Economic Commission for Europe

Inland Transport Committee

9 January 2014

Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (ADN Safety Committee)

Twenty-fourth session
Geneva, 27-31 January 2014
Item 3 (b) of the provisional agenda
Special authorizations, derogations and equivalents

Proposed text of derogations regarding the use of LNG for propulsion

Transmitted by the Government of the Netherlands

Attached is the proposed text of possible derogations for two vessels regarding the use of LNG for propulsion.

Decision of the ADN Administrative Committee relating to the tank vessel Chemgas 851

Derogation No. x/2014 of 31 January 2014

The competent authority of the Netherlands is authorized to issue a trial certificate of approval to the motor tank vessel *Chemgas 851*, official ID number 55679 and BV Register number 24521F, type G tanker, as referred to in the ADN, for the use of liquefied natural gas (LNG) as fuel for the propulsion installation.

Pursuant to paragraph 1.5.3.2 of the Regulations annexed to ADN, the above-mentioned vessel may deviate from the requirements of 7.2.3.31.1 and 9.3.2.31.1 until 30 June 2017. The Administrative Committee has decided that the use of LNG is sufficiently safe if the following conditions are met at all times:

1. The vessel has a valid ship's certificate according to the Rhine Vessel Inspection Regulations, based on recommendation 22/2013 of the CCNR.

2. A HAZID study by the recognized classification society shows that the safety level of the LNG propulsion system is sufficient. This study covered but was not limited to, the following issues:

   - Interaction between cargo and LNG;
   - Effect of LNG spillage on the construction;
   - Effect of cargo fire on the LNG installation;
   - Different types of hazard posed by using LNG instead of diesel as fuel;
   - Adequate safety distance during bunkering operations.

3. The information that LNG is used as fuel is included in the dangerous goods report to traffic management and in emergency notifications;

4. All data related to the use of the LNG propulsion system shall be collected by the carrier. The data shall be sent to the competent authority on request;

5. An evaluation report shall be sent to the UNECE secretariat for information of the Administrative Committee. The evaluation report shall contain at least information on the following:
   (a) system failures;
   (b) leakages;
   (c) bunkering data (LNG);
   (d) pressure data;
   (e) abnormalities, repairs and modifications of the LNG system including the tank;
   (f) operational data;
   (g) inspection report by the classification society which classed the vessel.

Decision of the ADN Administrative Committee relating to the tank vessel Chemgas 852

Derogation No. x/2014 of 31 January 2014

The competent authority of the Netherlands is authorized to issue a trial certificate of approval to the motor tank vessel *Chemgas 852*, official ID number 55678 and BV Register number 25106R, type G tanker, as referred to in the ADN, for the use of liquefied natural gas (LNG) as fuel for the propulsion installation.

Pursuant to paragraph 1.5.3.2 of the Regulations annexed to ADN, the above-mentioned vessel may deviate from the requirements of 7.2.3.31.1 and 9.3.2.31.1 until 30 June 2017. The Administrative Committee has decided that the use of LNG is sufficiently safe if the following conditions are met at all times:

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   (a) system failures;
   (b) leakages;
   (c) bunkering data (LNG);
   (d) pressure data;
   (e) abnormalities, repairs and modifications of the LNG system including the tank;
   (f) operational data;
   (g) inspection report by the classification society which classed the vessel.

Attached documents:

- Annex 1: HAZID Study
- Annex 2: Deviations from IGF Code
- Annex 3: Bunkering procedure
- Annex 4: Crew Training
- Annex 5: Project description
- Annex 6: TNO HAZID Assessment
- Annex 7: CCNR Recommendations

Hazid Study Chemgas 851/852

(version 27th August 2013)

1. Hazid – April 2013

For the Chemgas 851/852 (ID 55679 & ID 55678) a Hazid study was performed in April 2013. The purposes of the studies is to identify the risks present to the specific system and ensure that safety systems have been considered and will be implemented in the design according the preventive measures mentioned in the Hazid.
The used Hazard analysis methodology is the Hazard and Operability Analysis[1] combined with the Safety/Hazard analysis[2].

The studied vessels are tankers type G according to the ADN regulations. All crew on board is trained to handle dangerous cargo and are aware of the risks of sailing with an ADN type G tanker.

In the Hazid all possible Hazards for this LNG fuelled vessel are identified and checked for their potential effects to the vessel, crew and environment. The study was performed on several days with people with different experience related to LNG systems and vessel design & operation. In Table 1 you can find a list of the participants of the Hazid.

During the Hazid we used a P & ID Fuel system as a guide. For every part we identified the following points:

- Deviation; an event (failure mode) deviated of the normal operational situation or technical status of the installation
- Cause; what leads to the deviation
- Hazard; what are the dangers of the deviation
- Potential Effects; what will be the effect to vessel, crew, environment
- Safeguards; technical solutions (design, control & monitoring systems) to reduce the probability to happen the deviation (event). Operational procedures and / or preventive measures, carried out by human, to reduce the probability to happen of the deviation (event).

During the Hazid only single failure was considered as is normal practice. During the study it was decided that a risk matrix, will not be included in this study. In such a matrix all risks are defined by taking the likelihood x impact. As both likelihood and impact are difficult to calculate and information is limited, the risk matrix is left out of this study and instead we took the position that all risks (likelihood x impact) should be addressed. The safeguards from the Hazid will serve as recommendations for the design.

2. Analysis second stage – June/July 2013

In the original design a so-called pressure build up unit was placed in the fuel storage room, under deck. With a small pipe LNG was transferred from the LNG tank to this unit where it would be vapourized. This part of the design led to the most discussion and although all hazards were defined and solved, Chemgas found a solution which increased the safety dramatically. During the June CCR meeting a new solution was briefly presented. The complete gas conditioning unit will now be placed on deck in a unit. In the LNG fuel tank a pump will be placed which will transport LNG to this unit.

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1 ABS consulting; Marine Safety, tools for risk-based decision making, ch 11; ISBN 0-86587-909-5
2 Blanchard, B.J.; Logistics engineering and management, 291; 2004 Pearson Education, Inc.

Besides the new design a new approach towards the risks and effects of the use of LNG was discussed together with TNO. To better understand the effects of a deviation as mentioned in the Hazid, the LNG system is divided in three sections:

- Containment block; fuel storage
- Conditioning block; gas conditioning unit
- Consumer block; all items in the engine room & HPRS on tank deck

The results of the Hazid can be found at the end of this document.

