure Incidents - "Early Warning Scheme - EWS"	-
2	PR 19	Rev.1	Jul 2017	Procedural Requirement for Thickness Measurements	1 Jan 2018

1. PR2 (Deleted):

PR2A & PR2B replaced PR2. Hence, PR2 is deleted with effect from 1 January 2017.

2. PR19 (Rev.1 July 2017):

This Procedure contains requirements for thickness measurements. Thickness Measurements, if not carried out by the Society itself shall be witnessed by a surveyor. This requires the surveyor to be on board, while the gaugings are taken, to the extent necessary to control the process. This Publication is revised to include the applicability of mobile offshore drilling units (MODU). In addition, old version of para 2.1 was deleted and superseded by the new version of Para 2.1.

SUMMARY OF NEW/REVISIONS TO IACS UNIFIED INTERPRETATIONS PUBLISHED IN 2017

New Revised Corrigenda Deleted/Withdrawn

Index	Resolution no.	Revision	Adoption	Title	Implemention Date
1	UI GF1	New	Jan 2017	Test for gas fuel tank's high-level alarm	01 Jan 2018
2	UI MPC51	Rev.1	Jan 2017	Resolution 2 of the 1997 MARPOL Conference Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines	01 Jul 2018
3	UI SC191	Corr.3	Jan 2017	IACS Unified Interpretations (UI) SC 191 for the application of amended SOLAS regulation II- 1/3-6 (resolution MSC.151(78)) and revised Technical provisions for means of access for inspections (resolution MSC.158(78))	-
4	UI GC18	Corr.1	Mar 2017	Test for cargo tank's high-level alarm (on ships built on or after 1 July 2016)	-
5	UI SC220	Corr.2	Mar 2017	Special requirements for ro-ro passenger ships	-
6	UI SC281	Withdrawn	Jun 2017	Single fall and hook system used for launching a lifeboat or rescue boat - Interpretation of the LSA Code as amended by MSC.320(89) and MSC.81(70) as amended by MSC.321(89)	-
7	UI GC18	Rev.1	Jul 2017	Test for cargo tank's high-level alarm (on ships built on or after 1 July 2016)	01 Jul 2018
8	UI GF1	Rev.1	Jul 2017	Test for gas fuel tank's high-level alarm	01 Jul 2018
9	UI GC19	New	Aug 2017	UI GC19 "External surface area of the tank for determining sizing of pressure relief valve (paragraph 8.4.1.2 and figure 8.1)"	01 Jan 2018
10	UI GC15	Rev.1	Aug 2017	Closing Devices for Air Intakes	01 Jan 2018
11	UI GF2	New	Sep 2017	Ship Steel Protection against Liquefied Gas Fuel (Part A-1, paragraph 6.3.10)	01 Jan 2019
12	UI SC221	Del	Sep 2017	Separation of Galley Exhaust Ducts from Spaces (Reg II-2/9)	-
13	UI SC144	Rev.3	Oct 2017	Maintenance, Thorough Examination, Operational Testing, Overhaul and Repair of Lifeboats, Rescue Boats and Fast Rescue Boats, Launching Appliances and Release Gear	01 Jan 2020
14	UI SC242	Corr.1	Aug 2011	Arrangements for steering capability and function on ships fitted with propulsion and steering systems other than traditional arrangements for a ship's directional control	21 Dec 2017
15	UI GF3	New	Dec 2017	Tank connection space for tanks on open deck and tank connection space equipment	01 Jan 2018
16	UI GF4	New	Dec 2017	Fuel preparation room	01 Jan 2018
17	UI GF5	New	Dec 2017	Appropriate location of premixed engines using fuel gas mixed with air before the turbocharger	01 Jan 2018
18	UI GF6	New	Dec 2017	Protection against cryogenic leakage and control of hazardous zones in fuel preparation rooms on open deck	01 Jan 2018
19	UI GF7	New	Dec 2017	External surface area of the tank for determining sizing of pressure relief valve	01 Jan 2018

