

MARITIME

# The new IGC Code, 2016 Edition MSC.370(93)

An update

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# ABOUT DNV GL - The leading classification society

## MARITIME

- **Maritime** is our core industry
- **12,400 ships & mobile offshore units** in DNV GL class, 278 mGT
- **Strong presence** in all ship segments
- **Dedicated ship type expert teams** support our clients worldwide
- **Among top performing** class societies in Port State Control statistics

### OIL & GAS



### ENERGY



### BUSINESS ASSURANCE



### LIFE SCIENCES



### Digital Solutions



**200**

Maritime offices globally



**4,300**

Maritime staff worldwide



**13,500**

employees groupwide

**5%**

revenue invested in R&D activities

# History of LNG shipping in DNV GL

## 1954

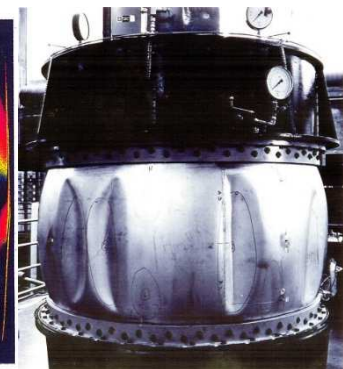
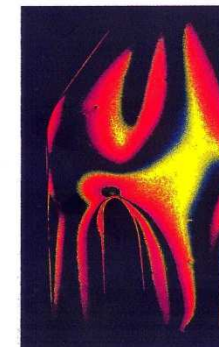
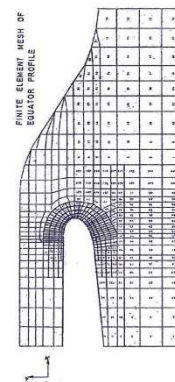
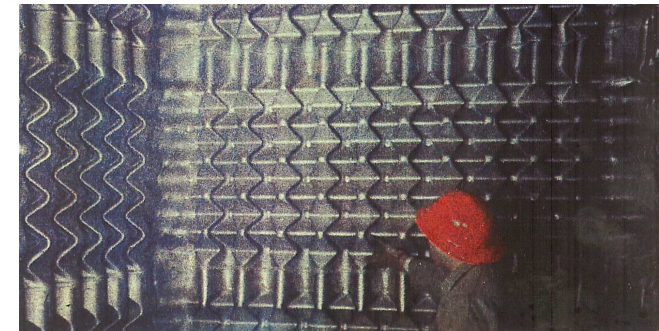
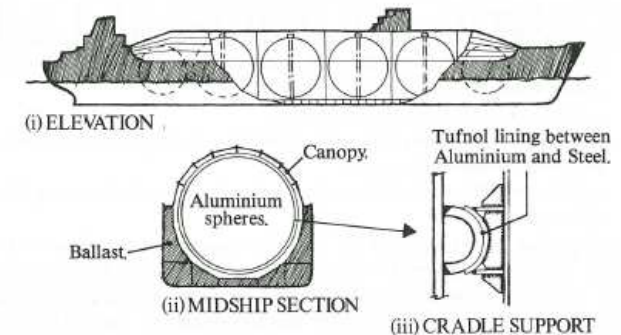
- DNV issued first **approval** in principle for a 7,500m<sup>3</sup> LNG carrier with 6 aluminium spherical tanks
- Design included a continuous weather cover similar to the new Mitsubishi Sayaendo concept

## 1959-62

- DNV Research developed a **membrane** containment system with Øivind Lorentzen and the Bennet Group
- Patent transferred to Gazocean which developed it into the Technigaz LNG containment system (Mark I)