Attached to this hazid-document you can find 6 drawings in which you can find the three blocks and additional information concerning the flow of LNG and NG in different stages and the places of the ESD valves:

450-001-1: General arrangement with block division
450-001-2: General arrangement with LNG & NG lines
450-001-3: P&ID Fuel system with block division
450-001-4: P&ID Fuel system with LNG & NG lines during normal operation
450-001-5: P&ID Fuel system with LNG & NG lines during time vessel is idle
450-001-6: P&ID Fuel system with LNG & NG lines during bunkering

To understand what will happen in case of a deviation as mentioned in the Hazid, in other words what will happen if LNG or NG is accidentally released in one of the blocks an analysis was made of how much LNG/NG would leak and what will be the effect. In table 2 the content of the block is added. In case of a leakage the complete block is isolated by closing of ESD valves and the total volume that might escape is known. In the table also the volume of gas on deck is added. From deck gas escapes directly into the open air. As the amounts will be less then from the conditioning block, no specific calculation is done.
For easy reference the original hazid study was also split with reference to the three blocks. Additional hazids related to the new design are added and marked by colouring the relevant row yellow.
Hazids that were deleted due to the new design are crossed.

Containment of LNG and NG between ESD valves

Marine Service Noord

Description See dwg 450-000 rev L	Compartment	Liquid or vapour	Content [liters]	Content of gas in nominal condition e.g. 0 atm 20degr C [liters]
Bunkerline between tank connection and shore connection (Enclosed by VL0017 and VL0005, VL0007)	containment block	liquid	110	66000
Bunkerline between tank connection and shore connection (Enclosed by VL0013 and VL0001, VL0003)	containment block	vapour	110	220
Gas conditioning unit (Enclosed by VL0011 and VL0029)	conditioning unit	liquid	700	420000
Gas conditioning unit (Enclosed by VL0014 and VL0034)	conditioning unit	vapour	750	6750
Vapour line high pressure to consumers incl vessel BT-02 (Enclosed by VL0029 and VL0030)	deck	vapour	1010	9090
Vapour line low pressure to consumers (Enclosed by VL0032 and VL0034)	deck	vapour	510	4590
Vapour lines to consumers (From VL0034 and VL 0030)	consumer block	vapour	50	450

Table 2: Content of compartments

2.1 Conclusion containment system

The largest imaginable LNG spill could occur when the LNG fuel tank ruptures.
The following safeguards were taken:

- The LNG storage tank is placed in the cargo area in compliance with existing rules and expected rules for a LNG cargo tank. This means, placed in a compartment protected by double hull and bottom.
- The complete hull, including the hold space for the LNG fuel tank, is designed with the same method as used for the so called “large cargo tanks”.
- The LNG fuel tank is a so called pressure tank, which means designed for a pressure of at least 10 bars and is of the same principle construction as pressure tanks for cargo products.
- The single wall LNG fuel tank will be insulated with a layer of 300 mm PIR and covered with a thin metal layer. The hold space will be filled with dry air.
- No tank connections below the deck are present, internal tank inspection is possible, tank equipment is in compliance with ADN rules for a cargo tank.
- The height of the insulated tank dome above deck is limited to the minimum possible height, lower than other fixed points on the ship. The dome will be protected against falling objects and direct sun radiation.

Conclusion: the risk of tank rupture is minimized as low as reasonable practical. The risk of rupture and the possible effects are less then risks and effects found in previous studies done in relation to transport of dangerous goods.

2.2 Conclusion conditioning system

A stainless steel drip tray of approximately 1000 LTR, free from the deck, with an overboard drain, is placed under the conditioning system to prevent the ship’s deck against cold liquid. The maximum volume of the liquid spill will be 700 L , taking into account the time needed to close the ESD valves. The calculated time to vaporize the liquid is about 70 seconds. Smaller leakages are more likely than leakage of the total volume of the conditioning system, but if the total volume is set free, the risk is within an acceptable margin. The ship remains operational, the main engine keeps running, the auxiliary diesel engine starts automatically.

2.3 Conclusion consuming system

For each auxiliary engine; in the HPRS, located on the tank deck, the NG pressure is reduced to about 1 bar. The NG enters the engine room via a double wall line to the LPRS, where the pressure is further reduced to about 50 mbars and then runs via a single wall line led to the air-inlet of the engine. Outer boundaries of the double wall line and LPRS are gastight and gas leakage will be detected and ventilated to a safe space on the open deck. Leakage of NG from the short single wall parts, about **50** mbars, will be detected by the gas detection above the auxiliary engines in the engine room. If gas is detected, the ESD in the in the associated supply line will be activated.

Concerning the main engine: In the gas conditioning block the NG pressure is reduced to 6 bars. Via a double wall line the NG is led to gastight valve cabinet in the engine room where the pressure is further reduced to about 5 bar. From there, via a double wall line, the NG goes to the engine cylinders. Gas leakage will be detected and ventilated to a safe place on the open deck.

Because of the double wall/ enclosure layout of the NG pipe system, no gas leakage into the engine room can occur.
The total amount of gas leakage from the double wall/ enclosure piping system and ventilated to open deck is 50 l.
The gas leakage amount into the engine room from the short and almost pressureless single wall parts of the system, also monitored by local gas detection in the engine room and safeguarded by ESD valve, will be extremely low.

Table 1: List of participants

Participant	Company	11/04/2013	12/04/2013	16/04/2013	25/04/2013
J.H. Klok (facilitator)	Goeree Maritime	1	1	1	1
E.W.P. den Haan (scribe)	Bureau Veritas	1	1	1	1
F. Kersbergen	Bureau Veritas	1	1	1	1
L. Korvink	ILT (Dutch authorities)		1		
A. Smit Roeters	Chemgas	1	1	1	1
J. Huis	Chemgas	1	1	1	1
M. Dane	Chemgas	1	1		1
L.de Jong	Chemgas	1	1		
A. van der Ven	Chemgas	1	1	1	
D. van Kempen	Chemgas	1	1		
J. Kuijs	Chemgas				
J. Penninga	Wartsila	1			
K. Vonk	Wartsila	1			
R. van der Sanden	Wartsila	1	1		
B. Kruyt	Wartsila		1		
J. Lont	Sandfirden		1		
P. van Galen	Sandfirden		1		
R. van Berkum	Cryovat		1		
G. Eising	MSN	1	1		
G. Leeuwis	MSN	1	1		
L. Vredeveldt (observer)	TNO			1	1