SUMMARY OF NEW/REVISIONS TO IACS UNIFIED INTERPRETATIONS PUBLISHED IN 2017

Index	Resolution no.	Revision	Adoption	Title	Implemention Date
20	UI GF8	New	Dec 2017	Control and maintenance of pressure and temperature of liquefied gas fuel tanks after the activation of the safety system	01 Jan 2018
21	UI GF9	New	Dec 2017	Special consideration within the risk assessment of closed or semi-enclosed bunkering stations	01 Jan 2018
22	UI GF10	New	Dec 2017	Ventilation of machinery spaces	01 Jan 2018
23	UI GF11	New	Dec 2017	Ventilation of double piping and gas valve unit spaces in gas safe engine-rooms	01 Jan 2018
24	UI GF12	New	Dec 2017	Ventilation inlet for double wall piping or duct	01 Jan 2018

1. UI GF1 (New Jan 2017):

UI GF1 was introduced for clarifying the term "each dry-docking" for cargo ships and passenger ships in the requirements relating to IGF Code, MSC Res.391(95), paragraph 15.4.2.3.

2. UI MPC51 (Rev.1 Jan 2017):

UI MPC51 2004 version was never agreed by IMO. This revision was introduced to quote the current wording of NTC 3.2.1 which it interprets and clarification with respect to testing according to D2 and E2 cycles and 'construction' of emission values

3. UI SC191 (Corr.3 Jan 2017):

UI SC191 is introduced for the application of amended SOLAS regulation II- 1/3-6 (resolution MSC.151(78)) and revised Technical provisions for means of access for inspections (resolution MSC.158(78)). Corrigendum for the UI was issued for Editorial correction identified by IMO Secretariat.

4. UI GC18 (corr.1 Mar 2017):

UI GC18 gives interpretation of IGC Code as amended by Res. MSC.370(93), 13.3.5. Corrigendum is issued to revise implementation note that UI should be applicable to ships built on or after 1st July 2016 (as described in the title).

5. UI SC220 (Corr.2 Mar 2017):

Special requirements for vehicle ferries, ro-ro ships and other ships of similar type. This UI gives interpretation to SOLAS regulation II-1/20-2 and SOLAS regulation II-1/17-1.1.1. Corrigenda for this UI is issued to correct the title to "Special requirements for ro-ro passenger ships".

6. UI SC281 (withdrawn Jun 2017):

IACS has agreed that UI SC 281 should be temporarily withdrawn (so that it isn't applied from 1st July 2017) while a review of the text is undertaken from SSE 4 report. This UI can be reinstated once the review of the text has been carried out in preparation for SSE 5.

7. UI GC18 (Rev.1 Jul 2017):

UI GC18 gives interpretation of IGC Code as amended by Res. MSC.370(93), 13.3.5. This revision introduced the interpretation of the expressions "high-level alarms" & "first occasion of full loading".

8. UI GF1 (Rev.1 Jul 2017):

UI GF1 was introduced for clarifying the term "each dry-docking" for cargo ships and passenger ships in the requirements relating to IGF Code, MSC Res.391(95), paragraph 15.4.2.3. This revision introduced the interpretation of the expressions "high-level alarms" & "first occasion of full loading".

9. UI GC19 (New Aug 2017):

UI GC19 was introduced to clarify paragraph 8.4.1.2 of the revised IGC Code (MSC.370(93). This UI gives the interpretation for terms Lmin and A for prismatic tanks.

10. UI GC15 (Rev.1 Aug 2017):

The UI provides clarification based on paragraph 3.2.6 of IGC Code (MSC.370(93)) regarding capability of closing devices for air intakes, outlets and other openings into service spaces being operated from inside the space whether applicable to the engine room casings and steering gear compartments. This revision is developed to align the UI with the approved MSC Circular (MSC.1/Circ.1559).

11. UI GF2 (New Sep 2017):

This UI was introduced to clarify whether drip trays specified in paragraph 6.3.10 of the IGF Code are required or not for tank connections in cases of liquefied gas fuel storage tanks arranged in a similar manner to cargo tanks of gas carriers.

12. UI SC221 (Withdrawn Sep 2017):

UI SC221 (New Oct 2007) was withdrawn as the content is included in of SOLAS II-2/Reg. 9.7.2.5, as amended.

13. UI SC144 (Rev.3 Oct 2017):

UI SC144 gives the interpretation for SOLAS Regulation III/20.11. This UI is updated to take account of amendments to SOLAS Reg.III-20.11 adopted through resolution MSC.404(96).

