

For the

# CINEXET Century

ANNUAL REPORT 1998



**ClassNK**

## PROFILE

Nippon Kaiji Kyokai, or ClassNK, celebrates its 100th anniversary in November 1999. In the past century, ClassNK has grown in stature, becoming one of the world's leading ship classification societies with a proven record of dedication to ensuring safety at sea and preventing pollution of the marine environment. As a non-profit, completely independent organisation, the Society serves the needs of the maritime industry on a global scale. Its standards for the design, construction and maintenance of ships and marine structures, which are backed by an exhaustive research program, are recognised around the world.

ClassNK also provides assessments of compliance with international rules, quality system certification, technical consultation, and type approvals of materials and equipment. These and other services are made possible by a network of expert surveyors stationed in offices worldwide.

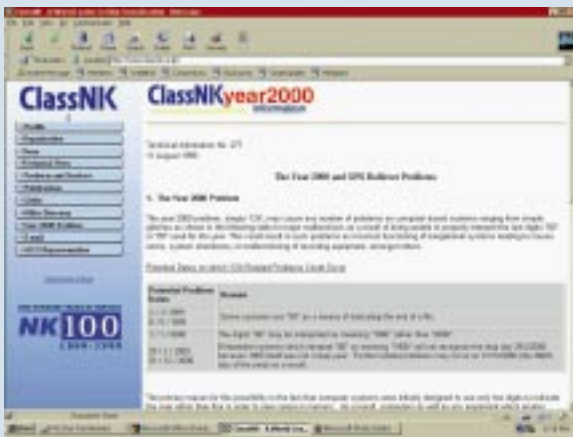
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## HIGHLIGHTS OF 1998

### Y2K PROJECT TEAM ESTABLISHED

ClassNK has established a special project team to examine the problem of Year 2000 (Y2K) compliance at the Head Office and began offering a variety of services in August 1998. The primary aim of this project team is to conduct research on how computer system performance at the turn of the century will affect the operation of ships and to work out preventive measures against potential problems. Another goal of this team is to share the results of its work with clients and related industries to the fullest possible extent.



ClassNK's Y2K information on the World Wide Web

The results of Y2K Project Team research are being published in the *ClassNK Technical Information* newsletter and on the Society's site on the World Wide Web ([www.classnk.or.jp](http://www.classnk.or.jp)).

Achievements of the team thus far include:

1. The collection of information from shipbuilders on presupposed predicted Y2K problems in electronic and electric equipment, the effect these problems could have on ships and measures that can be taken; and
2. The creation of Y2K Risk Management Guidelines for the creation of risk management manuals by shipowners, operators and manufacturers, which includes thorough tests that can be implemented by shipowners, operators and manufacturers of equipment to avoid potential problems, as well as measures to cope in the event of trouble and samples of measures taken by companies and ships.

### EVALUATION BY PORT STATE CONTROL

With regard to Port State Control (PSC), ClassNK was recognised with zero penalty point status by the U.S. Coast Guard (USCG) for its very low detention rate over the past three years. This evaluation signifies that ClassNK ranks among the world's top ship classification societies.

### PARTICIPATION IN SHIP CALS (CONTINUOUS ACQUISITION AND LIFECYCLE SUPPORT) PROJECT

ClassNK, seven major shipbuilders and Nippon Yusen K.K. (NYK) participated in the Ship CALS Project, relating to the electronic approval of design drawings as well as the digitization and networking of ship-related information. Some of the initial objectives of the project were successfully met during the year, including the establishment of a system for electronic transfer of plans and the enabling of 3-D CAD data distribution.

### ELECTRONIC VERSION OF TECHNICAL RULES

In 1998, ClassNK released not only its regular printed, but also the first CD-ROM version of technical rules, including the *Rules for the Survey and Construction of Steel Ships*. This CD-ROM release follows on the previous year's *Register of Ships* on CD-ROM. Because the technical rules and survey summaries are compiled in an SGML (electronic text format) database, users can easily search for and refer to the data they need.

### PROGRAM DEVELOPED FOR NEW RULES CONCERNING BULK CARRIER SAFETY FOR NEW SHIPS AND MEASURES TO IMPROVE SAFETY OF EXISTING SHIPS

A new set of IACS stability and structural requirements is to be applied to new bulk carriers. For ship designers, ClassNK has developed an analytical program separate from NK-BOSUN, its existing program for calculating hull scantlings. By using the new program, designers can meet all ClassNK requirements.

The Society has also reviewed the structural requirements for existing ships to ensure safety and has worked out measures for ships failing to meet the requirements. Further details on this topic can be found on page 33 of this publication.



Calculation program for bulk carrier safety for new ships

## MESSAGE FROM THE CHAIRMAN AND PRESIDENT



(From left) Managing Director Y. Tsudo, Executive Vice President M. Hidaka, Managing Director Dr. M. Oka, Chairman and President T. Mano, Managing Director M. Murakami, Executive Vice President K. Ogawa, Managing Director T. Takano

### REFLECTING ON THE PAST, AS WE LOOK TO THE FUTURE

The year 1999 is one of reflection for ClassNK. As the Society looks back to its foundation 100 years ago, we are also looking to the future, preparing to offer an ever higher level of service as the world and the shipping and shipbuilding industries plan for the 21st century. Considering the long history of our organisation, one can only wonder at the devoted and often unsung efforts of many thousands of staff who have served the Society. A sense of tradition, despite the many changes that have taken place, is of great importance to ClassNK. This tradition, of striving continuously to further marine safety, serves

to define what the Society is, and gives us the confidence to face the challenges of the future. I am certain that these challenges will continue to demand resourcefulness, spirit and ever-closer communication with our clients, partners and friends in Japan and around the world.

Many indicators point to the fact that ClassNK has 'come of age' as a major international class society. The ClassNK name and logo, introduced in the early 1990s, is well known today. The Society has also worked actively to employ professionals from around the world, and in June 1997 the total gross tonnage of ships under class with the Society exceeded the 100 million mark for the first time.



This total has been steadily growing, to the point where about 20% of the world merchant tonnage under class is now on our Register.

Various events are planned to commemorate ClassNK's centenary this year, including a publication outlining the history of the Society and the establishment of a new NK Award, a prize to be awarded for outstanding academic papers by students in Asia. Other activities include upgrading the computer hardware in the ClassNK Room at the World Maritime University and founding an information centre that can protect the Society's data resources and records in the event of a major earthquake. The new centre, which is also part of our program to centralise and improve access to our information resources, is scheduled for completion in May 2001.

In 1998, ClassNK had a busy year despite problems in the financial sector in Japan and the effects of the Asian financial crisis that began in the latter half of 1997. This brisk activity was the result of factors including increased shipbuilding on a global scale, implementation of the International Safety Management (ISM) Code and measures to ensure bulk carrier safety, and the increased scope of work which the government of Japan acknowledges that the Society can undertake. In addition, improvements to NK-SHIPS, our on-line, secure classification and survey record database, and PrimeShip, our integrated group of systems and services for lifetime ship care, also contributed to making the year one of progress.

In addition, ClassNK saw significant developments in its other information-providing services. We have begun to provide vital information on the Y2K problem via our web site, created a database in SGML format for documents related to technical regulations, and released a CD-ROM version of the *Rules for the Survey and Construction of Steel Ships*.

Looking at future developments in ship inspection activities, which contribute to ensuring safety at sea and preventing pollution of the marine environment, recent PSC activity is representative of a growing trend toward removing substandard ships from operation. The safety of ships is maintained not only by shipowners, but it also relies on a long 'chain of safety' that includes flag and port state authorities, classification societies, shippers, insurance companies and

other groups in related industries, each of whom bears different responsibilities.

In support of our role in this process, we are planning to introduce PrimeShip-HullExpert, a database of technical information covering various aspects of the design, construction, maintenance and inspection of hull structures, based on ClassNK's wealth of experience in the classification of many types of ships. Using this database, the first full version of which is scheduled for completion at the end of 1999, practical information regarding hull structures can be accessed with ease.

We are confident that not only our surveyors, but also technical experts and a wide range of others in the marine and shipbuilding fields will find this package of great benefit.

As ClassNK embarks on its second century of operations, to ensure that we continue to offer high-level surveying capabilities and services that win the confidence of shipowners, shipyards and other customers, we will continue to expand our inspection network, develop advanced technologies and improve information systems and surveyor training. In the future, remaining free from the pressures of business in the private sector, ClassNK will continue to devote itself to its maritime activities and, as a non-profit, independent third-party ship classification society, aim to provide its clients with the highest possible level of service.

As the Society approaches its 100th anniversary, I would like to thank all of our clients, friends and staff around the world, and to request your continued support as we move into what I trust will be a happy and prosperous new century for us all.

March 1999



Tadashi Mano  
Chairman and President





The Year in  
**REVIEW**

In 1998, the total tonnage of ships under class with the Society surpassed 100 million tons for the second consecutive year. As a result, although prospects for the shipbuilding industry remain uncertain, ClassNK was able to make favourable progress during the year.

Service activities spanned a wide range of fields. The Society worked to ensure compliance of companies and ships with the ISM Code by the 1 July 1998 deadline. To keep pace of technical innovations, ClassNK developed new-generation computer technologies for ship classification operations and released information on Y2K computer issues through publications and its site on the World Wide Web. Other service-related activities included appraisals of compliance with the nitrous oxide (NOx) regulations for diesel engines set under the MARPOL protocol on preventing marine pollution from ships.

In addition, in accordance with the strengthening of international regulations on the safety of ships and environmental preservation, ClassNK supported the formation of technically rational and practical agreements through such global organisations as the International Maritime Organisation (IMO) and the International Association of Classification Societies (IACS).

## CLASSIFICATION ACTIVITIES

### CLASSED FLEET

As of 31 December 1998, the ClassNK Register totalled 6,640 ships, equal to a total gross tonnage of 104,914,485 gt, up 3,154,819 gt from the total for the previous year.

In all, 5,319 ships, or 80.1% of the ClassNK Register at the close of 1998, were flagged outside Japan, with ports of registry in 71 nations and territories. In terms of gross tonnage, this number is equal to 90,973,109 gt, or 86.7% of the total. Ships flying the flags of Panama, Japan, Liberia, Singapore and the Philippines accounted for 76.7% of the total and 81.8% of the gross tonnage classed by the Society.

Additions to the Register during the year amounted to 471 ships, or 7,231,015 gt, representing a decrease of 80 ships but an increase of

35,660 gt from a year earlier. In all, 378, or 4,237,601 gt, left the Register, a decrease of 14 ships, but an increase of 631,039 gt, from 1997. Of this total, 175 vessels were removed for reasons of non-compliance with Society rules, and 101 were transferred to other classification societies.

### NEWBUILDINGS

Newly constructed ships classed by the Society dropped 16.7%, to 404, equal to 6,714,594 gt, which is approximately the same gross tonnage level as in 1997. The number of new tankers and liquefied gas carriers rose 38.8%, to 93 vessels (up 36.4%, to 1,644,308 gt). New bulk carriers added to the Register dropped 28.0%, to 103 ships (down 30.7%, to 3,029,890 gt), while new cargo ships slipped to 124, from 127 in 1997 (up 63.4%, to 1,934,022 gt).