General

nb	Deviation	Cause	Hazard	Potential Effects	Safeguards
0		General	General	Main engine switches to gasoil; diesel aux. engine starts	Preventive maintenance measures; Fuel tank designed according ADN Rules
16	Loss of ventilation in double wall system (each engine)	Mechanical & electrical failure	No circulation which may lead to accumulation of NG in double wall	unsafe atmosphere in double wall	gas supply to engine affected stopped by safety system (including alarm)
17	Fire on deck	External	Fire	Pressure build up in tank & piping	Waterspray system and fire fighting equipment; Fire fighting procedures
18	Fire in engine room	External to the gas system	Fire & smoke	Damage to vessel, black out, human injuries	Detection and (fixed) fire fighting system; ESD; Fire fighting procedures
15a	Leaking of LNG pipe system on open deck	Human error; trapped liquid; collision & dropped objects; fatigue and corrosion	Brittle fracture ship structure; fire on deck	loss of structural integrity; danger to humans, (parts of) vessel and cargo	LNG outside high stressed area only; water spray system for protection vital parts of vessel; ample drip trays provided; relief valve return to tank; ESD
15b	Leaking of NG pipe system on open deck	Collision & dropped objects; fatigue and corrosion	NG release/Fire	Minor environmental pollution & danger to humans, (parts of) vessel and cargo	ESD ; water spray system for protection vital parts of vessel

Containment 1/2

~~8a~~	~~Small leakage PBU unit below deck~~	~~Pipe fracture because of fatigue~~	~~LNG in secondary barrier~~	~~Gas around PBU; unsafe atmosphere in double wall~~	~~Pressure / Temperature control in double wall. Overpressure leaded back to the fuel tank~~
8b	Deterioration tank insulation material	Ageing of material	No hazards	Very slow increase of the rate of pressure build-up; Holding time diminishes	During engineering phase ageing is taken into consideration
8c	No LNG consumption	Any reason	Pressure build up in tank which may lead to unintentional venting	Possible injury	Venting pipe (height above deck acc requirements) in vertical direction; possibility for de bunkering
8d	Rupture of tank ~~connection branch below deck~~	Collision, grounding, fatigue, thermal	LNG spill in fuel storage hold space	brittle fracture, NG in fuel storage hold space, causing unsafe atmosphere.	Special attention to design and construction of hull similar to so-called large cargo tanks.
8e	Failure of submerged LNG pump	Mechanical or power supply failure	No hazards	Main Engine will automatically change to gasoil after process vessel in conditioning unit is empty	Idem potential effects

Containment 2/2

9a	Flooding of fuel storage hold space	Leakage of heating medium and leakage from deck	NG in the double wall space around the PBU unit and into heating system; water in storage hold may accumulate and damage insulation	Damage to construction, piping and connections	Bilge/Flooding alarm; anti-floatation device provided; non return valve in bilge system; Gas leakage in the heating medium is leaded to a safe place;
9b	Temperature too low in fuel tank space	Heat absorpition by LNG tank	Cold ship structure	Brittle fracture	Equilibrium between heat ingress and cold absorption calculated; temperature is monitored
14	Mechanical damage from outside on dome	Collision (with bridge) & dropped objects	NG release/Fire	Minor environmental pollution & danger to humans, (parts of) vessel and cargo	Dome below max air draft & water spray system for protection vital parts of vessel; Diesel auxiliary engine can be started to replace electrical power

Conditioning 1/3

1a	Gas conditioner; heating or circulation stops	Rupture of piping of glycol within exchanger	LNG in glycol system	Pump malfunctions/runs hot; pressure build up in glycol system; icing in glycol	LNG supply to and from heat exchanger closes; Safety pressure valve on glycol system; glycol supply to and from heat exchanger closes
1b		Failure of glycol system (malfunction, rupture or electrical failure or too low temperature)	No vapourisation of LNG	LNG (liquid) to engine room	Closing of flow control valve;
2a	Malfunction of flow control valve	Mechanical failure (stays open)	No vapourisation of LNG	LNG (liquid) to engine room	Temperature transmitter on vapour line to engines, if temp is too low shut off fuel supply to engine
2b		Mechanical failure (closes)	No hazards	Main engine switches to gasoil (dual fuel);	Preventive maintenance measures; diesel aux. engine starts
2c	LNG in NG main supply line	Malfunction of evaporator system	Liquid to gas valve unit & HPRS; thermal stresses;	Main engine switches to gasoil, aux engines stops; gasoil engine starts	Temperature transmitter on vapour line to engines, if temp is too low shut off fuel supply to engine; Operational procedures

Conditioning 2/3

3a	Failure of temperature & pressure control system	No electrical power supply	No hazards	Main engine switches to gasoil (dual fuel);	Preventive maintenance measures; Fail to close valve; diesel aux . engine starts
3b		Sensor failure	See 2		Self sensor test; Calibration sensor
3c		Processor failure	See 2		Self processor test
3d		Wire break	See 2b		
~~6a~~	~~Pressure build-up unit; heating or circulation stops~~	~~Rupture of piping of glycol within exchanger~~	~~LNG in glycol system~~	~~Pump malfunctions/runs hot; pressure build up in glycol system; icing in glycol~~	~~LNG supply to and from heat exchanger closes; Safety pressure valve on glycol system; glycol supply to and from heat exchanger closes~~
~~6b~~	-	~~Failure of glycol system (malfunction, rupture or electrical failure or too low temperature)~~	~~No vapourisation of LNG -> no hazard~~	-	-
3a	Failure of temperature & pressure control system	No electrical power supply	No hazards	Main engine switches to gasoil (dual fuel);	Preventive maintenance measures; Fail to close valve; diesel aux . engine starts

Conditioning 3/3

~~7a~~	~~Malfuntioning of flow control valve~~	~~Mechanical failure (stays open)~~	~~Increasing tank pressure~~	~~ESD blocks LNG vapourisation~~	~~Pressure transmitter on tank, if pressure is too high shut off liquid supply to pressure build up unit~~
~~7b~~	-	~~Mechanical failure (closes)~~	~~No hazards~~	-	-
7c	Leakage of process vessel	falling object/bridge collision	LNG/NG spill	LNG vaporization/NG dispersion	Bull bar, process unit protected by skit, drip tray and ESD system