14. UI SC242 (Corr.1 Aug 2011):

UI SC242 gives the interpretation of Arrangements for steering capability and function on ships fitted with propulsion and steering systems other than traditional arrangements for a ship's directional control (SOLAS Chapter II-1, Regulations 29.1, 29.2.1, 29.3, 29.4, 29.6.1, 29.14, 28.3 and 30.2). UI SC242 (Rev.1 Apr 2016) was deleted and reverted to (Corr.1 Aug 2011), as it was not endorsed by the relevant IMO Sub-committee.

15. UI GF3 (New Dec 2017):

UI GF3 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 2.2.15.3, regarding the application of tank connection spaces and which equipment can be located therein.

16. UI GF4 (New Dec 2017):

UI GF4 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 2.2.17, to establish the definition of fuel preparation rooms.

17. UI GF5 (New Dec 2017):

UI GF5 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 5.4.1, to establish the appropriate location of premixed engines using fuel gas mixed with air before the turbocharger.

18. UI GF6 (New Dec 2017):

UI GF6 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 5.8 & 6.2.1.1, regarding protection against cryogenic leakage and control of hazardous zones in fuel preparation rooms on open deck.

19. UI GF7 (New Dec 2017):

UI GF7 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 6.7.3.1.1.2 and figure 6.7.1, regarding sizing of pressure relief valve.

20. UI GF8 (New Dec 2017):

UI GF8 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 6.9.1.1, regarding control and maintenance of pressure and temperature of liquefied gas fuel tanks after the activation of the safety system.

21. UI GF9 (New Dec 2017):

UI GF9 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 8.3.1.1, regarding special consideration within the risk assessment of closed or semi-enclosed bunkering stations.

22. UI GF10 (New Dec 2017):

UI GF10 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 13.5.1, regarding ventilation of machinery spaces containing gas fuelled consumers.

23. UI GF11 (New Dec 2017):

UI GF11 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 13.8.2, regarding ventilation of double piping and gas valve unit spaces in gas safe engine rooms.

24. UI GF12 (New Dec 2017):

UI GF12 gives the interpretation for IGF Code, MSC Res.391(95), paragraph 13.8.3, regarding location of ventilation inlet of double wall piping or duct.

SUMMARY OF NEW/REVISIONS TO IACS RECOMMENDATIONS PUBLISHED IN 2017

New Revised Corrigenda Deleted/Withdrawn

Index	Resolution no.	Revision	Adoption	Title	Implemention Date
1	Rec 148	New	Jan 2017	Survey of liquefied gas fuel containment systems	-
2	Rec 109	Rev.1	May 2017	Acceptance criteria for cargo tank filling limits higher than 98% (on ships constructed before 1 July 2016)	-
3	Rec 149	New	May 2017	Guidance for applying the requirements of 15.4.1.2 and 15.4.1.3 of the IGC Code (on ships constructed on or after 1 July 2016)	-
4	Rec 150	New	May 2017	Vapour pockets not in communication with cargo tank vapour / liquid domes on liquefied gas carriers	-
5	Rec 151	New	Jul 2017	Recommendation for petroleum fuel treatment systems for marine diesel engines	-
6	Rec 72	Corr.1	Sep 2017	Confined Space Safe Practice	-
7	Rec 77	Rev.4	Oct 2017	Guidelines for the Surveyor on how to Control the Thickness Measurement Process	-
8	Rec 47	Rev.8	Oct 2017	Shipbuilding and Repair Quality Standard	-
9	Rec 84	Rev.1	Nov 2017	CONTAINER SHIPS - Guidelines for Surveys, Assessment and Repair of Hull Structure	-

1. Rec.148 (New Jan 2017):

Rec.148 gives recommendations for vessels which need to comply with the International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels (IGF Code), MSC Res.391(95). In developing the inspection/survey plan, the requirements for the survey of liquefied gas fuel containment systems are to be in accordance with the requirements of Unified Requirement Z16, Section 2.2.

2. Rec.109 (Rev.1 May 2017):

IACS developed the acceptance criteria in this recommendation in order to assist societies in advising Administrations on how to apply paragraph 15.1.3 of The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as amended. Since the revised IGC Code specifically stated that isolated vapour pockets were prohibited, that Rec 109 was revised to apply to the "old" IGC Code and Rec. 149 was issued for cargo tank filling limits under the revised IGC Code.