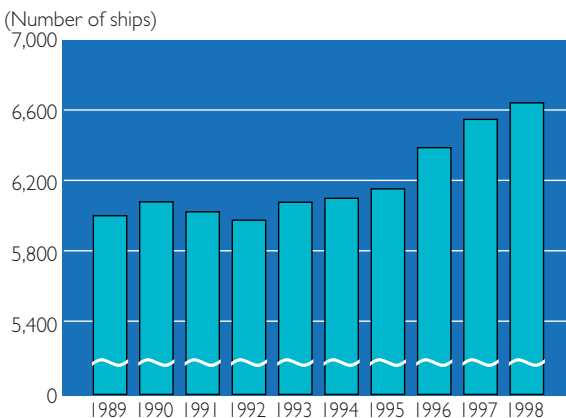


Fig. 1a Total number of ships classed

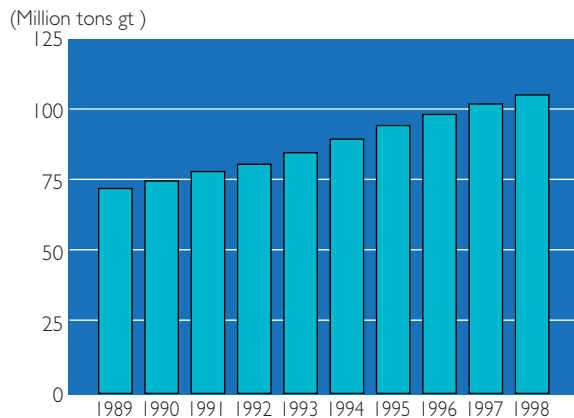


Fig. 1b Aggregate total gross tonnage of ships classed

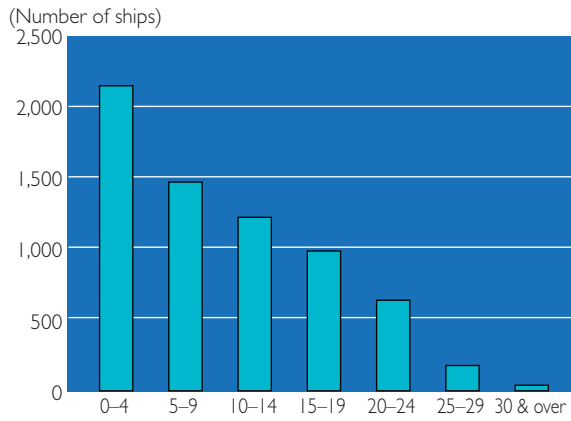


Fig. 2a Breakdown of ships classed by age

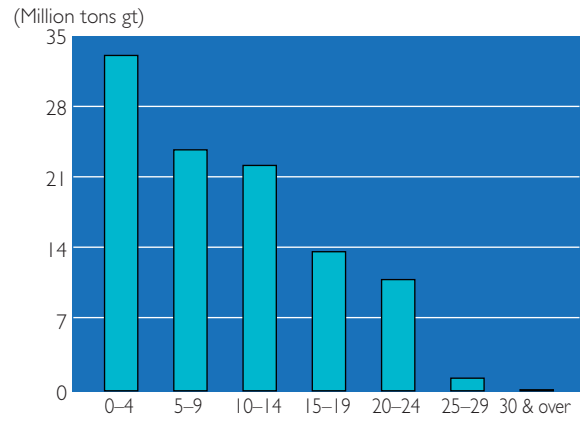


Fig. 2b Breakdown of ships classed by age

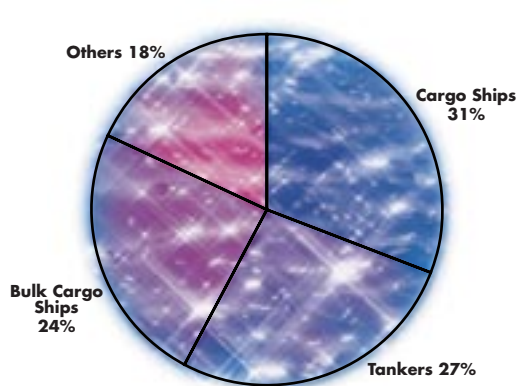


Fig. 3a Breakdown of NK-classed ships by type (Total number)

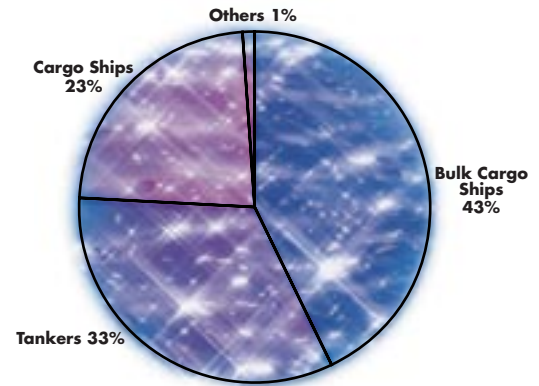


Fig. 3b Breakdown of NK-classed ships by type (Aggregate total gross tonnage)

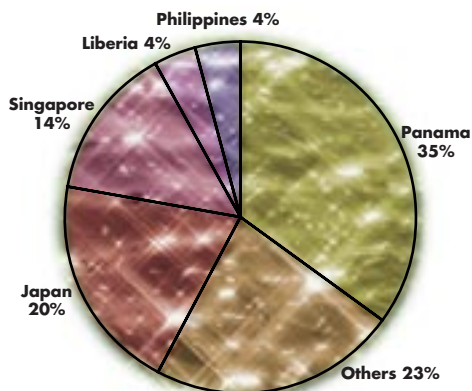


Fig. 4a Breakdown of NK-classed fleet by flag (Total number)

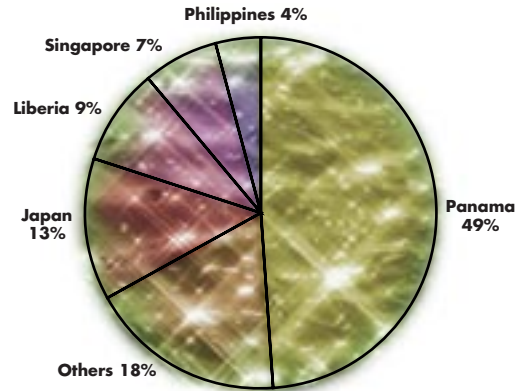


Fig. 4b Breakdown of NK-classed fleet by flag (Aggregate total gross tonnage)



## ACTIVITIES RELATED TO CLASSIFICATION

### INSPECTION OF MATERIALS, EQUIPMENT AND FITTINGS

Inspections of prime movers and auxiliary machinery increased from 1997, but inspections of boilers, deck machinery and equipment, fittings and freight containers dropped year-on-year. Materials inspections remained at the same level as a year earlier. A total of 10,136 inspections were performed on testing machines, a slight decline from the previous year.

### CERTIFICATION OF MANUFACTURERS

The number of marine-related certifications made by the Society amounted to 80, a 12.7% increase from the previous year. Certifications of materials and equipment came to 343. Furthermore, approval for Cargo Securing Manuals and firms engaged in thickness measurement work totalled 2,200 and 23, respectively.

### ASSESSMENT AND REGISTRATION BASED ON ISO STANDARDS

ClassNK is authorised by the Japan Accreditation Board for Conformity Assessment (JAB) to provide assessment and registration services under the ISO 9000 series of international quality-system standards. This authorisation covers the following fields:



The 50,655 dwt bulk carrier *Sanko Sincere*, built by Namura Shipbuilding for Sunlight Shipping



*Century Fortune*—a 73,829 dwt bulk carrier built by Sumitomo Heavy Industries for Ever Bright Shipping S.A.

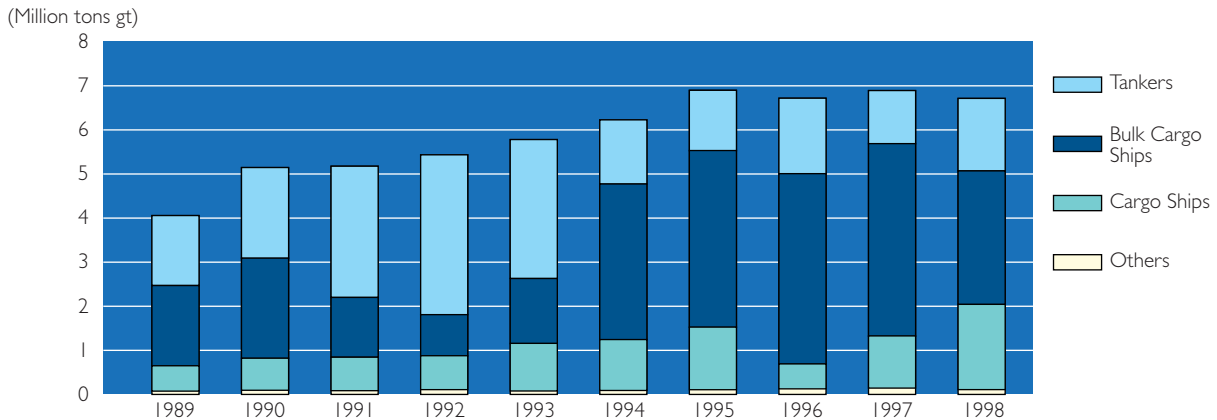


Fig. 5 Annual breakdown of newbuildings by type

1. Basic and fabricated metal;
2. Machinery and equipment;
3. Shipbuilding and water transport;
4. Cargo handling, storage and other transport support activities;
5. Technical testing and analysis; and
6. Labour recruitment and provision of personnel, and adult and other education.

In 1998, the Society assessed and registered 41 suppliers of the above products and services. As of 31 December 1998, ISO 9000 series registration by the Society totalled 145 suppliers.

Since September 1997, the Society has also been authorised to provide assessment and registration services under the ISO 14000 series of environmental management standards. One supplier was registered under this series in 1998.

#### SGS AND RvA CERTIFICATION

The Society is involved in classification services for ships and offshore installations with regard to new-building and in-service structures and statutory services carried out on behalf of appropriate national administrations. In this field, ClassNK obtained renewal of its ISO 9001:1994 certification, which was first obtained in 1995. This certification is applicable to ClassNK's Head Office, Research Center, and all of its domestic branches and

overseas offices. The audit was carried out by Société Generale de Surveillance (SGS), after which ClassNK was registered with Raad voor de Accreditatie (RvA) of the Netherlands.

Furthermore, to support compliance with the ISM Code, ClassNK was authorised to make its certification service program for ship safety management systems part of its statutory services. This authorisation conforms to ISM as a statutory IMO service.

In the area of technical services, appraisal/certification and technical consultation relating to ships, industrial facilities and equipment, the Society continued to offer assessment and registration services in 1998.

Activities such as these form the backdrop of the ship registration activities ClassNK has pursued in its 100 years of operations. In the future, the Society intends to continue improving the quality of these services to meet the needs of customers around the world.