Consuming 1/3

4a	Failure of gas valve unit	Internal malfunction	Leakage of NG in gas valve cabinet	Gas detection in double wall unit	Shut down gas system main engine, switch to gasoil
4b		Mechanical failure (stays open)	No hazard		Engine can withstand 8 bar pressure
4c		Mechanical failure (closes)	No hazard	Main engine switches to gasoil (dual fuel);	
5a	NG leakage in engine feed system	Internal malfunction	Internal leakage of NG	NG in double wall unit	Shut down gas system, switch to gasoil, complete double wall engine gas unit; type approved engine; gas detection in double wall unit
5b	NG in exhaust system	Misfire	Combustion of NG in exhaust system	Rupture of exhaust system; exhaust gases in engine room	Rupture disc, ventilation of exhaust pipe after engine stops; fire detection; Shut down gas system main engine, switch to gasoil
5c	NG in crankcase	Internal leakage	Explosion in crankcase	Main engine stops & damage to engine	FMEA being carried by Wartsila: Gas detection in crankcase ventilation will be fitted if FMEA indicates requirement to do so.

Consuming 2/3

5d	Component failure (electrical)		No additionals hazards compared to ordinary gasoil engines		Standard Wartsila Control & monitoring system
5e	Gas leakage into cool water system	Internal leakage	No hazards within cool water system	Accumulation into safe zone	low level alarm on cooling water & ventilation of expansion tank to safe place
5f	Backfire of engine	Incorrect air-fuel mixture, leaking inlet valve or incorrect ignition timing	Flame form inlet system; scatttered parts from inlet system due to pressure wave; flame in gas train	Damage to inlet system engine or engine room & operators	System to detect backfire and shut-down engine immediately to prevent new backfires
10a	Internal failure of HPRS	Mechanical failure	High pressure on low pressure system	NG blow off outside engine room	ESD valve aux engine closes
10b	NG leakage from HPRS	Mechanical failure	NG leakage in atmospere	Environmental pollution	In the HPRS the pressure is reduced to 1 bar maximum
11a	Internal failure of LPRS	Mechanical failure	No hazard as system can handle 50 mbar	50 mbar in where 0 mbar should be, aux engine stops	Pressure detection
11b	NG leakage from LPRS	Mechanical failure	Leakage of NG into LPRS system	NG in double wall unit	Shut down gas system, complete double wall engine gas unit; type approved engine; gas detection in double wall unit

Consuming 3/3

12	NG leakage of single wall fuel pipe	Mechanical failure	Possible minor NG leakage in engine room	unsafe atmosphere in engine room	Gas detection & ventilation
13a	NG in exhaust system	Misfire	No hazard because of too lean mixture	No effect	
13b	NG in crankcase	Internal leakage	No hazard internal closed circuit due to size of cylinders and lean burn principle	No effect	Carter ventialtion; Gas detection & ventilation
13c	Component failure		No additionals hazards compared to ordinary gasoil engines	No effect	
13d	Minor gas leakage into cool water system	Internal leakage	Accumulation of NG into engine room	unsafe atmosphere in engine room	low level alarm on cooling water & ventilation of expansion tank to open air
13e	Backfire	Incorrect air-fuel mixture	No hazards	Pressure shock in inlet	Engine control system
Add1	Leakage of LNG from pipe GCU to HRPS	Piping rupture	NG spill	NG dispersion	ESD system

Attachments:

- 450-001-1: General arrangement with block division
- 450-001-2: General arrangement with LNG & NG lines
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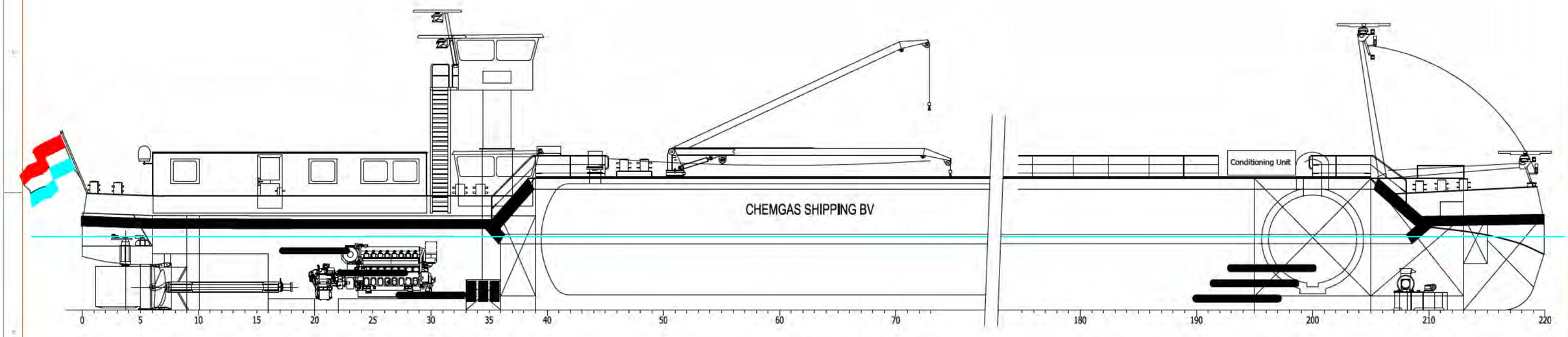