3. Rec.149 (New May 2017):

Rec.149 gives guidance for applying the requirements of 15.4.1.2 and 15.4.1.3 of the IGC Code (on ships constructed on or after 1 July 2016). since the revised IGC Code specifically stated that isolated vapour pockets were prohibited, that Rec 109 was revised to apply to the "old" IGC Code and Rec. 149 was issued for cargo tank filling limits under the revised IGC Code.

4. Rec.150 (New May 2017):

Rec.150 gives guidance for applying the requirements of 8.2.17 of the IGC Code which was amended by Res. MSC.370(93).

5. Rec.151 (New July 2017):

Rec.150 gives recommendation for petroleum fuel treatment systems for marine diesel engines. This recommendation is divided in two parts part I, recommendation for the treatment of fuel oil on board ships and in Part II, tests procedures to confirm the ability of RMF fuel oil pumps operation with marine fuels with low viscosity.

6. Rec.72 (Corr.1 Sep 2017):

Rec.72 gives guidelines for confined space safe practice. Work in confined and enclosed space has a greater likelihood of causing fatalities, severe injuries and illness than any other type of shipyard work or on board ships. In this corrigendum, correction was made to the CO & CO2 limits in the table.

7. Rec.77 (Rev.4 Oct 2017):

Rec.77 gives guidelines for the surveyor on how to control the thickness measurement process. In this revision, the relevant text in Recommendation 77 was aligned with the corresponding text in the revised PR 19 Rev.1. A footnote was added to the control process. MODU and Z15 were added to the para. 1.

8. Rec.47 (Rev.8 Oct 2017)

Rec.47 gives the recommendations for shipbuilding and repair quality standards. It is divided into two parts. Part A - Shipbuilding and Remedial Quality Standard for New Construction and Part B - Repair Quality Standard for Existing Ships. The reason for revision is to update information of Table 4.2 of Part B, revise standard references, and the nomenclature of some steel grade becomes obsolete.

9. Rec.84 (Rev.1 Nov 2017):

Rec 84 gives the guidelines for Surveys, Assessment and Repair of Hull Structure of Container ships. This revision contains significant changes, modification of some paragraphs, some sketches so that they are aligned to those contained in the other IACS Recommendations and Resolutions.

Appendix II Summaries of IACS Members Class Report Data

ABS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**240,858,829**	**9,444**	**375,233,955**	**1,860**	581	1,279	**110**
Tankers (crude, product & gas)	106,403,861	1,864	180,790,761				
Container vessels	38,972,077	546	42,803,314				
Dry bulk	55,145,928	1,074	102,406,822				
Passenger vessels (over 12 pax)	491,678	58	316,088				
Other ship types	39,845,285	5,902	48,916,969				

BV	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**117,346,936**	**9,450**	**174,480,930**	**1,328**	301	1,027	**109**
Tankers (crude, product & gas)	34,472,850	1,478	51,818,329				
Container vessels	18,368,250	444	20,999,002				
Dry bulk	45,093,659	2,137	84,910,245				
Passenger vessels (over 12 pax)	3,801,009	364	520,815				
Other ship types	15,611,168	5,027	16,232,539				

CCS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**86,638,584**	**3,241**	**138,016,074**	**1,183**	215	968	**45**
Tankers (crude, product & gas)	22,971,041	716	39,395,480				
Container vessels	13,839,111	312	15,393,826				
Dry bulk	41,232,876	917	75,281,637				
Passenger vessels (over 12 pax)	1,276,783	151	345,819				
Other ship types	7,318,773	1,145	7,599,313				

CRS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**1,491,070**	**307**	**2,095,614**	**50**	21	29	**17**
Tankers (crude, product & gas)	639,642	18	1,083,809				
Container vessels	-	-	-				
Dry bulk	638,310	21	965,968				
Passenger vessels (over 12 pax)	166,379	198	18,080				
Other ship types	46,739	70	27,757				