## 1970

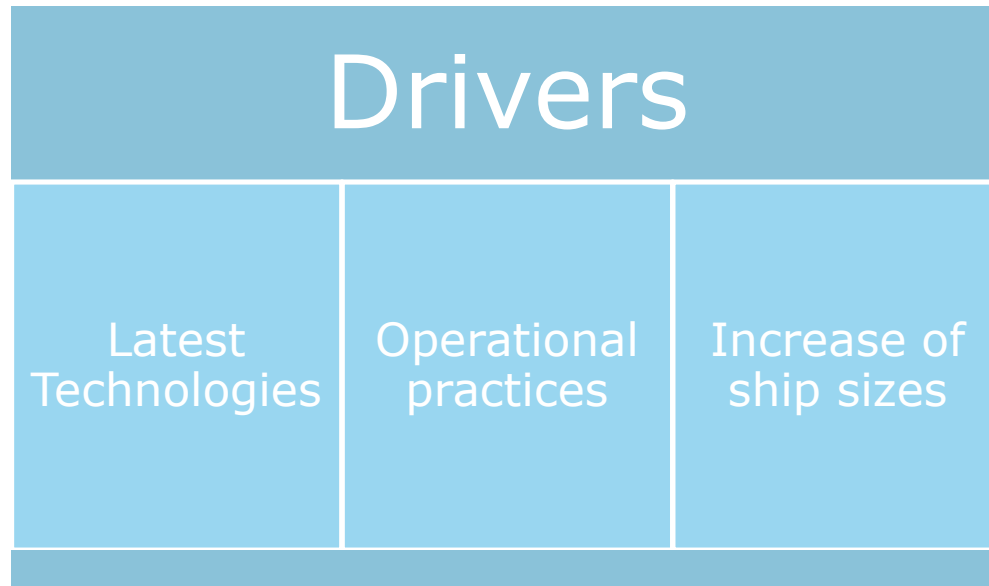
- DNV was at the forefront of **finite element** and fracture mechanic stress analysis and supported Moss Værft with spherical tank containment system
- Product came to be known as the “**leak before failure**” concept for spherical cargo tank



## The IGC Code revision

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- The intension of a full revision has been agreed by IMO in October 2007.



- The new IGC Code is a SIGTTO led industry effort



## Implementation Status

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- The IGC Code has not been fundamentally amended since 1993
- Industry effort
  - 129 participants from 18 countries
  - 10 working groups
- The revised IGC code was adopted in MSC93 in May 2014 and hence is the 2014 Amendments (MSC.370 (93)) of the code and is the IGC Code 2016 Edition



## Application and Provisions

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### Application

- Ships regardless of their size
- carriage of liquefied gases having a vapour pressure exceeding 0.28 MPa absolute at a temperature of 37.8°C
- Carriage of other products, as shown in chapter 19, when carried in bulk.
- enter into force **1 January 2016**
- Keel laying **01 July 2016.**
- **Not** Retroactive Except freeboard and stability requirements

### Provides

- method to ask IMO to add new cargoes to the list
- Direction to use other than LNG Cargoes as Fuel

## Fundamental changes

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- The revised Code is an **evolution** of the old Code and is updated in all chapters to also cover future designs
- The revised Code is more **goal-based** and every sub-chapter starts with the goal to be achieved.
- Goal based regulations does not specify means of achieving compliance but sets goals that allow alternative ways of achieving compliance.
- Although the revised IGC Code regulations still contain prescriptive requirements, each regulation now has a **purpose statement** and functional requirements which may not be fully addressed in the prescriptive requirements