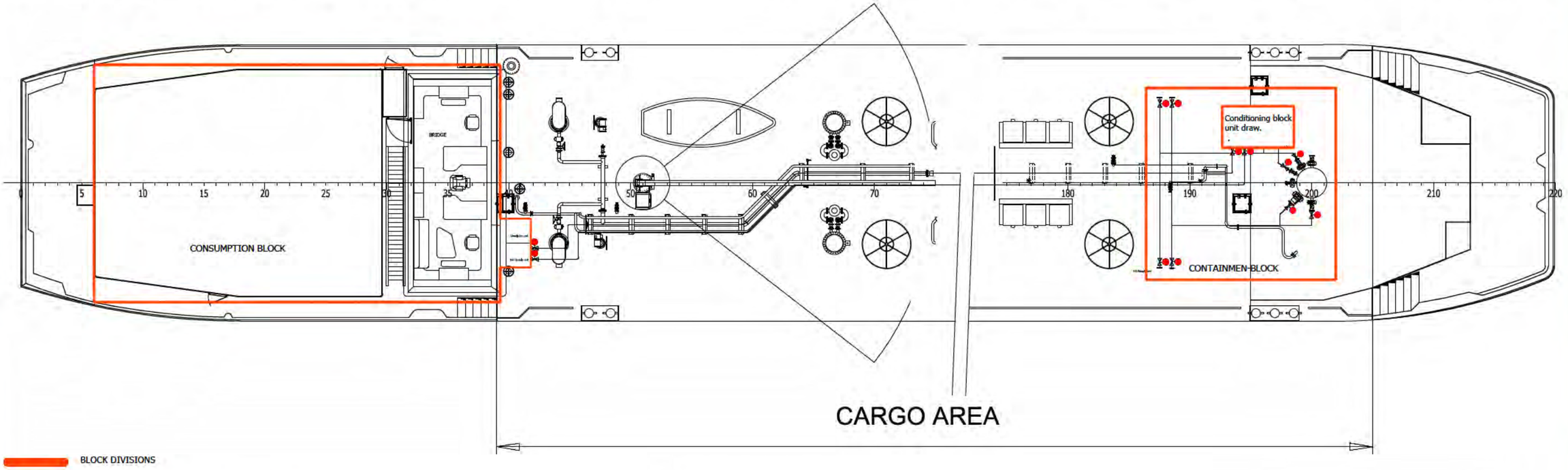

BLOCK DIVISIONS

ESD VALVES

BLOCK DIVISION TRIPLE 'C' PRINCIPLE

PRINCIPAL DIMENSIONS

LENGTH O.A.	110,00 m
LENGTH MLD.	109,95 m
BREADTH O.A.	11,37 m
BREADTH MLD.	11,32 m
DEPTH	5,65 m
DRAUGHT Ballast	2,25 m
DRAUGHT Construction	3,15 m
CARGOTANK CAPACITY	2620 m³

MSN
VOORLOPIG
PRELIMINARY
d.d. 17-04-2013

L	removed EH-03, changed cap.	MSM	22-07-2013
K	Added Electric heater	MSM	17-07-2013
J	Added buffertank for gas conditioning.	MSM	12-07-2013
I	Changed manhole, feedpump LNG added	MSM	04-06-2013
H	Changed PBU unit into electric heater	GLE	21-05-2013

WIJZ. (REV.) | WIJZ. OMSCHRIJVING (REV. DESCRIPTION) | GEC. DOOR (CHECKED BY) | DATUM (DATE)

GET. DOOR: (DRAWN BY) GLE | DATUM (DATE) 31-01-13 | GEC. DOOR: (CHECKED BY) | DATUM (DATE) | SCHAAL (SCALE) NONE

MARINE SERVICE NOORD B.V.
ENGINEERING – PIPING SYSTEMS – ENGINEROOM INSTALLATION,
P.O. BOX 120 9600 AC HOOGEZAND PHONE 31(0)598-519819 FAX 31(0)598-519830
e-mail: msn@msholding.nl web-site: http://www.msholding.nl

TEKENING OMSCHRIJVING: (DRAWING DESCRIPTION) General arrangement with block division

PROJECT NR.: (PROJECT NR.) CG012 | TEKENING NR.: (DRAWING NR.) 450-001/1 | *KLASSE: (CLASSIFICATION) | AUTORITEIT: (AUTHORITY) | FORMAAT: (SIZE) A1

Consumption block

SCANIA SGI-07M
AUX-01

SCANIA SGI-16M
AUX-02

AIR FLOW

LPRS

HPRS
10

Gas Venting

Vapour line B/T barg

DN50

80X50

DN80

GAS VALVE UNIT
P.in = 6 bar
P.OUT = 4,8 BAR

Gas valve cabinet

DN80/DN125

DN25

ME-01
Wartsila 8L20DF

AFT SHIP

GAS SAFE MACHINERY SPACE

CARGO DECK
Hazardous zone 1

ESD VALVES

BLOCK DIVISION

conditioning block

Driptray

PS

SB

vent mast

Containment block

N2 connection

Manifold

LNG Fuel Tank

FT-01

GFP-01

Notes:

1. All pressure relief valves connected to tank dome and ball valves sealed in open position
2. Length of fuel pipe max. 10 mtr.
3. Gas venting lines venting to safe place
4. Provide with a secure system in such manner that only one safety valve can be closed.
5. Test connections on several heights.
diameter transit dome 1,5mm
6. All operable valves to be fitted with nameplate

Reference diagrams:

LEGENDA

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
	Control valve	PDI	Differential pressure indicator	LT	Level transmitter		High pressure reducing set 6bar - 50mbar
	Relief valve	PT	Pressure transmitter		Double walled pipe		
	Ball valve	PI	Pressure indicator	PV	PV valve		Low pressure reducing set 50mbar-0
	Actuator	PS	Pressure switch		Dry brake coupling		
	ESD valve	TT	Temperature transmitter		Needle valve		Exchanged submergible pump with bottom valve
	ESD Wartsila control	TI	Temperature indicator		Insulation (HDPE)		
	ESD Scania control	LI	Level indicator				
	Excessive flow valve	XX	Gas detection				
	Valve						

Tag no.	Description	Flow (m³/h)	Pres. (barg)	Power (kW)	Cap. (m³)
ME-01	Main engine Wartsila			1320	
AUX-01	Scania SGI-16M			285	
AUX-02	Scania SGI-07M			110	
BT-02	Buffer vessel				88
FT-01	Fuel tank				
GC-01	conditioning unit	4	8	2	1,5
GFP-01	Gas Fuel pump				
LT-0001	Leak Tray				

L	removed EHC3, changed dec	MDM	22-07-2013
K	Added Electric Heater	HBM	17-07-2013
J	Added switchbox for gas conditioning.	MDM	12-07-2013
I	Changed manifold, Hexcomm LNG added	MDM	04-06-2013
H	Changed PFU unit for electric heater	DLS	21-05-2013

MSN
VOORLOPIG
FREELIMINARY
d.d. 17-04-2013

MARINE SERVICE NOORD B.V.
ENGINEERING – PIPING SYSTEMS – ENGINEROOM INSTALLATION
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P&ID Fuel System with block division