#### AUDIT AND REGISTRATION OF SAFETY MANAGEMENT SYSTEMS

To handle strong demand for ISM Code assessments around the world, ClassNK has stationed trained auditors at its exclusive surveyor offices and has created a system to provide ISM assessment

#### INSPECTION OF MATERIALS, EQUIPMENT AND FITTINGS

<i>Category</i>	<i>Items</i>	<i>Amounts</i>
<i>Materials</i>	Rolled steel	2,915,500 tons
	Cast and forged steel	74,633 tons
<i>Equipment</i>	Prime movers	1,745 units
	Boilers	448 units
	Deck machinery and equipment	1,864 units
	Auxiliary machinery	26,589 units
<i>Fittings</i>	Anchors	952 units
	Chains	9,657 lengths
<i>Freight containers</i>		4,171 units

services at these locations. During 1998, the Society assessed, then granted Documents of Compliance (DOCs) and Safety Management Certificates (SMCs) to 107 companies and 1,247 ships. As of 31 December 1998, the total number of assessments had reached 365 companies and 2,270 ships.

**RESEARCH AND DEVELOPMENT**

ClassNK developed NewSTRIP, a software utility for calculating vessel seaworthiness, during the year. Designed to replace conventional programs, NewSTRIP incorporates highly advanced analysis and system technologies, and operates under Windows™ operating systems. It incorporates an improved strip method that raises analysing precision in short waves and following waves, and also features an interactive graphical user interface and database management functions.

In other activities, ClassNK began preparing *Casualty Review*, a series of pamphlets containing specially selected information on casualty cases drawn from the Society's records. The first issue, entitled *A Comprehensive Damage Review of Second-generation VLCCs*, was released in 1998.

Furthermore, in ClassNK's PrimeShip advanced total ship-care services, it is developing products such as PrimeShip-HullExpert, a comprehensive



*Ocean Favour*—a 72,400 dwt bulk carrier built by Sasebo Heavy Industries for Ocean Glory Maritime Inc.



The 75,752 dwt bulk carrier *Orange Tiger*, built for Victoria Steamship Inc. by Sanoyas Hishino Meisho



The 72,497 dwt bulk carrier *Spring Peacock*, built by Imabari Shipbuilding for Spring Peacock Corporation



The 77,283 dwt bulk carrier *Corona Dynamic*, constructed by Kawasaki Heavy Industries for Whale Line S.A.

database with information on hull structures. PrimeShip-HullExpert contains a wide range of technical data amassed by the Society with regard to the design, construction, maintenance and inspection of hull structures. The product is a PC database that facilitates access to practical information in related fields, making it beneficial to a wide range of users. After releasing a demo version of PrimeShip-HullExpert in the summer of 1999, the Society plans a partial release by year-end.

ClassNK's R&D activities cover a variety of other areas, and results of this work are announced through lectures around the world. Details can be found in the Worldwide Activities section on page 14.

## ESTABLISHMENT OF AND AMENDMENTS TO TECHNICAL RULES

### ESTABLISHMENT

In 1998, ClassNK adopted the *Rules and Guidance for the Audit and Registration of Safety Management Systems*.

### AMENDMENTS

The following technical rules were amended during the year:

1. *Regulations for the Issue of Statutory Certificates* (Partial);
2. *Rules for Approval of Manufacturers* (Partial);
3. *Rules and Guidance for the Survey and Construction of Steel Ships* (19 amendments, including partial revision of Part B on the subjects of strengthening bulk carrier safety and surveys of lifesaving equipment);
4. *Rules and Guidance for High-Speed Craft* (Partial, related to surveying);
5. *Rules for the Survey and Construction of Ships of Fibreglass Reinforced Plastics* (Partial, related to surveying);
6. *Rules for Floating Docks* (Partial, related to surveying);
7. *Rules and Guidance for Marine Pollution Prevention Systems* (Partial, related to surveying and intact stability of oil tankers, etc.);
8. *Rules and Guidance for Cargo Refrigerating Installations* (Partial, related to surveying);
9. *Rules and Guidance for Cargo Handling Appliances* (Partial, related to surveying);
10. *Rules for Diving Systems* (Partial, related to surveying);
11. *Rules and Guidance for Automatic and Remote Control Systems* (Partial, related to surveying and environmental testing of automatic machinery and equipment, etc.);



*Lady Kadoorie*—a 151,249 dwt bulk carrier built by NKK Corporation for Estrella Navigation S.A.



The 47,541 gt container carrier *Concord Bridge*, built by Imabari Shipbuilding



- 12. *Rules and Guidance for Navigation Bridge Systems* (Partial, related to navigation bridge visibility);
- 13. *Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use* (Full and partial; related to six sections, including lifesaving equipment prototype approval).

**TECHNICAL SERVICES**

Drawing on know-how garnered through 100 years of experience, ClassNK offers diverse technical services in addition to those related to ship classification and surveying. In 1998, such services included the supervision of shipbuilding, computer analysis, and a variety of inspections of industrial plants and equipment requested by the parties ordering them, government organisations and third parties.

One noteworthy activity was the commencement of NOx appraisal services for organisations desiring to obtain assessments prior to the 1 January 2000 enforcement of *IMO Regulations for the Prevention of Air Pollution from Ships*. In 1998, appraisals were performed at plants manufacturing 130 different models of diesel engine in 10 product groups.

ClassNK also performed consulting services such as safety evaluations on wave power generation plants under construction and ship lift systems, as well as assessments of hull status.



*NYK Castor*—a 76,847 gt container carrier built by Mitsubishi Heavy Industries for Vesta Co., Ltd.

**ACTIVITIES ON BEHALF OF GOVERNMENTS**

In 1998, the governments of the Republic of Equatorial Guinea and Bolivia newly authorised ClassNK to perform statutory surveys on ships flying their flags. These operations are offered in accordance with international conventions and national regulations. With the addition of these two nations, the number of countries authorising us to perform these duties and issue certificates reached 96.

**COMMITTEES**

Having surpassed the 100-million-gt mark in its ship classification activities, it is vital that ClassNK raise



The 3,499 gt LPG tanker *Gas Jaya*, built for Raffkesia Marine S.A. by Shin Kochi Jyuko



*Nassau Spirit*—a 107,181 dwt oil tanker built by Koyo Dockyard for Vissi Transport Inc.

awareness of its status as a leader in the world's marine transport and shipbuilding industries and become even more responsive to client needs. To this end, six general and six technical committee meetings are held outside Japan every year. Through such gatherings, committee members provide the Society with a high level of valuable information, and ClassNK can pass on technical and other information related to its activities. The meetings held in 1998, which mainly focused on the subjects of bulk carrier safety, NOx emission regulations, Y2K problems and amendments to international rules, were highly evaluated by participants.

## IMO

ClassNK representatives participated as part of the Japanese delegations at the following committee meetings in 1998:

- 41st meeting of the Sub-committee on Stability and Load Lines and on Fishing Vessels Safety (SLF);
- 41st and 42nd meetings of the Marine Environment Protection Committee;
- 41st meeting of the Sub-committee on Ship Design and Equipment;
- 69th and 70th meetings of the Marine Safety Committee; and
- 3rd meeting of the Sub-committee on Bulk Liquids and Gases.



*Delphinus Leader*—a 57,391 gt vehicle carrier built by Imabari Shipbuilding for Milford Shipholding S.A.



The 57,623 gt vehicle carrier *Aquarius Leader*, constructed at Shin Kurushima Dockyard for Hercules Shipholding Navigation S.A.



The 280,889 dwt oil tanker *Takachiho II*, constructed by Ishikawajima-Harima Heavy Industries for Seaborn Enterprises



*Koushin Maru*—a 2,496 gt cable layer built by Hitachi Zosen Corporation for Dokai Tugboat Corp.

## IACS

As a founding member of IACS, ClassNK actively supports the association's efforts to advance classification procedures. In the year under review, we participated in the following meetings:

- Council: 2 meetings;
- Quality Committee: 1 meeting;
- General Policy Group: 2 meetings;
- Ad-hoc Group on Bulk Carrier Safety: 2 meetings;
- Working Group: 9 meetings; and
- Extraordinary Working Group: 14 meetings.

Furthermore, ClassNK served as the chair of two extraordinary working groups in the areas of hull damage and material welding. Major topics covered by these working groups included:

- Y2K problems;
- Realistic response in light of ISM Code enactment;
- Bulk carrier safety;
- IACS management policies;
- Response to EU regulations;
- Requests from related industries;
- Position of classing organisations in accordance with the amended SOLAS;
- Future measures in response to the survey report on the *Derbyshire* sinking; and
- Decisions on standard regulations: two established, three abolished and 18 amended.



*Varuna*—a 13,654 gt passenger ship/vehicle ferry constructed by Mitsubishi Heavy Industries



*Koyo Maru*—a 2,096 gt ocean-going salvage tug built for Japan Ocean Tug and Nippon Salvage by Mitsubishi Heavy Industries



# WORLDWIDE

## Activities





*To promote ClassNK's further development as a leading ship classification society, in 1998 the Society continued to globalise its internal organisation. We opened offices in Qingdao, China; Miri, Malaysia; and Hachinobe, Japan. At our overseas offices, we also increased the numbers of locally employed managers and survey personnel dispatched from Japan. In addition to survey activities, we gave lectures to a wide variety of audiences with the aim of introducing our technological capabilities and the abundant know-how and research achievements we have made in 100 years of operations. Other activities included international co-operation in the form of training for government survey officials, which is part of our diverse efforts to ensure safety at sea and preservation of the marine environment.*

## JAPAN

In 1998, as in the previous year, many new vessels including two VLCCs, three large-scale LNG tankers and one cruise liner were constructed in Japan to NK class. As a result, the total number of newly built NK-classed vessels rose to 316, equal to 6.16 million gt.

Newbuildings worthy of note in 1998 included the *Koyo Maru*, the largest tug in Japan, which received the Society's BRS1A classification for bridge systems because it was designed to minimise manpower requirements. Another specialised vessel entering class was the *Koushin Maru*, a 2,496 gt cable layer.

In the field of technical services, ClassNK performed appraisals of compliance with NOx emission regulations for maritime diesel engines at Yanmar Diesel Engine Co., Ltd and Daihatsu Diesel Mfg. Co., Ltd. In addition, the Society performed third-party inspections of pressure vessels destined for China and Malaysia based on the ASME Code.

In its ISO-related activities, Fukushima Ltd. became the first company to receive ISO 14001 certification for environmental management systems from ClassNK. Furthermore, the Society granted ISO 9001 certification to a total of 13 companies during the year, including:

- NKK Corporation  
Design, Production, Installation and Servicing of Sludge Treatment Equipment;
- Kamome Propeller Co., Ltd.  
Design, Development, Production, Installation and Servicing of Fixed Pitch Propellers, etc.;
- Oshima Shipbuilding Co., Ltd.  
Design, Production and Installation of Steel Bridges;
- Kobe Diesel Co., Ltd.  
Design, Development, Production and Servicing of UE Diesel Engines;
- Nakamura Jico Co., Ltd.  
Design, Development, Production and Servicing of Heat Exchangers; and
- Fuji Car Mfg. Co., Ltd.  
Design, Production, Installation and Servicing of Pressure Vessels.