# The IGC update project and the IGF development project



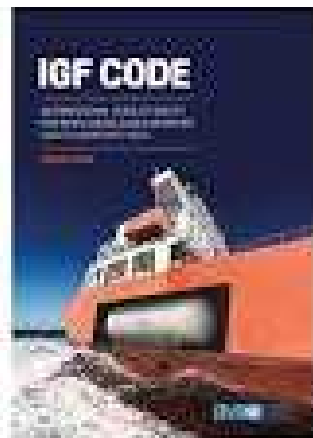
Gas Carriers



FSU  
FSRU  
FLNG



Gas Bunker Vessels

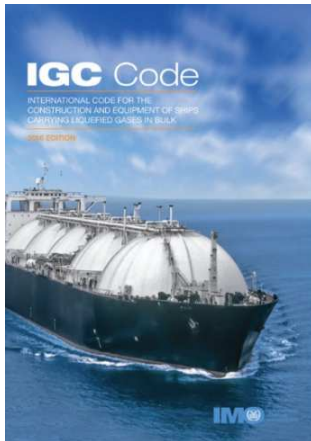


LNG Fuelled Ships

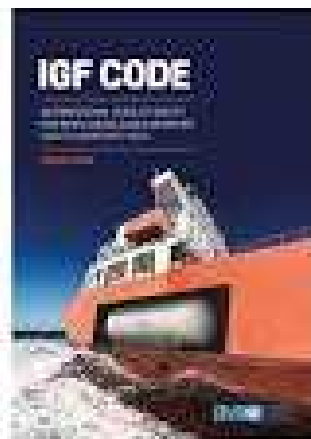


## The IGC update project and the IGF development project

- Common challenge but different approach to be addressed is Gas as Fuel



- Cargo as Fuel – Chapter 16
- Extended to cover use of cargo mainly LNG on Internal combustion engines mainly DFDE
- Would allow use of other than LNG cargoes as fuel
- Applies to **gas carriers** using gas as fuel



- Applies to **non gas carriers** using LNG as Fuel or other Low Flash point fuels

## Summary of major changes

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### Ship Design and Arrangement

- gas dangerous spaces in line with IEC
- Changes to the separation of the cargo tank from the side shell
- Safety principles and functional requirements introduced into Chapter 4
- Introduction of new material grade FH and *High Manganese Steel*
- Introduction of “limit state methodologies” for novel configuration of cargo containment design that cannot meet prescriptive requirements given in the revised IGC Code.



## Summary of major changes

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### Electrical systems

- Chapter 10 revisions to reflect current IEC requirements
- Tank pressures and hull temperatures to be controlled also in the event of single faults in the electrical supply.



### Cargo Handling

- Cargo tank pressure relief valve - in the event of a failure of a cargo tank PRV a safe means of **emergency isolation** shall be allowed
- Means to monitor quality of **inert gas** supplied to the insulation space
- Introduction of requirements for **vapour oxidation** which include boilers and gas combustion units

## Details on IACS work on revised IGC Code

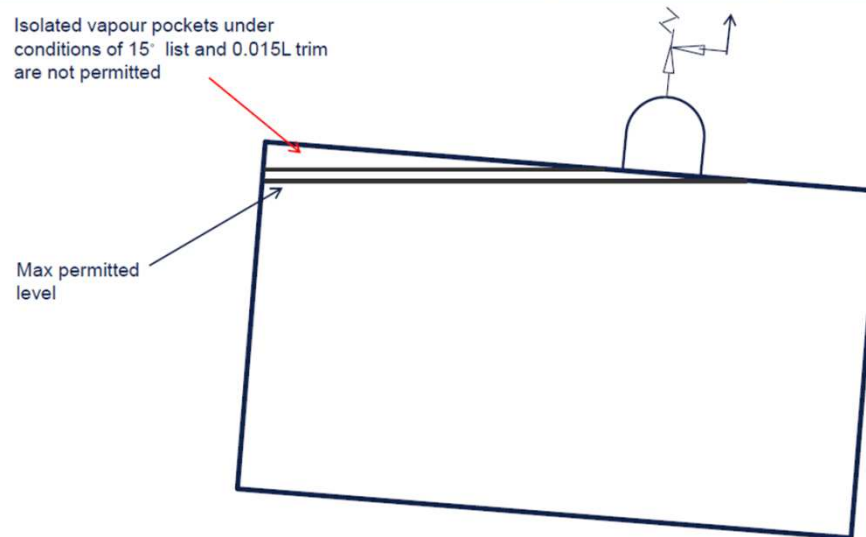
IACS	Reference	Update	Details
UR G1	Cargo Containment of gas tankers	Rev. 3 Jun 2016	Not applicable to revised IGC Code
UR G3	Liquefied gas cargo and process piping	Rev. 6 Jan 2016	general principles approval & survey
UI GC7	Carriage of product not covered by the code	Rev. 1 Jun 2016	4.23.1.2 on design vapour pressure
UI GC8	Permissible stresses in way of supports of type C cargo tanks	Rev. 1 Jun 2016	4.23.3.1 on Plastic deformation
UI GC11	Loading of cargo C tanks for ships constructed before 1 July 2016	Rev. 1 Feb 2016	Not applicable to revised IGC Code
UI GC12	Secondary Barrier Testing Requirements	Rev. 2 Aug 2015	CCS with glued secondary barriers
UI GC13	Examination before and after the first loaded voyage	Rev. 1 Mar 2016	Application, Certification, Survey Req 1 <sup>st</sup> Loading/Discharge
UI GC14	Pump Vents in Machinery Spaces	New Apr 2015	to pumps in the machinery spaces serving dry duct keels through which ballast piping passes