CG012 | 450-001/3 | A1

Consumption block

SCANIA SGI-07M
AUX-01

SCANIA SGI-16M
AUX-02

AIR FLOW

LPRS

HPRS

Gas Venting

Vapour line B/I barg

GAS VALVE UNIT
P.in = 6 bar
P.OUT = 4,8 BAR

Gas valve cabinet

ME-01
Wartsila 8L20DF

AFT SHIP

GAS SAFE MACHINERY SPACE

CARGO DECK
Hazardous zone 1

ESD VALVES
LNG
NG
ME RUNNING ON NG FROM LNG
AE's RUNNING ON NG FROM NG

conditioning block

Driptray

PS

SB

Containment block

vent mast

LNG Fuel Tank

FT-01

Notes:

1. All pressure relief valves connected to tank dome and ball valves sealed in open position
2. Length of fuel pipe max. 10 mtr.
3. Gas venting lines venting to safe place
4. Provide with a secure system in such manner that only one safety valve can be closed.
5. Test connections on several heights.
diameter transit dome 1,5mm
6. All operable valves to be fitted with nameplate

Reference diagrams:

LEGENDA

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
	Control valve	PDI	Differential pressure indicator	LT	Level transmitter		High pressure reducing set 6bar->50mbar
	Relief valve	PT	Pressure transmitter		Double walled pipe		
	Ball valve	PI	Pressure indicator	PV	PV valve		Low pressure reducing set 50mbar>0
	Actuator	PS	Pressure switch		Dry break coupling		
	ESD valve	TT	Temperature transmitter		Needle valve		Exchanged submergible pump with bottom valve
	ESD Wartsila control	TI	Temperature indicator		Insulation (HDPE)		
	ESD Scania control	LI	Level indicator				
	Excessive flow valve	XX	Gas detection				
	Valve						

Tag no.	Description	Flow (m³/h)	Pres. (barg)	Power (kW)	Cap. (m³)
ME-01	Main engine Wartsila			1320	
AUX-01	Scania SGI-16M			285	
AUX-02	Scania SGI-07M			110	
BT-02	Buffer vessel				88
FT-01	Fuel tank				
GC-01	conditioning unit	4	8	2	1,5
GFP-01	Gas Fuel pump				
LT-0001	Leak Tray				

L	removed EHC13, changed dec	MDM	22-07-2013
K	Added Electric Heater	HBM	17-07-2013
J	Added switchboard for gas conditioning.	HBM	12-07-2013
I	Changed monitors, Hexicomm LNG added	MDM	04-06-2013
H	Changed PFU unit for electric heater	GLS	21-05-2013

MSN
VISORLEPIG
PRELIMINARY
d.d. 17-04-2013

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P&ID Fiel system with LNG & NG lines during normal operation

CG012 | 450-001/4 | A1

Consumption block

SCANIA SGI-07M
AUX-01

SCANIA SGI-16M
AUX-02

AIR FLOW

LPRS

Gas Venting

HPRS
10

Vapour line S/I berg

DN50

DN80

GAS VALVE UNIT
P.in = 6 bar
P.OUT = 4,8 BAR

Gas valve cabinet

DN80/DN125

DN25

ME-01
Wartsila 8L20DF

AFT SHIP

GAS SAFE MACHINERY SPACE

CARGO DECK
Hazardous zone 1

ESD VALVES
NG
BOIL OFF CONTROL

PS

SB

vent mast

Containment block

conditioning block

Driptray

LNG Fuel Tank
FT-01

Notes:

1. All pressure relief valves connected to tank dome and ball valves sealed in open position
2. Length of fuel pipe max. 10 mtr.
3. Gas venting lines venting to safe place
4. Provide with a secure system in such manner that only one safety valve can be closed.
5. Test connections on several heights.
diameter transit dome 1,5mm
6. All operable valves to be fitted with nameplate

Reference diagrams:

LEGENDA

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
	Control valve	PDI	Differential pressure indicator	LT	Level transmitter		High pressure reducing set 6bar - 50mbar
	Relief valve	PT	Pressure transmitter		Double walled pipe		
	Ball valve	PI	Pressure indicator	PV	PV valve		Low pressure reducing set 50mbar-0
	Actuator	PS	Pressure switch		Dry brake coupling		
	ESD valve	TT	Temperature transmitter		Needle valve		Exchanged submersible pump with bottom valve
	ESD Wartsila control	TI	Temperature indicator		Insulation (HDPE)		
	ESD Scania control	U	Level indicator				
	Excessive flow valve	XX	Gas detection				
	Valve						

Tag no.	Description	Flow (m³/hr)	Pres. (barg)	Power (kW)	Cap. (m³)
ME-01	Main engine Wartsila	4	8	1320	
AUX-01	Scania SGI-16M			285	
AUX-02	Scania SGI-07M			110	
BT-02	Buffer vessel				88
FT-01	Fuel tank				
GC-01	conditioning unit			2	1,5
GFP-01	Gas Fuel pump				
LT-0001	Leak Tray				

MSN
VISGRLEPIG
PRELIMINARY
d.d. 17-04-2013

L	removed EHC13, changed dec	MDM	22-07-2013
K	Added Electric Heater	HBM	17-07-2013
J	Added switchboard for gas conditioning.	MSH	12-07-2013
I	Changed manifold, Heatcores LNG added	MDM	04-06-2013
H	Changed PFU unit for electric heater	GLS	21-05-2013

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P&ID Fiel system with LNG & NG lines during boil-off control

CG012 | 450-001/9 | A1

Consumption block

SCANIA SGI-07M
AUX-01

SCANIA SGI-16M
AUX-02

AIR FLOW

LPRS

HPRS 10

Gas Venting

Vapour line B/I barg

DN50

DN80

80X50

GAS VALVE UNIT
P.in = 6 bar
P.OUT = 4,8 BAR

Gas valve cabinet

DN80/DN125

DN25

726 108

708

ME-01
Wartsila 8L20DF

AFT SHIP

GAS SAFE MACHINERY SPACE

CARGO DECK
Hazardous zone 1

ESD VALVES
LNG
NG

conditioning block

Driptray

PS

SB

vent mast

Containment block

CV-0001

CV-0002

CV-0003

VL-0009

VL-0010

VL-0011

VL-0012

VL-0013

VL-0014

VL-0015

VL-0016

VL-0017

VL-0018

VL-0019

VL-0020

EFV-0001

LNG Fuel Tank

FT-01

GFP-01

Notes:

1. All pressure relief valves connected to tank dome and ball valves sealed in open position
2. Length of fuel pipe max. 10 mtr.
3. Gas venting lines venting to safe place
4. Provide with a secure system in such manner that only one safety valve can be closed.
5. Test connections on several heights.
diameter transit dome 1,5mm
6. All operable valves to be fitted with nameplate

Reference diagrams:

LEGENDA

Symbol	Description	Symbol	Description	Symbol	Description	Symbol	Description
	Control valve	PDI	Differential pressure indicator	LT	Level transmitter		High pressure reducing set 6bar - 50mbar
	Relief valve	PT	Pressure transmitter		Double walled pipe		
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	Actuator	PS	Pressure switch		Dry brake coupling		
	ESD valve	TT	Temperature transmitter		Needle valve		
	ESD Wartsila control	TI	Temperature indicator		Insulation (HDPE)		Exchanged submergible pump with bottom valve
	ESD Scania control	U	Level indicator				
	Excessive flow valve	XX	Gas detection				
ETV	Valve						

Tag no.	Description	Flow (m³/h)	Pres. (barg)	Power (kW)	Cap. (m³)
ME-01	Main engine Wartsila			1320	
AUX-01	Scania SGI-16M			285	
AUX-02	Scania SGI-07M			110	
BT-02	Buffer vessel				88
FT-01	Fuel tank				
GC-01	conditioning unit	4	8	2	1,5
GFP-01	Gas Fuel pump				
LT-0001	Leak Tray				

L	removed: EHC13, changed: dec	MDW	22-07-2013
K	Added: Electric Heater	MDW	17-07-2013
J	Added: switchbox for gas conditioning.	MDW	12-07-2013
I	Changed: Manifold, Heatcores LNG added	MDW	04-06-2013
H	Changed: PFU unit incl electric Heater	DLS	21-05-2013

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P&ID Fiel system with LNG & NG lines during bunkering

CG012

450-001/6

A1

Annex 2: Chemgas 851/852

Deviations from Res.MSC.285 (86), June 2009

MSC 285	**Chemgas 851/852**
1.1.2 Application	IGF code should apply in addition to Solas. This should read “in addition to CCR/ADN requirements” for inland nav.ships.
1.3.25 Definitions	Risk assessment. The definition of “risk” in 2.2.33 includes likelyhood. In our HAZID this is not taken into account. See hazid study)
2.8.1.4 LNG storage tank	As 6 meter is not possible due to air draft in inland waters, vent mast is in accordance with ADN regulations
2.8.4.2 Storage in enclosed spaces	Double hull structure at the location of the fuel storage tank is strengthened similar to hull structure for cargo tanks as requested by ADN

As the IGF code is still developping a similar comparison was done with the latest version from February 2013.

Deviations from BLG 17/WP.5/Add.1, February 2013

BLG17	**Chemgas 851/852**
2.1.3 Application	IGF code should apply in addition to Solas. This should read “in addition to CCR/ADN requirements” for inland navigation vessels
4.2.1 Definitions	Risk assessment. The definition of “risk” in 2.2.33 includes likelyhood. In our HAZID this is not taken into account. See hazid study)
5.3.4.1/5.3.5 Tank location	Double hull structure at the location of the fuel storage tank is strengthened similar to hull structure for cargo tanks as requested by ADN
6.4.1.4 LNG tank	Vessel is designed for inland waters
6.4.9.3.3.8 Design loads	Vessel complies with class & statutory rules for inland vessels, design loads are according these requirements.
6.7.2.7.3 Pressure relief system	As 6 meter is not possible due to air draft in inland waters, vent mast is in accordance with ADN regulations
6.7.2.9 Pressure relief system	All other are addressed in Hazid

Annex 3

Liquefied natural gas bunkering procedure

1. PURPOSE

To fill the liquefied natural gas storage tank(s) in a safe way, the following procedures shall be followed closely:

2. GENERAL

Before the vessel's liquefied natural gas storage tanks can be filled, the competent authority shall be informed. The authority could demand for extra safety precautions. The authority's approval for the bunker transfer must be available before bunkering has started.
As long as there are no regulations for liquefied natural gas bunker transfer the following can be used as guidance, where applicable:

- General bunker transfer procedures for oil fuel
- Precautions and procedures for cargo filling and –discharge by inland waterway tank vessels

3. PRE-FILLING

Before liquefied natural gas transfer has commenced, warning signs shall be placed, the bunker checklist in appendix A has to be filled in and signed both by a vessel's representative and the delivery truck driver.
After all questions on the bunker checklist are answered positive and the delivery truck driver has received all necessary documentation, transfer can commence.

4. FILLING

During transfer the following items shall continuously be checked:

- The gas pipes, -hose and connectors for leakage,
- The mooring lines,
- Forces on the transfer hose,
- Tank pressure, which can be controlled by use of the top filling spray facility (with this procedure a vapour return is not required).

5. POST-FILLING

After liquefied natural gas transfer, and after the transferhose is disconnected, warning signs on the shore can be removed. At this time the vessel's representative shall inform the crew and the competent authorities that the transfer is finished.

Appendix A (template)

<table>
<tr><th colspan="2">Liquefied natural gas bunker checklist</th></tr>
<tr><td colspan="2">Precautions and appointments made for transfer of liquefied natural gas</td></tr>
<tr><td>- Vessel’s particulars
……
(Vessel’s name)</td><td>……
(European vessel identification number)</td></tr>
<tr><td>- Truck’s particulars
……
(Company name)</td><td>……
(Plate number)</td></tr>
<tr><td>- Bunker location
……
(Address)
……
(Date)</td><td>……
(Place)
……
(Time)</td></tr>
<tr><td colspan="2">Liquefied natural gas related particulars</td></tr>
<tr><td colspan="2">Quantity in m^3: .....</td></tr>
<tr><td colspan="2">Emergency procedure</td></tr>
<tr><td colspan="2">Filling must be stopped immediately in case of any leakage. All valves have to be set in their safe position.
A red flashlight on the vessel will indicate the abnormal situation described.
The truck driver will stop the liquefied natural gas transfer immediately.
All personnel will evacuate the bunker area immediately in accordance with the safety rota.</td></tr>
</table>

The start of the liquefied natural gas transfer is only allowed if all questions raised on the following checklist are answered ‘yes’ and both responsible persons have signed the list.
If one of the questions cannot be answered ‘yes’, liquefied natural gas transfer is **NOT** allowed.