ISO 9002 certifications were granted to 10 companies, such as:

- NKK Corporation  
Production and Servicing of Diesel Engines, Steam Turbines, Boilers, Cranes, Shield Tunnelling Machines and Coated Steel Pipes; and
- Sanoyas Hishino Meisho Corporation  
Servicing (Maintenance, Service parts supply, Service engineer) of High-Speed Engines.

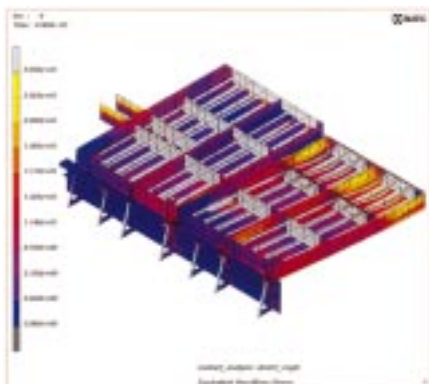
The Society issued DOCs for compliance with the ISM Code to 41 companies, including Fukunaga Kaiun Co., Ltd., Hayama Shipping Ltd. and Nissan Prince Kaiun Co., Ltd. These achievements brought ClassNK's total number of ISM Code DOCs to 201.

Also during the year, the Society authorised five maritime industrial facilities. Among these facilities were Kure Plant No. 1 of Ishikawajima-Harima Heavy Industries Co., Ltd., and the Maizuru Plant of Hitachi Zosen Co., Ltd.

In March 1998, ClassNK participated in an exhibit at SEA EXHIBITION '98, held in Yokohama. In addition to demonstrations of IPCA—a computer software utility in the PrimeShip series—and CS-BOSUN, the Society introduced its measures related to CALS and STEP in the New Technology Seminar. At the 12th Asian Technical Exchange and Advisory Meeting on Marine Structures, which was held in

July in Kanazawa, a lecture was offered on ClassNK's collapse analysis of hatch covers and transverse bulkheads. This lecture was presented as an example of elasto-plastic analysis of bulk carrier structural parts with large deformation. Also in July, at '98 ClassNK Seminar events held in Tokyo, Kobe, Imabari and Fukuoka, the Society explained amendments to technical rules, following the amendments to SOLAS and the Japan Ship Safety Law, and the enforcement of NOx emission regulations. In November, the Society presented the results of its R&D activities through an event in Tokyo. Presentations covered seven topics, including PrimeShip-HullExpert: A Comprehensive Database for Use in the Design, Construction, Inspection and Maintenance of Hull Structures and Recent Trends in Damage and Ageing Effects in Propulsion Shafting as Seen from Classification Surveys.

In the area of international co-operation, at the request of the Tokyo MOU (Memorandum of Understanding), ClassNK conducted lectures for PSC surveyors in the Asia-Pacific region on the subjects of SOLAS and MARPOL. Furthermore, following a request from the Overseas Shipbuilding Co-operation Centre (OSCC), the Society held lectures on ship surveys and related topics for trainees from developing countries.



Collapse analysis of bulk carrier hatch covers



SEA EXHIBITION '98 (Japan)



## ASIA AND OCEANIA

### AUSTRALIA

In 1998, construction was completed in Japan for an NK-classed 8,823 dwt oil/chemical tanker destined for the Botany Bay Shipping Group. The Society also certified cable models for Triangle Cable (Australia) Pty. Ltd., and authorised Podean Electronica Naval Ltd. and another company as radio service companies, and Commercial Diving Services Pty. Ltd. as an in-water survey firm.

ClassNK opened an exhibit at LNG12, a global exhibition related to the LNG industry, which was held in Perth in May. The Society promoted its PrimeShip series and other products and services, and informed visitors of the fact that one-third of all modern LNG tankers are registered with ClassNK.

### INDIA

At INMARCO 98, a research symposium sponsored by the Institute of Marine Engineers of India in November, a report entitled *Human Factors on Man-Machine Systems in Engine Rooms* was presented by a representative of the Society. The report was based on an analysis of the cause of accidents reported by surveyors. In



The 8,823 dwt oil/chemical tanker *Botany Trust*, constructed by Hitachi Zosen Corporation



Technical Seminar in Goa (India)

December, ClassNK held a technical seminar in Goa on topics including PSC and requirements of ship classification surveys during construction.

#### INDONESIA

Construction was completed in Japan for an NK-classed 17,781 dwt oil tanker and a 3,499 gt LPG tanker for delivery to Indonesia.

In ISO-related activities, the Society certified P.T. Scorpa Pranedya under ISO 9002 regulations for crew manning. ClassNK awarded DOCs to five Indonesian shipowners, including P.T. Admiral Lines and P.T. Djakarta Lloyd. With these additions, a total of 10 Indonesian shipowners have been granted DOCs by the Society.

At ISM Code Seminars sponsored by the Japan International Cooperation Agency and ClassNK in February in Jakarta and Denpasar, lectures were given to survey personnel from the Sea Communication Department of the Indonesian Ministry of Transportation. In addition, at the Universitas Darma Persada (UNSADA) Seminar held in Jakarta, ClassNK made a presentation of its PrimeShip-BOSUN software application for calculating hull scantlings.



ISM Seminar in Denpasar (Indonesia)

#### MALAYSIA

To help improve survey services in Malaysia, ClassNK opened an office Miri in 1998. This opening brings the total number of ClassNK offices in Malaysia to four.

Owing primarily to the Asian economic crisis, the number of newbuildings in Malaysia decreased from the previous year. In all, 35 NK-classed ships were constructed, including one passenger vessel and two oil barges. These ships were delivered to shipowners in Malaysia, Singapore and other locations. In Japan, work was finished on the 18,942 m<sup>3</sup> LPG tanker *Aman Hakata*, an NK-classed ship destined for Asia LNG Transport Dua Sdn. Bhd.



*Aman Hakata*—an 18,942 m<sup>3</sup> LNG tanker constructed by NKK Corporation for Asia LNG Transport Dua (Malaysia)



*Pegaden/Pertamina 1024*—a 17,781 dwt oil tanker constructed by Sasebo Heavy Industries for Pertamina (Indonesia)



In ISM Code-related operations, the Society granted a DOC to Semua Shipping Sdn. Bhd. In addition, Samudera Dive Services (M) Sdn. Bhd. was authorised as an in-water survey firm.

At World Maritime Day, 1998, sponsored by the Brunei Marine Department in November, ClassNK participated in an ISM Code panel discussion held as part of a seminar.

**PACIFIC ISLANDS**

Ships built in Japan to NK class for delivery to shipowners in the Pacific included a Ro-Ro ship for Micronesia, a passenger ferry for Samoa and a



*Caroline Voyager*—a 1,335 gt roll-on/roll-off carrier constructed by Hitachi Zosen Corporation for the government of Micronesia



The 993 gt passenger ferry *Lady Naomi*, built by NKK Corporation for the Samoan government

fishing training and fishery survey vessel for Tonga. Among these ships, the ferry was built in compliance with SOLAS 94 and features two large inflatable life rafts with carrying capacities of 100 people.

**PEOPLE'S REPUBLIC OF CHINA**

In response to the development of China's ship-building and marine transportation industries, ClassNK worked in 1998 to further enhance its services for customers by opening its fifth office in the country, in Qingdao. NK-classed ships completed in China during the year included a 15,962 dwt bulk carrier at the Xingang Shipyard, a 12,630 dwt bulk carrier at the Jingjiang Shipyard, three 190 gt tugs at the Donghai Shipyard and a 215 gt oil tanker at the Dalian Shipyard. At the Beihai Shipyard, the Society acted as supervisor for the shipowner during construction of a large coal carrier barge.

Material and equipment approvals were granted to a variety of companies during the year. These approvals included rolled steel from Qinhuangdao Shougang Plate Mill and Anyang Iron & Steel Group Co., Ltd., welding materials from Nangjin Dagang Electrode Factory, propellers and other castings from Tianjin Sanda Casting Co., Ltd., manufacturing methods for



*Siong Lian Express*—a 215 gt oil tanker constructed by Dalian Shipyard Enterprises (China) for a Singapore shipowner



Symposium sponsored by MARIC



*Hercules Leader*—a 57,449 gt vehicle carrier built by Imabari Shipbuilding for Hong Kong-based managers



The 77,663 dwt bulk carrier *Energy Pegasus*, constructed by Mitsui Engineering & Shipbuilding for Bouquet Shipping S.A.

anchors and other equipment from Shanghai Hudong, lifeboats from Qingdao Beihai Shipyard and Jiangyin Wolong F.R.P. Boat Co., Ltd., boat davits from CSSC Zhenjiang Marine Auxiliary Machinery Works and emergency towing equipment from China Shipbuilding Trading Co. Ltd. Furthermore, Yiu Lian Dockyards and three other companies were authorised as plate thickness measurement firms.

At a technical symposium sponsored in Shanghai in October by the Marine Design & Research Institute of China (MARIC), ClassNK gave lectures on subjects including cautionary points related to vent systems of oil and chemical tankers and the USCG Vapor Control System. The Society also made presentations on LPG and chemical tankers at shipyards throughout China.

In Hong Kong, ships built in Japan, the Republic of Korea and China were delivered as NK-classed ships to Hong Kong shipowners and management companies. These vessels included 57,449 gt and 57,623 gt vehicle carriers for Wallem Shipmanagement Ltd., as well as 19 bulk carriers, one oil tanker, two oil/chemical tankers and two refrigerated cargo carriers. Material and fittings approvals included Wuxi Hai Hong Boat Making Co. Ltd. for lifeboats and Billboard Engineering Co., Ltd., for emergency equipment on tugs.

ISM Code DOCs were granted to Gold Bridge Shipping Limited and two other companies, bringing to 20 the total number of DOCs awarded by the Society to Hong Kong shipowners. Also, at a seminar sponsored by the Tokyo MOU and held in Hong Kong for 40 PSC surveyors from 13 nations and regions in the Asia-Pacific area, ClassNK held a lecture on ISM Code requirements.

**PHILIPPINES**

Two bulk carriers constructed by Tsuneishi Heavy Industries (Cebu), Inc. were completed as NK-classed vessels. In addition, the Society classed four new-buildings built in Japan for Philippine shipowners: a 51,152 dwt chip carrier and three bulk carriers. During 1998, ClassNK approvals in the Philippines included welding materials of Industrial Welding Corporation, Sandoval Shipyards Inc. as a plate thickness measurement firm, and Subsea Services Incorporation and one other company as in-water survey firms.

In ISO-related operations, the Society granted ISO 9002 certification to Tsuneishi Heavy Industries. Furthermore, ISO certification for ship crew training was conferred on K-Line Maritime Training Corporation, and ISO 9002 certification for crew manning was granted to Leonis Navigation Company, Inc., and another company.

In ISM-related activities, ClassNK bestowed DOCs on three companies, including Dalisay Shipping Corporation. As a result, the total number of DOCs granted by the Society in the Philippines reached 13 companies.