## Details on IACS work on revised IGC Code

IACS	Reference	Update	Details
UI GC15	Closing Devices for Air Intakes	Rev.1 Aug 2017	3.2.6 Not in Engine-room casings, cargo machinery spaces, electric motor rooms and steering gear compartments
UI GC16	Cargo tank clearances (on ships constructed on or after 1 July 2016)	Rev. 1 Feb 2016	Previous IGC in GC6 Based on MSC/Circ.686
UI GC17	Unprotected openings	New Jun 2016	Previous IGC in GC5 Other openings that have to remain open
UI GC18	Test for cargo tank's high level alarm	Rev. 1 Jul 2017	"each drydocking", "High-level alarms", "first occasion of full loading"
UI GC19	External surface area of the tank for determining sizing of pressure relief valve	New Aug 2017	8.4.1.2 and fig 8.1

## Details on IACS work on revised IGC Code

IACS	Reference	Update	Details
REC 109	Acceptance criteria for cargo tank filling limits higher than 98%	Rev. 1 May 2017	Corrections and not applicable to revised IGC Code
REC 149	Guidance for applying the requirements of 15.4.1.2 and 15.4.1.3 of the IGC Code	New May 2017	Higher Filling Limits for revised IGC Code
REC 150	Vapour pockets not in communication with cargo tank vapour / liquid domes on liquefied gas carriers	New May 2017	Requires Emergency procedures for isolated vapour pockets



## Areas that IACS may look at

IGC	Reference
5.2.2.1	Location of piping containing liquid
5.2.2.1.5	Cargo piping to be located inboard of the transverse tank protective location requirement. Aligned with the change in 2.4.1
9.4.6	Monitoring the quantity of inert gas flowing into individual insulation spaces when the inert gas system is part of the required leak detection system
11.3.1	Water spray shall also cover gas process units on deck, exposed lifeboats, liferafts and muster stations facing the cargo area and semi-enclosed cargo machinery/cargo motor room
12.1.1	Spaces entered during normal cargo operations. Ventilation shall run continuously. Monitoring of ventilation systems to be provided.