DNV GL	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**281,991,825**	**10,694**	**372,033,196**	**1,960**	621	1,339	**105**
Tankers (crude, product & gas)	71,164,073	1,662	127,728,398				
Container vessels	94,375,136	1,925	106,288,007				
Dry bulk	42,270,440	958	76,375,526				
Passenger vessels (over 12 pax)	10,854,851	426	1,148,753				
Other ship types	63,327,325	5,723	60,492,512				

IRS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**11,622,313**	**1,025**	**19,012,008**	**201**	64	137	**37**
Tankers (crude, product & gas)	6,844,811	168	11,750,209				
Container vessels	484,072	24	624,552				
Dry bulk	3,065,729	124	5,437,664				
Passenger vessels (over 12 pax)	138,280	53	48,055				
Other ship types	1,089,421	656	1,151,527				

KR	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**65,095,188**	**1,747**	**99,930,337**	**691**	74	617	**78**
Tankers (crude, product & gas)	20,366,845	627	32,642,859				
Container vessels	7,813,311	227	9,081,859				
Dry bulk	28,765,860	473	53,439,604				
Passenger vessels (over 12 pax)	141,904	8	44,603				
Other ship types	8,007,268	412	4,721,412				

LR	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**205,987,860**	**6,445**	**298,110,098**	**1,364**	404	960	**106**
Tankers (crude, product & gas)	96,929,834	1,817	155,484,035				
Container vessels	31,653,584	541	34,989,616				
Dry bulk	53,399,976	1,191	95,904,161				
Passenger vessels (over 12 pax)	11,214,801	378	1,416,183				
Other ship types	12,789,665	2,518	10,316,103				

NK	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**246,527,095**	**7,897**	**395,259,063**	**1,274**	178	1,096	**111**
Tankers (crude, product & gas)	44,059,008	1,399	69,994,955				
Container vessels	21,970,095	595	24,377,709				
Dry bulk	155,126,048	3,870	281,717,077				
Passenger vessels (over 12 pax)	166,966	9	88,517				
Other ship types	25,204,978	2,024	19,080,805				

PRS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**2,413,882**	**307**	**3,482,188**	**102**	40	62	**36**
Tankers (crude, product & gas)	103,840	17	157,023				
Container vessels	41,813	2	50,874				
Dry bulk	1,492,252	61	2,519,694				
Passenger vessels (over 12 pax)	191,712	38	34,307				
Other ship types	584,265	189	720,290				

RINA	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**36,792,827**	**3,243**	**45,796,339**	**487**	106	381	**89**
Tankers (crude, product & gas)	8,399,045	591	13,610,636				
Container vessels	2,766,522	99	3,188,287				
Dry bulk	10,800,560	294	19,562,961				
Passenger vessels (over 12 pax)	6,620,935	513	1,228,690				
Other ship types	8,205,765	1,746	8,205,765				

RS	Gross Tonnes	No of vessels	Deadweight	Total no. of Surveyors	Plan approval engineers	Exclusive ship surveyors	No of flag Administrations with which the Class Society has agreements
Total Size of classed fleet	**10,602,257**	**2,568**	**12,111,624**	**723**	77	646	**64**
Tankers (crude, product & gas)	4,285,198	542	5,641,287				
Container vessels	216,592	19	270,978				
Dry bulk	562,565	27	917,769				
Passenger vessels (over 12 pax)	101,392	95	26,658				
Other ship types	5,436,510	1,885	5,254,932				

Classed fleet figures include ocean going self-propelled ships of 100 GT and over, excluding fishing vessels, military vessels and pleasure craft, with dual classed ships counted at 100%.

Number of surveyors includes combined total number of surveyors, consisting of the number of exclusive plan approval engineers (RO Code A1.1.2 Plan approval staff are the personnel authorized to carry out design assessment and to conclude whether compliance has been achieved), and the number of exclusive surveyors involved in surveys of ships (RO Code A1.1.1 Survey staff are the personnel authorized to carry out surveys (in operation and under construction), and to conclude whether or not compliance has been achieved.)

Number of flag Administrations with which the Class Society has agreements means number of flag Administrations with which the class society has agreements to act on their behalf as a recognized organization.

IACS

International Association
of Classification Societies

IACS Limited
Permanent Secretariat
6th Floor, 36 Broadway
London SW1H 0BH
United Kingdom

www.iacs.org.uk