To promote international co-operation, ClassNK provided ISM assessment training to ship inspectors and GMDSS training to radio inspectors of the Philippine government.



The 51,152 dwt chip carrier *Forest Princess*, constructed by Hitachi Zosen Corporation for Bona Marine

**REPUBLIC OF KOREA**

A total of six newbuildings, amounting to approximately 368,000 gt, were constructed as NK-classed ships in South Korea in 1998. These ships included 179,302 dwt and 179,385 dwt bulk carriers constructed by Hyundai Heavy Industries Ltd. for Hong Kong shipowners, a 178,633 dwt bulk carrier constructed by Daewoo Heavy Industries, Ltd., also for a Hong Kong shipowner, a 168,968 dwt bulk carrier built by Samsung Heavy Industries Co., Ltd., for a Japanese shipowner and a 3,580 dwt oil tanker built by Cheung Ku Marine Industry Co. Ltd. for an Indonesian company.



The 168,968 dwt bulk carrier *Chihaya*—constructed by Samsung Heavy Industries for Kamogawa Naviera S.A.



*Dyna Aquarius*—a 178,633 dwt bulk carrier built for Triumph Sea Limited by Daewoo Heavy Industries



Technical presentation at ClassNK's Singapore office



The 30,747 dwt oil carrier *Kirana Pratama*, constructed by Jurong Shipyard (Singapore) for Kirana Tanker Pte. Ltd.



Singapore '98

In addition to the above newbuildings, the Society performed surveys on 850 ships already in service, more than 8,000 inspections of pressure vessels, valves and other equipment, and more than 1,000 inspections of ropes and other rigging equipment. ClassNK also authorised a variety of materials and equipment during the year, including fire protection materials from Samgong Co., Ltd., welding materials from Sam Myung Steel Co., Ltd., davits and other equipment from companies such as Oriental Precision & Engineering Co., Ltd., and water-level indicators from Hanla Level Co., Ltd. Furthermore, Samyang Radio Co., Ltd. and another company were authorised as radio service companies, and Pacific Ocean Development Co., Ltd., and another company as in-water survey firms.

ISM-related activities included the granting of a DOC to Won Hee Shipping Co., Ltd., bringing to four the total number of DOCs granted by the Society to companies in South Korea.

#### SINGAPORE

In addition to a 30,747 dwt oil tanker constructed at Jurong Shipyard Limited and a 4,947 gt general cargo carrier constructed by P.T. Batamec, an oil tanker, 11 barges and four tugs were constructed at shipyards in the Singapore area as NK-classed vessels in 1998. Furthermore, several large ships were constructed at Japanese shipyards to NK class for Singapore shipowners, including a 107,160 dwt oil tanker for Neptune Shipmanagement Services Pte. Ltd. and three container carriers for Pacific International Lines Pte. Ltd.

The number of ship surveys by the Society in Singapore was at the same level as the previous year, but new ship drawing approval orders decreased



from 1997. Sealing & Coating NDT Marine Services and four other companies were authorised by ClassNK as plate thickness measurement firms, and Maritime Underwater Maintenance & Services Pte. Ltd. was authorised as an in-water survey firm.

During the year, the Society granted DOCs for ISM Code compliance to 13 companies, including Sinanju Tankers Pte. Ltd. As a result, the total number of Singapore shipowners to receive DOCs from ClassNK reached 35.

In March, ClassNK exhibited at Singapore '98, one of the largest international maritime exhibitions in Asia. The society displayed its PrimeShip products and the CD-ROM version of its *Register of Ships* at this exhibit.

In December, ClassNK gave a presentation on ship stability at its Singapore office. This presentation included explanations of the stability of loaded oil tankers (regulations related to MARPOL Annex I, 25A), the use of probability methods to measure the damage stability of dry cargo carriers (regulations related to SOLAS Chapter 2-1, 25) and PrimeShip-IPCA. Attendees at this presentation included not only Singapore shipyards and ship design companies, but companies from Malaysia, as well.

#### TAIWAN

The Society classed a total of 15 ships constructed in Japan and delivered to Taiwan shipowners as NK-classed vessels. These ships included four container carriers for Evergreen Marine Corp. (Taiwan) Ltd. and Uniglory Marine Corporation.

ClassNK also authorised Fair Wind Shipbuilding & Docking Co., Ltd. as a plate thickness measurement



Technical Seminar in Taipei



The 52,090 gt container carrier *Ever Delight*, constructed by Mitsubishi Heavy Industries



*UniActive*—a 13,329 gt container carrier constructed by Evergreen Shipyard



*Ratha Bhum*—the 6,393 gt container carrier built by Kyokuyo Shipyard for Regional Container Lines

firm and Shin Hsiung Fong Electric & Co., Ltd., as a radio services firm. In ISM-related activities, the Society granted DOCs to five companies, including Glory Navigation Co., Ltd., and TMT Co., Ltd., bringing to 12 the number of Taiwan shipowners granted DOCs by ClassNK.

In November, the Society held a Technical Seminar for Taiwan shipowners, which included lectures on bulk carrier safety, NOx regulations and the present state of PSC. Amendments to NK technical regulations were also explained at this seminar.

#### THAILAND

Two container carriers constructed in Japan were delivered as NK-classed ships to Regional Container Lines Public Co., Ltd. In addition, DOCs for ISM Code compliance were granted to six companies, including Nathalin Co., Ltd., and Unique Marine Company Limited, bringing to 13 the number of DOCs presented by the Society in Thailand. Codar (Thailand) Co., Ltd., was authorised as a radio services firm, and Mermaid Maritime Ltd. and TECKI (Thailand) Ltd. were authorised as plate thickness measurement firms.

#### VIETNAM

One of three tugs under construction as NK-classed ships at Tam Bac Shipyard was launched in December 1998. The remaining two ships will be completed in 1999. ClassNK also provided technical consulting services for a 6,500 dwt cargo carrier being built at Bach Dang Shipyard, and carried out dock gate supervision services for Ben Kien Shipyard and Song Cam Shipyard.



## NORTH AND SOUTH AMERICA

### UNITED STATES OF AMERICA

In ISM-related activities, ClassNK granted a DOC to SEG International Marine, Inc. The Society also authorised Williamson Marine Services Ltd. and two other companies as in-water survey firms, Caterpillar Inc. as an approved manufacturer, and Navtronics, Inc., as a radio services firm.

In an atmosphere of active PSC, ClassNK was recognised as one of the world's leading ship classification societies by earning zero penalty point status from the USCG. This status is granted for maintaining a very low detention rate over the past three years. In addition, ClassNK representatives visited government agencies in the Bahamas, Liberia, Panama and Vanuatu, as well as the USCG Headquarters and Department of Labor to exchange opinions on topics including ship classification activities and PSC.

At the 22nd U.S.-Japan Cooperative Program in Natural Resources (UJNR), which was held in 1998 in Washington D.C., ClassNK lectured on PrimeShip-HullExpert. At the Y2K Problems Seminar sponsored by USCG North-West, the Society presented a lecture on its Y2K response activities.



Visit to the USCG Headquarters by ClassNK representatives



ClassNK visits the Vanuatu Ship Registry office in New York (from left: J. Horan Jr., Administrator of Vanuatu Maritime Services; T. Nakanishi, Regional Manager, Americas, ClassNK; D.J. Sheetz, Deputy Commissioner and Executive Vice President, Vanuatu Maritime Services; and H. Terashima, Manager, ClassNK Survey Department).



*Argentine Confidence*—a 27,000 dwt bulk carrier being constructed in Argentina by Astilleros Rio Santiago

## SOUTH AMERICA

In Argentina, ClassNK surveyed a 27,000 dwt bulk carrier under construction at Astilleros Rio Santiago S.A. with a scheduled completion in May 1999. In addition, the number of ship inspections performed in the area covered by the ClassNK's Buenos Aires office, including Argentina and neighbouring countries, such as Paraguay and Uruguay, exceeded 180 in 1998. In ISM-related activities, the Society granted DOCs to two companies, including Maruba S.C.A., during the year.

Operations in Brazil included the performance of consultant services for Vale do Rio Doce Navegacao S.A. (DOCENAVE), one of the nation's largest shipowners. Also, End-Check was authorised as a plate thickness measurement firm, and SMD Marine Systems Electronica Naval Ltda. as a radio services firm.

The Society also gave lectures on a variety of subjects at international meetings and universities. At SOBENA '98—the 17th Conference on Maritime Transportation, Shipbuilding and Offshore—which was held in Rio de Janeiro, a lecture was given on ClassNK's work in high-level technologies, with a focus on CALS/STEP. At a polytechnic school in San Paolo, ClassNK explained its activities as a ship classification society to naval architecture students. Furthermore, at the 2nd Advanced Training Course on Ship Inspections, sponsored in Chile by the IMO, the Society gave a lecture on Bulk Cargoes (BC) Code to ship inspector candidates from Central America. Expectations are high that the presence of highly trained inspectors in Central America will contribute to decreases in substandard ships and maritime accidents in the region.



## EUROPE

### DENMARK

Approvals in Denmark included life rafts from Viking Life Saving Equipment AS, fire protection materials from C.C. Jensen AS and manufacturing methods for diverse automation equipment from DEIF A/S, MAN B&W Diesel A/S and Danfoss A/S. In addition, ClassNK inspected diesel engines from MAN B&W Diesel A/S, 3,500 kVA power generation equipment for delivery to Japan, pressure vessels, heat exchangers and other equipment. As a result, the number of such inspections performed by the Society in Denmark surpassed 2,000.

The International Congress on Combustion Engines (CIMAC), held in May in Copenhagen, gathered approximately 500 participants, primarily engine manufacturers. At this event, ClassNK made presentations in the fields of:

- Investigation of NO<sub>x</sub> Measurement for Practical Use;
- Sound Power Determination Method for Marine Diesel Engine by Sound Intensity; and
- Monitoring of Marine Two Stroke Diesel Cylinder Lubricating Condition by Ferrography.

### FRANCE AND SWITZERLAND

The Society authorised manufacturing methods for forged castings from France's Manoir Industries and automated equipment from C.M.R. ClassNK also audited and granted a DOC to Reederei Zurich AG of Switzerland for ISM Code compliance.



#### GERMANY AND POLAND

During the year, a bulk carrier was constructed in Japan and delivered to German shipowner Orion Schifffahrt-Gesellschaft Reith & Co. as an NK-classed ship. In marine equipment inspection and approval services, the centre of the Society's activities in Germany and Poland, ClassNK performed a wide range of diesel engine inspections. Aggregate inspections of other equipment, including cylinder covers, pressure vessels and valves surpassed 1,000 in these countries.

The Society also authorised AG Kuehnle, Kopp and Kausch of Germany as an approved manufacturer, and Enamor Ltd. of Poland as a radio services firm. Furthermore, in Germany authorisations were given for automation equipment from Bedia Motoren Technik GmbH and another company, hoses and other equipment from Aeroquip-Vickers International GmbH and another company, fire protection materials from Fehrmann GmbH, and lifeboats from FR. Fassmer GmbH.