## IMO work on CORRECTIONS to the revised IGC Code

IGC	Reference	IMO	Details
5.9.3.1	100% radiographic or ultrasonic inspection of butt-welded joints for piping systems with design temperatures colder than -10°C, <b>or</b> with inside diameters of more than 75 mm, or wall thicknesses greater than 10 mm.	MSC 93/22/Add.1/Corr.5	Correction: <b>and</b> .
5.11.6.3	All emergency shutdown valves shall be of the <b>"fire closed"</b> type	MSC 97 93/22/Add.1/Corr.5	Correction: <b>"failed-closed"</b> type (i.e. closed on loss of actuating power).
5.12.1	Materials ...not lower than <b>55°C</b> ...	MSC 93/22/Add.1/Corr.3	Correction: <b>"not lower than -55° C"</b> .
7.8.4	Leakage detection of toxic or flammable vapours into a <b>non-hazardous area</b> or overboard	MSC 93/22/Add.1/Corr.3	Correction: <b>"safe location"</b>
8.2.18	Vent System	MSC 93/22/Add.1/Corr.3	Deleted: <b>"by the Administration"</b>
11.2.1	Fire Main	MSC 93/22/Add.1/Corr.3	Added: <b>"gauge"</b> after "MPa".
13.6.4	Oxygen deficiency monitoring. Carriage of non-flammable product: - <b>Cargo tank hold spaces</b> ..."where indicated in column "f" in the table of chapter 19"	MSC 97 93/22/Add.1/Corr.5	Correction: <b>"hold spaces for independent tanks other than type C tanks"</b> ; and "where indicated by an "A" in column "f" in the table of chapter 19".
13.6.11	Gas Sampling exhaust lines ..."non-hazardous area" ...	MSC 93/22/Add.1/Corr.3	Correction: <b>"safe location"</b>
16.9.5	Alternative fuel ventilation	MSC 93/22/Add.1/Corr.3	Correction: ventilation <b>inlet</b> in a non-hazardous <b>outlet</b> in a safe location."



## IMO work on Interpretations to the revised IGC Code

IGC	Reference	IMO	Details
3.2.5	Wheelhouse windows are required to be of A-0 fire class	Ref IMO Res. MSC.411 (97).	Requirement for A0 for wheelhouse windows will be removed from 1 Jan. 2020. Some Flags have accepted earlier implementation.
8.2.9	Requirement for safe means and procedures for emergency isolation of a cargo tank PRV.	UI MSC 97 (MSC.1/Circ.1559)	The PRV can be isolated on a temporary basis to reseal or repair the valve before putting the PRV back into service. Such means of emergency isolation should be installed in a manner that does not allow their inadvertent operation.
8.4.1.2	Determining the area to be excluded from the external surface area of prismatic tank. Definition of Lmin	MSC 97 (MSC.1/Circ.1559)	Interpretation: For Lmin, for non-tapered tanks, and for tapered tanks
11.3.6	Last Paragraph: "In addition, means shall be provided to back-flush the system with fresh water"	MSC 97 (MSC.1/Circ.1559)	Interpretation: Should mean the water-spray system as a whole (i.e. piping, nozzles and in-line filters) can be <b>flushed or back-flushed</b> , as appropriate, with fresh water to prevent the blockage of pipes, nozzles and filters.

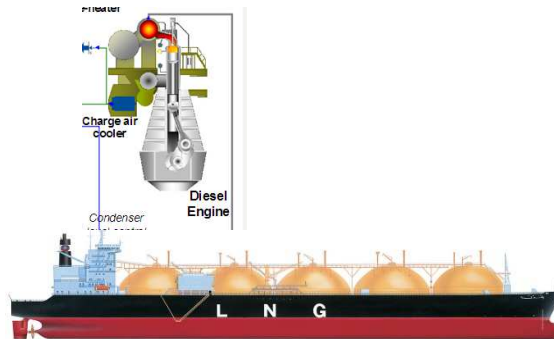
# DNV GL complementary work in relation to the IGC Code