#### GREECE AND CYPRUS

In 1998, ClassNK granted ISM Code DOCs to 17 companies in Greece, including Marmaras Navigation Ltd., Kritsas Shipping (Panama) S.A.

and Iolcos Hellenic Maritime Enterprise Co. Ltd. These activities brought to 27 the total number of Greek companies granted DOCs by the Society.

Also during the year, two 107,181 dwt oil tankers were completed in Japan and delivered to Tsakos Shipping & Trading S.A. as NK-classed ships. Two container ships under the management of Columbia Shipmanagement Ltd. of Cyprus were also constructed in Japan and delivered as NK-classed ships.

In authorisation activities, ClassNK authorised four Greek companies, including Technical Marine Bureau D.N., Petrogonas and Associates and P.L. Tzaneas & Partners, as plate thickness measurement firms.

In June, the Society participated in Posidonia '98, one of the world's largest international marine industry exhibitions, which was held in Piraeus, Greece. In its exhibit, ClassNK demonstrated PrimeShip-IPCA and introduced its Bulk Carrier Safety calculation software. Also in Piraeus, in December the Society held a Technical Seminar on the subject of PSC for Greek shipowners. Lectures were given in the Greek language, and the participants, including engineers and representatives from Greece's Coast Guard as well as shipowners, rated the event highly.



PSC Seminar (Greece)



NYK Sirius—a 76,847 gt container carrier constructed by Mitsui Engineering & Shipbuilding for Columbia Shipmanagement



Screw conveyer inspected on behalf of the ordering party

#### ITALY

ClassNK authorised emergency tug equipment from Posidonia S.R.L. and inspected a wide range of other equipment. The Society also performed inspections requested by parties ordering screw conveyors, high-pressure compound compressor units and cranes. Furthermore, at the training program held for new PSC officers in Genova, ClassNK lectured on fire prevention guidelines for engine rooms.

#### THE NETHERLANDS

Ship surveys in the Netherlands increased in 1998, and ClassNK also inspected equipment such as an inert gas power generator, and crane and boat davits. The Society also authorised boat davits of Davit International GmbH, pipe joints of Georg Fischer Waga N.V., and other types of equipment.

At the PRADS '98 meeting on the practical design of ships, held in September in the Hague, ClassNK gave a lecture entitled Design of Corrugated Bulkheads of Bulk Carriers against Accidental Flooding Load.

#### PORTUGAL AND SPAIN

In Portugal, in addition to more than 100 surveys of ships, ClassNK authorised Protecno, Ltd., as a plate thickness measurement company, and Assistencia Tecnica Maritima, Ltd., and Sema

Electronicas, S.A., as radio service firms. Ship surveys also surpassed 100 vessels in Spain, where the Society held a number of shipboard audits in accordance with the ISM Code.

#### SCANDINAVIA

As in the previous year, ClassNK carried out a wide variety of materials and marine equipment approval activities in the Scandinavian region in 1998.

In Norway, these inspections covered launching appliances and lifeboats from Umoe Schat-Harding AS, boat davits from Aukra Industrier AS, rescue boats from Ulstein Forsyningstjeneste AS, fire protection materials from Team Tec AS, fire detection and alarm equipment from Autronica AS, and emergency towing equipment from Scanrope AS and other companies. In Sweden, the Society authorised standard structural design drawings for heat exchangers, as well as diverse fire protection materials and fire prevention equipment, including fire protection materials from Isolamin AB. In Finland, ClassNK authorised rolled steel from Rautriikki Steel, manufacturing methods for propeller castings from Finnscrew Finland Plc and cables from Helkama Bica Oy.

In equipment inspection operations, ClassNK inspected auxiliary machinery such as pumps and fans and other electrical equipment in countries including Norway. The number of such units inspected surpassed the 5,000 mark during the year.

#### TURKEY

A 16,000 dwt multipurpose cargo carrier under construction as an NK-classed ship at Turkey's Selah Shipyard was launched in December 1998. Furthermore, ClassNK surveys of ships in Turkey surpassed 200 vessels during the year. ISM-related activities included the granting of DOCs to 11 companies, including Akat Denizcilik Ve Ticaret Ltd. Sti., Karsel Gemi Isletmeciligi Ve Ticaret A.S. and Guzey Ship Management Co., Ltd. As a result, the



*Alfamar*—a 16,000 dwt multipurpose cargo carrier built by Selah Shipyard

total number of DOCs conferred by the Society on Turkish shipowners reached 24 by the close of the year.

#### UNITED KINGDOM

Two chemical tankers were constructed in Japan and delivered to UK shipowners as NK-classed ships during the year. Also, in accordance with an increase in surveys in western Africa, surveys conducted by ClassNK's London Regional Office increased compared with the previous year, and an increase was also seen in inspections of materials and equipment. In this environment, inspections of engine components and other equipment, as well as of fittings surpassed 1,000 and 4,000, respectively.

In material, equipment and manufacturer approval activities, the Society authorised Kawasaki Precision Machinery (UK) Ltd. and Thorn Security Ltd. as approved manufacturers. Hydraulic motors from Kawasaki Precision Machinery (UK), fire detection and alarm equipment from Thorn Security Ltd., materials with fire-preventing structural materials from Charles Henshaw & Sons Ltd., and heat-resistant apparel from CAC Industrial Products Ltd. were authorised during the year.



## THE MIDDLE EAST

In activities related to Saudi Arabia, two 1,161 gt supply vessels were constructed in Japan as NK-classed ships for shipowner Zamil Operations & Maintenance Co., Ltd. The Society also granted ISM Code DOCs to Red Sea Marine Services, Saudi Shipping & Maritime Services Co., Ltd., and Saudi Arabian Bunkering Services, and SMCs for 12 ships in Saudi Arabia.

In the United Arab Emirates, surveys of ships increased, bringing the total of inspections in this country to 400. In addition, Maritronics was authorised as a radio services firm, and Lonestar Technical Services and two other companies were authorised as plate thickness measurement firms.

Three LNG tankers constructed in Japan for the Qatar LNG Project, each with a cargo capacity of 135,000 m<sup>3</sup>, were put into service for LNG transport during the year.

## AFRICA

Construction of a 268 gt fishery research vessel was completed in Japan for the Tunisian government. In addition, in South Africa 300 ship surveys were carried out, and Cape Diving and Salvage (Pty) Ltd. was authorised as an in-water survey firm.



*Broog*—a 135,000 m<sup>3</sup> LNG tanker constructed by Mitsui Engineering & Shipbuilding for the Qatar LNG Project

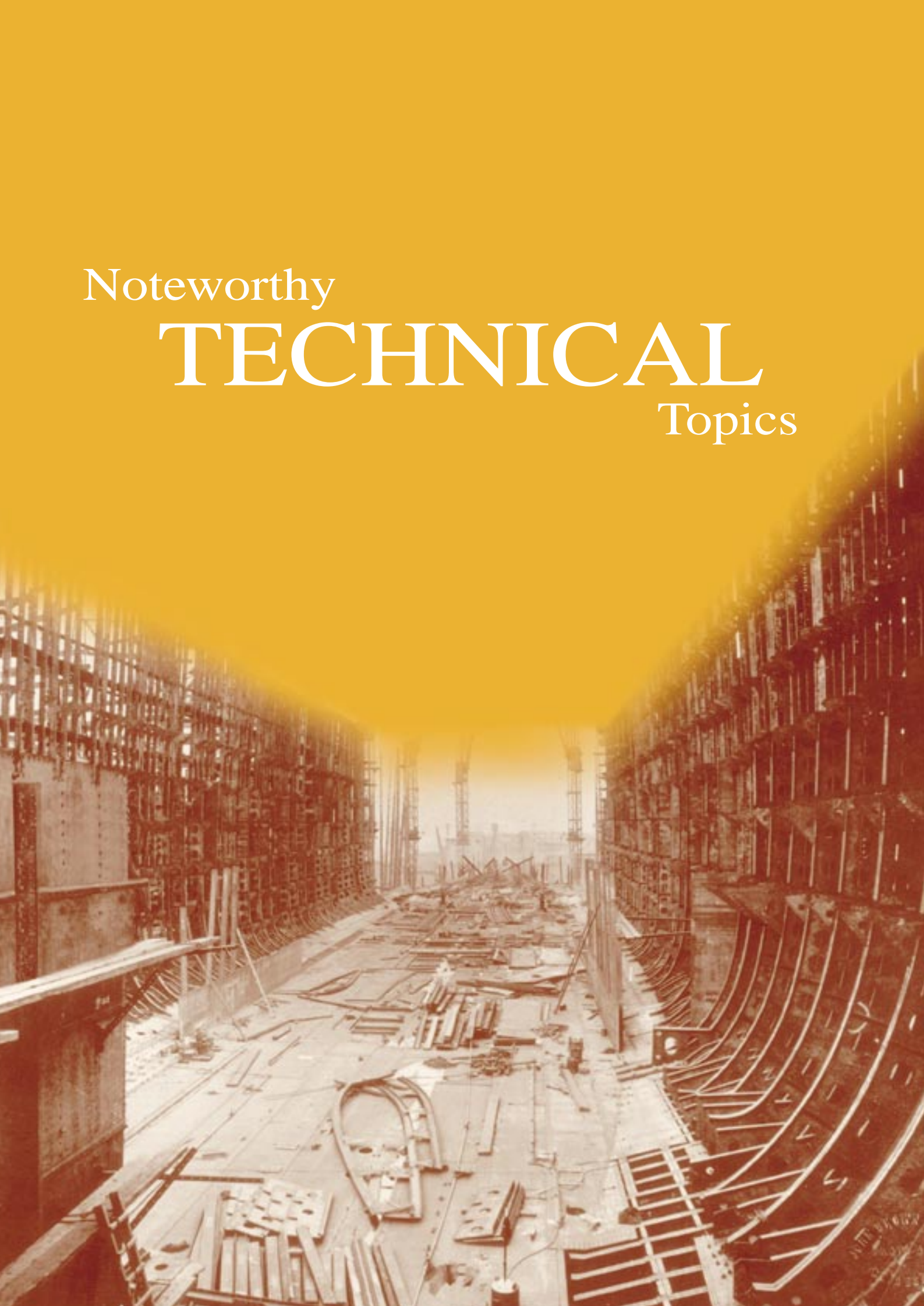


*Zamil 4*—a 1,161 gt supply vessel built by Kanmon Shipbuilding for Zamil Operations & Maintenance

Noteworthy

# TECHNICAL

Topics



## UPGRADING THE SAFETY OF EXISTING BULK CARRIERS

### OVERVIEW

Frequent serious sea casualties involving bulk carriers from the late 1980s into 1990 prompted the International Association of Classification Societies (IACS) and the International Maritime Organisation (IMO) to introduce the Enhanced Survey Program (ESP) to improve the safety of existing bulk carriers. Although ESP did contribute to reducing the number of casualties involving bulk carriers at the time, around 1994 the number of losses began to increase again.

IACS and the IMO responded with thorough efforts to review the safety of bulk carriers. As a result of several years of study, IACS decided to implement retroactive requirements for existing bulk carriers. This section seeks to summarize the results of preliminary assessments for these retroactive

requirements—targeting structural requirements for the flooding of the foremost cargo hold—as well as to introduce measures to comply with the new structural requirements.

### STRUCTURAL REQUIREMENTS FOR THE CONDITION WHEN THE FOREMOST CARGO HOLD IS FLOODED

IACS has established structural standards with the aim of ensuring that the aft transverse corrugated watertight bulkhead and the double bottoms of the foremost cargo hold have sufficient strength to withstand flooding of the foremost cargo hold, and decided to apply them to the ships described below. These structural standards are outlined in Table 1.

“Single-side skin bulk carriers of 150 m and upward in length ( $L_p$ ) which carry solid bulk cargoes with a density of 1.78 t/m<sup>3</sup> and above, which are contracted for construction before 1 July 1998, and the keels of which are laid or which are at a similar stage of construction prior to 1 July 1999.”

UR S19	<p><b>EVALUATION OF SCANTLINGS OF THE TRANSVERSE WATERTIGHT CORRUGATED BULKHEAD BETWEEN CARGO HOLD NOS. 1 AND 2, WITH CARGO HOLD NO. 1 FLOODED, FOR EXISTING SINGLE-SIDE SKIN BULK CARRIERS</b></p>
	<p>The most severe combinations of cargo induced loads and flooding loads are to be used for examining of the scantlings of the bulkhead, depending on the loading conditions included in the loading manual:</p> <ol style="list-style-type: none"> <li>1. Homogeneous loading conditions;</li> <li>2. Non-homogeneous loading conditions.</li> </ol> <p>The thickness of bulkhead excluding the corrosion margin (hereinafter, “net thickness”) are to be used for examining the scantlings of the bulkhead.</p> <p>The corrugated bulkhead is to be renewed or reinforced by measures deemed appropriate by the Society, according to the relationship between the actual gauged thickness and required new thickness.</p>
UR S22	<p><b>EVALUATION OF ALLOWABLE HOLD LOADING OF CARGO HOLD NO. 1 WITH CARGO HOLD NO. 1 FLOODED, FOR EXISTING SINGLE-SIDE SKIN BULK CARRIERS</b></p>
	<p>The most severe combinations of cargo induced loads and flooding loads are to be used, depending on the following loading conditions described in the loading manual:</p> <ol style="list-style-type: none"> <li>1. All bulk loading conditions except packed cargo conditions such as steel mill products;</li> <li>2. Packed cargo conditions such as steel mill products.</li> </ol> <p>The loading in the foremost cargo hold is not to exceed the calculated allowable hold loading in flooded conditions.</p>

Table 1 IACS Structural Standards

Depending on their ages on 1 July 1998, ships falling within these application limits must comply with the above standards according to the timetable in Table 2. As of 31 December 1998, 968 ships classed with NK fall within these application limits. Figure 1 describes the number of ships that will reach this due date each year.

**SUMMARY OF THE PRELIMINARY ASSESSMENT FOR UR S19**

Of the 968 ships classed with NK that are within the above application limits, 167 either did not use corrugated bulkheads or were of the type of ship having four holds. The latter is not capable of complying with the damaged stability requirements. For the remaining 801 ships, net thicknesses of the bulkhead were calculated based on as-built plans according to IACS Unified Requirement S19. These preliminary assessments indicated the following

tendency among ships for which some steel renewal/reinforcement was estimated to be necessary in order to comply with UR S19. (Note: Two cases were considered. In the first case, bulkheads were judged to have maintained their original thicknesses. In the second, diminution was determined to amount to less than 2 mm of the original thickness.)

“It is more difficult to meet UR S19 requirements under non-homogeneous loading conditions than under homogeneous loading conditions. Also, this is generally more difficult for larger ships, ranging from the Handysize to the Panamax and Capesize. In the most difficult case—Capesize ships under non-homogeneous loading conditions—70% required steel renewal and/or reinforcements even if bulkheads had retained their original thickness.”

Figure 2 depicts the results of these preliminary assessments for each ship size and loading condition.

SHIP'S AGE ON 1 JULY 1998 (A)	NO. OF SHIPS	IMPLEMENTATION SCHEME
A ≥ 20	60	The due date of first Intermediate Survey (IS) or Special Survey (SS) after 1 July 1998, whichever comes first.
15 ≤ A < 20	104	The due date of SS after 1 July 1998, but not later than 1 July 2002.
10 ≤ A < 15	253	The due date of SS after the date on which the ship reaches 15 years of age, but not later than the date on which the ship reaches 17 years of age.
A < 10	551	The date on which the ship reaches 15 years of age.
<b>TOTAL</b>	<b>968</b>	

Table 2 Implementation timetable of IACS URs S19, S22 and S23.2



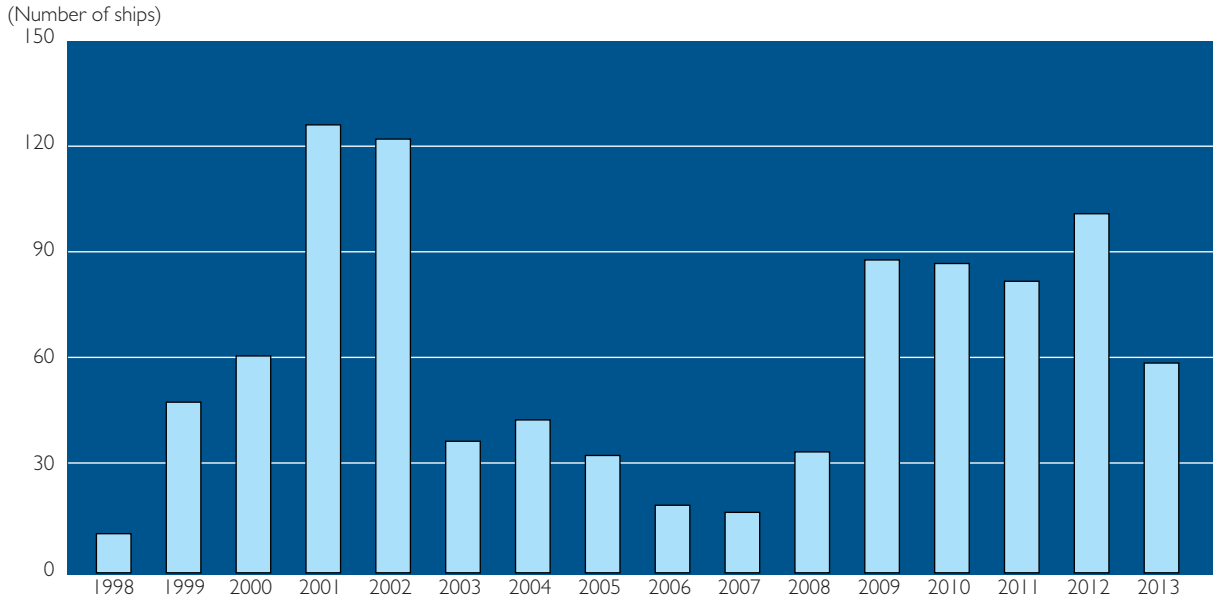


Fig. 1 Number of ships reaching the due date

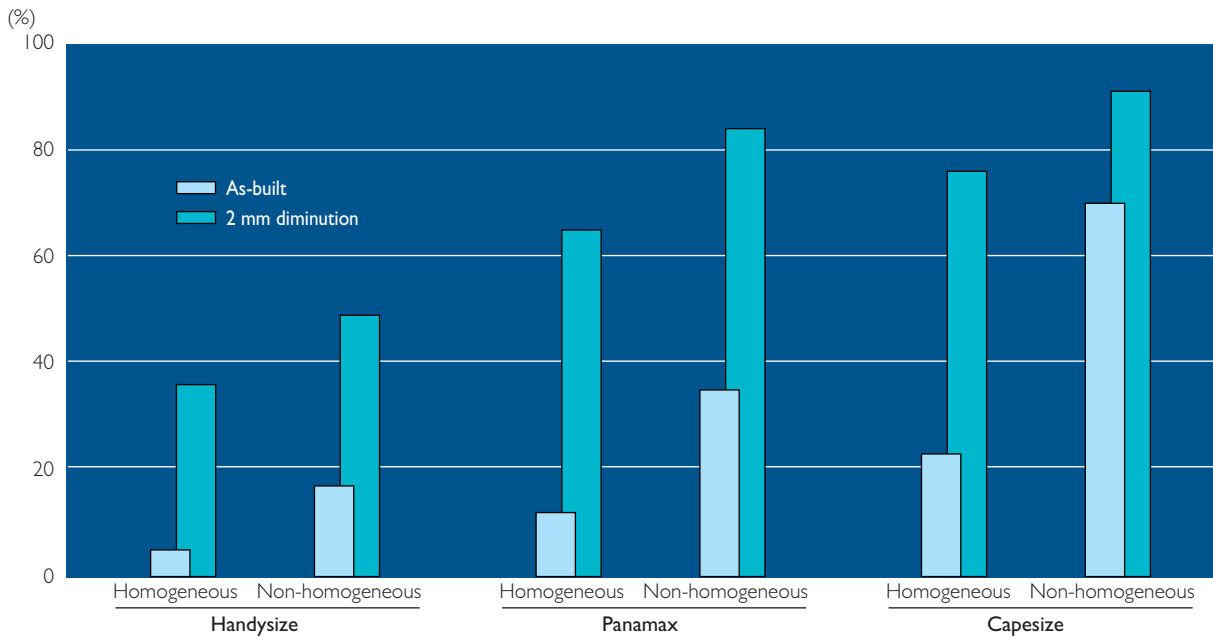


Fig. 2 Percentage of ships estimated to require steel renewal/reinforcement to comply with IACS UR S19

### SUMMARY OF THE PRELIMINARY ASSESSMENTS FOR UR S22

Of the 968 ships classed with NK that are within the application limit, 837 remain after omitting those ships for which preliminary assessment was under way or ships having four holds which are not capable of complying with damaged stability requirements. In accordance with IACS Unified Requirement S22, allowable hold loading was calculated for these 837 ships based on as-built plans. These preliminary assessments indicated that the following ships would require some steel renewal/reinforcement in order to comply with UR S22.

“All of the Handysize ships that were assessed complied with UR S22. However, about 15% of the ships in each of the Panamax and the Capesize classes were estimated to require some countermeasures to comply with UR S22.”

Figure 3 depicts the results of these preliminary assessments for each ship size.