requirements on ships at fixed locations

Chapter 16 updated for addressing Gas as fuel

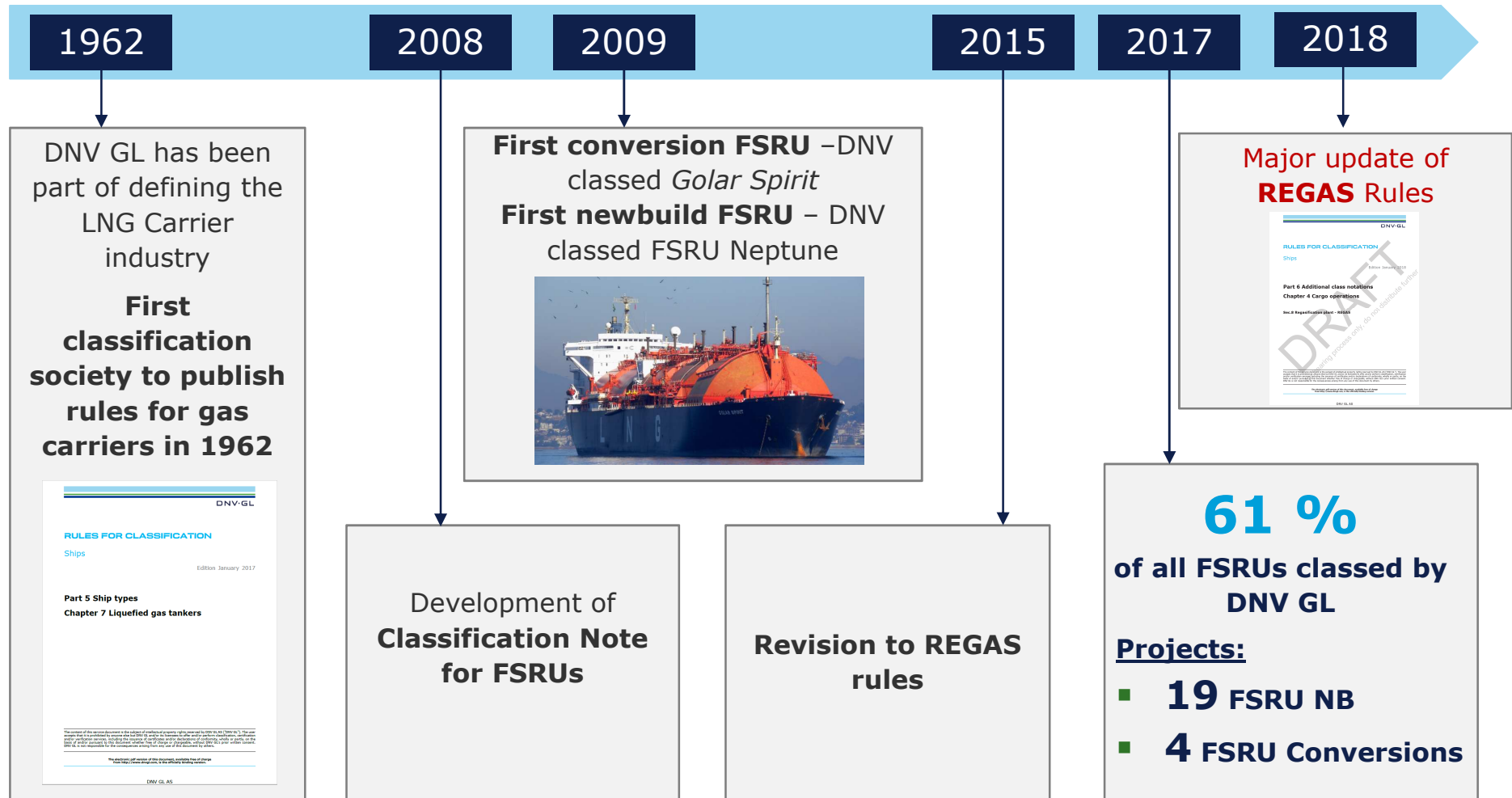
Mandatory for Gas Bunker Vessels



Rules on Gas Fuelled Ships  
Classification: **GF**

Rules for Gas bunker Vessels  
Classification: **Gas Bunker**

# DNV GL has been at the forefront of the FSRU development and classifies more than half of the global FSRU fleet today



# Thank you for your attention

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