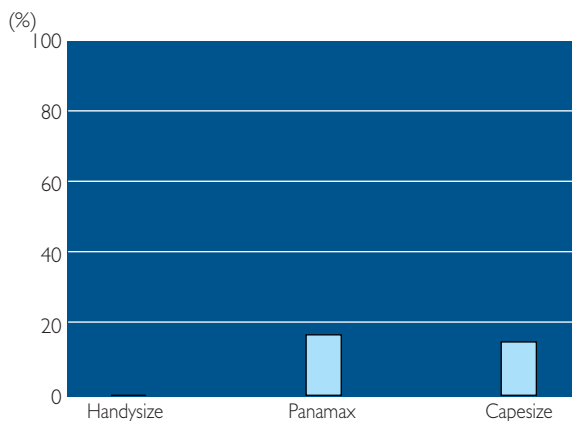


Fig. 3 Percentage of ships estimated to require steel renewal/reinforcement to comply with IACS UR S22

### PROCEDURE FOR THE IMPLEMENTATION OF STRUCTURAL REQUIREMENTS FOR THE CONDITION WHEN THE FOREMOST CARGO HOLD IS FLOODED

Figure 4 describes the process for implementing retroactive requirements on existing bulk carriers. More specifically, the procedure for implementing structural requirements for the condition when the foremost cargo hold is flooded is described below.

- ClassNK calculates the net thickness of the corrugated bulkhead and the allowable hold loading in accordance with UR S19 and UR S22 based on as-built plans. Next, ClassNK notifies shipowners or ship management companies of these preliminary assessments. Hoping that these notifications would be helpful in planning ship maintenance, ClassNK has sent these notifications regardless of the due date of implementation for each ship. Almost all notifications, excluding those for ships having four holds—which are not capable of complying with damage stability requirements—had been completed as of 31 December 1998.
- Corrugated bulkheads are inspected, and their thickness is measured. Results of the thickness measurements are compared with the net thickness of the corrugated bulkheads.
- If necessary, plans for steel renewal and/or reinforcement to comply with the requirements are proposed by shipowners or ship management companies. After being approved by ClassNK, these plans are implemented.

### COUNTERMEASURES

#### RENEWAL AND/OR REINFORCEMENT OF CORRUGATED BULKHEADS

In accordance with UR S19, where the gauged thickness of a corrugated bulkhead is less than the sum of the net thickness plus 0.5 mm, steel renewal with a minimum thickness of the net thickness plus 2.5 mm is required. (Alternatively, of the many factors that determine the net thickness requirement,

reinforcing doubling strips may be used, providing that the net thickness is dictated by bending capacity requirements.)

A variety of measures may be implemented, depending on the condition of the ship. Some typical examples are listed below.

- Steel renewal of the lower part and the middle part of the bulkhead.
- Steel renewal of the lower part of the bulkhead and reinforcement by doubling strips of the middle part of the bulkhead.
- Reinforcement by doubling strips of the lower part and the middle part of the bulkhead.
- Reinforcement by gussets with shedder plates.

#### **COUNTERMEASURES TO MEET THE STRUCTURAL REQUIREMENTS OF THE DOUBLE BOTTOM**

Where the results of preliminary assessments based on as-built plans indicate that the double bottom construction does not meet the requirements, the following measures are to be taken as applicable.

- Reduction of loading in the foremost cargo hold.
- Reassessment of allowable hold loading based on the actual thickness of double bottom floors and girders.
- Renewal with double bottom floors and girders of increased thickness.
- Reinforcement of openings on double bottom floors and girders.

ClassNK has played a central role in carrying out the theoretical verifications of IACS bulkhead strength standards. The aim of these activities is to staunch the increase in casualties at sea involving bulk carriers.

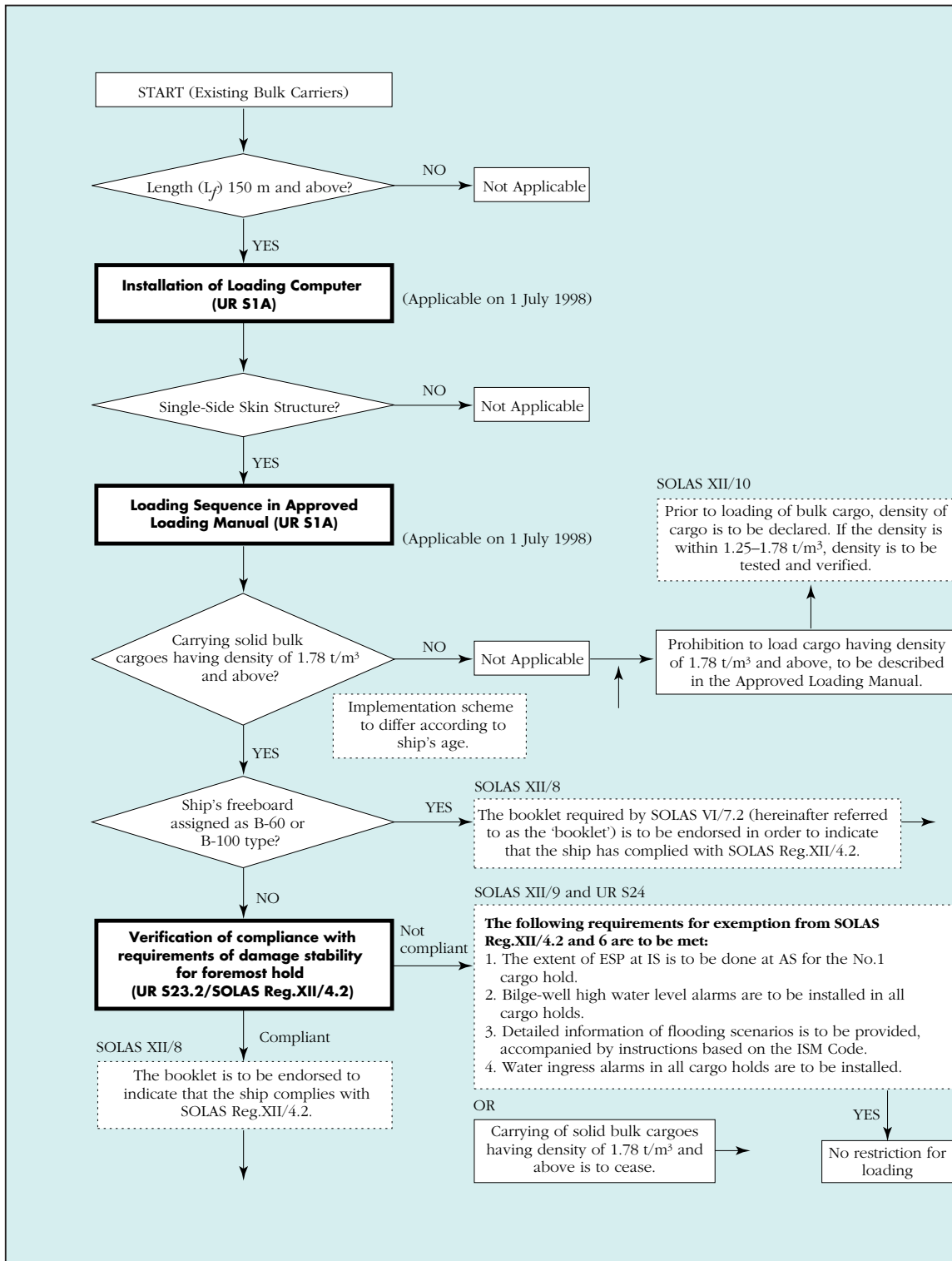
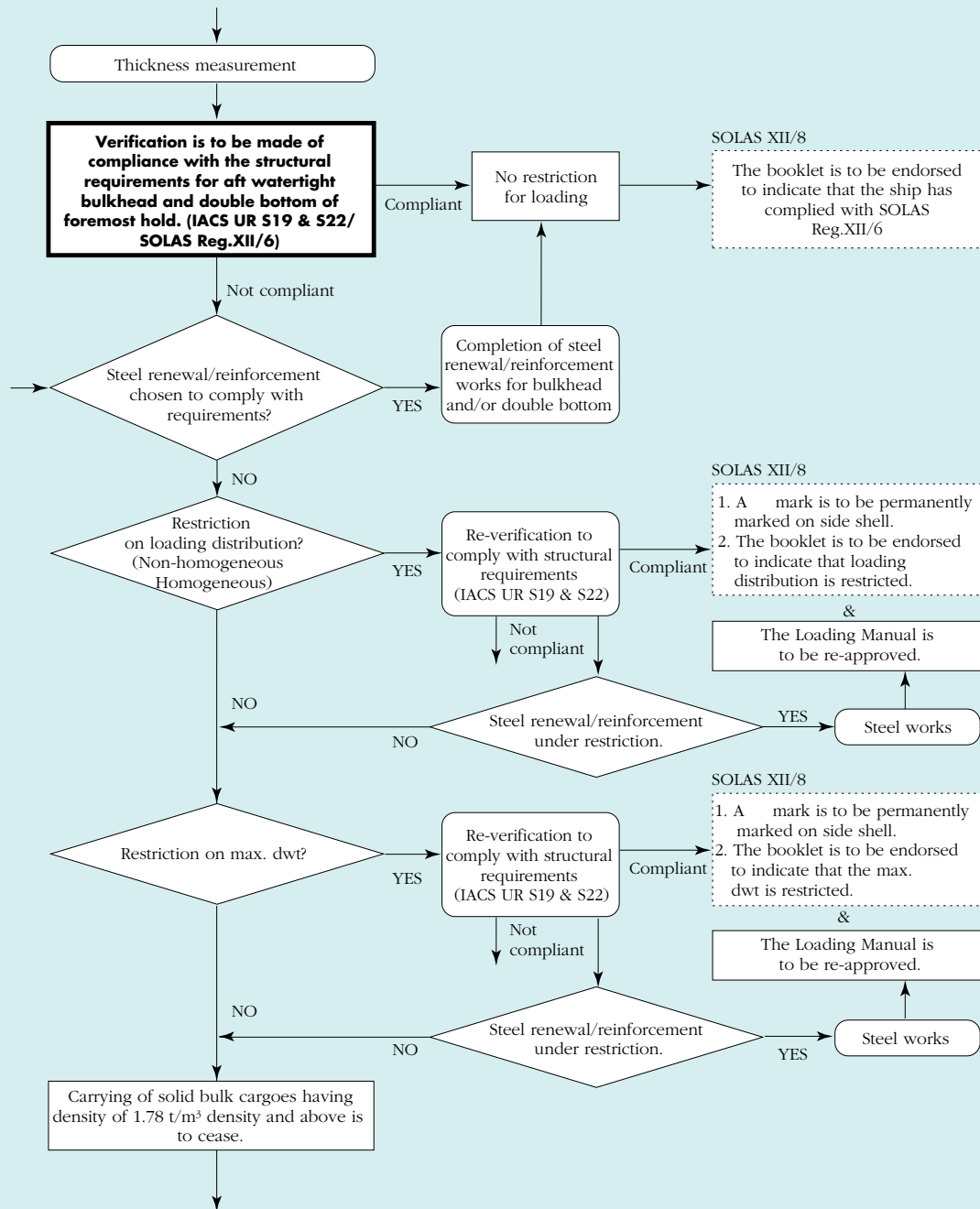


Fig. 4 Flowchart for the application of additional requirements to existing bulk carriers (IACS UR S1A, S19, S22 and S23.2)





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(As of 31 December 1998)

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**Annual Report 1998**

Published by Nippon Kaiji Kyokai  
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Printed in Japan  
ISSN 0913-2414

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