Liquefied natural gas bunker checklist			
		Vessel	Truck
1.	Is the competent authority's permit for the liquefied natural gas transfer in the designated area available?	○	--
2.	Are the requirements of local regulations and of the competent authority met?	○	--
3.	Is the competent authority informed that liquefied natural gas transfer will be commenced?	○	--
4.	Is the vessel well moored?	○	--
5.	Is the lighting, both on the truck and on the vessel (bunker manifold and escape routes), sufficient and in good working order?	○	○
6.	Are the signs, that designate the safe area around the tank truck on the shore, placed?	--	○
7.	Are all for any possible leakage necessary drip-trays placed and is the water spray installation for immediate use available?	○	--
8.	Is the liquefied natural gas transfer hose properly supported and are there no extreme forces or stress on the hose?	○	○
9.	Are the liquefied natural gas transfer hose and break away coupling in good condition?	○	○
10.	Is the ground cable connected in the right way?	--	○
11.	Are all means of communication between truck, bunker manifold and wheelhouse checked and in working condition?	○	○
12.	Are all safety and control devices on the liquefied natural gas installation checked and in good working order?	○	--
13	Is the amount of liquefied natural gas that will be transferred agreed?	○	○
14.	Do the ordered liquefied natural gas specifications apply on the delivered liquefied natural gas specifications?	○	○
15.	Is the emergency stop procedure discussed with, and understood by, the truck driver?	○	○
16.	Is there a liquefied natural gas quality certificate available?	○	○
17.	Has the crew been informed that the liquefied natural gas transfer has commenced?	○	--
18.	Is for the whole time of the filling or emptying of the liquid natural gas storage tank a continuous supervision by the responsible persons of the vessel and the truck ensured?	○	○
19.	Are there suitable means of escape in case of emergency available?	○	
Checked and signed:			
Vessel's responsible person: ..... (Name in capitals) ..... (Signature)		Tank truck's responsible person: ..... (Name in capitals) ..... (Signature)	

Annex 4

Description of the training of the crew on board of liquefied natural gas driven inland waterway vessels

A. Introduction

The main purpose of the course is to familiarise the crew of inland waterway vessels with the properties and hazards of liquefied natural gas and to gain knowledge on how to work with liquefied natural gas as fuel on board the vessel; for instance in case of operation, bunkering and maintenance.

The course will include a theoretical part, consisting of the topics mentioned under B and a practical training on board the vessel in which the theoretical items will be dealt with in practice.

The selection of a suitable training institute and the extent of the training will be in accordance with, and determined by the competent authority. Every 2.5 years, the training shall be repeated.

After successful participation, the crew will be issued a certificate by the training institute.

B. The liquefied natural gas course will cover the following topics:

1. Legislation

1.1 General legislation / best practice for ADN, ROSR, European Directive EU 2006/87 and new developments

1.2 Available international legislation concerning liquefied natural gas (for seagoing / best practices) IMO, IMDG and new developments

1.3 Rules of the classification society which has classed the vessel

1.4 Legislation concerning health and safety

1.5 Local regulations and permits

1.6 Recommendations according to ADN and RVIR

2. Introduction to liquefied natural gas

2.1 The definition of liquefied natural gas, critical temperatures, liquefied natural gas hazards, atmospheric conditions

2.2 Compositions and qualities of liquefied natural gas, liquefied natural gas-quality certificates

2.3 MSDS (safety sheet): physical / product characteristics

2.4 Environmental properties

3. Safety

3.1 Hazards and risks

3.2 Risk management

3.3 The use of personal protection

4. The techniques of the liquefied natural gas installation

4.1 General configuration
4.2 Explanation of the effects of liquefied natural gas
4.3. Temperatures and pressures
4.4 Valves and automatic controls, ATEX
4.5. Alarms
4.6 Materials (hoses, pressure relief valves)
4.7 Ventilation

5. Service & checks of the liquefied natural gas installation

5.1 Daily maintenance
5.2 Weekly maintenance
5.3 Periodical maintenance
5.4 Failures
5.5 Documentation of maintenance work

6. Bunkering of liquefied natural gas

6.1 Bunkering procedure liquefied natural gas
6.4 Gas freeing / flushing of the liquefied natural gas system
6.5 Check lists and delivery certificate

7. Preparation of the liquid natural gas system for maintenance of the vessel

7.1 Gas free certificate
7.2 Gas freeing / flushing of the liquefied natural gas system before docking
7.2 Inerting of the liquefied natural gas system
7.3 Procedure de-bunkering of the bunker tank
7.4 First filling of the liquefied natural gas bunker tank (cool down)
7.5 Start up after dock period

8. Emergency scenarios

8.1 Emergency plan
8.2 Liquefied natural gas spill on deck
8.3 Liquefied natural gas skin contact
8.4 Release of natural gas on deck
8.5 Release of natural gas in enclosed spaces (power stations)
8.6 Fire on deck in the vicinity of the liquefied natural gas storage tank.
8.7 Fire in engine rooms
8.8 Specific hazard in case of transport of dangerous goods
8.9 Grounding/collision of the vessel

Project description

Contents

1. Introduction

Chemgas is a shipping company for inland and seagoing gas carriers with 48 years of experience in the transport of gasses. Currently, Chemgas is planning on building a gas carrier (ADN type G) which will use LNG as fuel and transports the common gasses as allowed by the ADN. The ship will be equipped with a dual fuel engine in order to switch to diesel in case of problems with the LNG system or a lack of LNG bunkerfacilities.
The ship will be built under Bureau Veritas class and shall comply with the legislation of RosR and ADN. Class will be maintained. In addition the design will comply, in as far as relevant for inland shipping, with the requirements of the IGF code as being developed by IMO. Because LNG is not allowed as fuel for propulsion, for both the CCR committee in Strasbourg and the ADN committee in Geneva a request for recommendation is submitted.
At the end of this project description a list of terms and abbreviations is added.

1.1 Update of design and project documentation

After the presentation of the project in Bruxelles in June 2013, some changes were made both to the LNG/NG system and the project documentation. The main update on the LNG/NG system is that a solution has been found to avoid tank connections below the deck. This is in line with the philosophy of the current ADN for type G vessels (ADN 9.3.1.11.6.(c)).
The differences are:

- The pressure build up unit is replaced by a submerged pump within the LNG tank.
- The system lay out has been updated and divided into 3 blocks, being consumers, conditioning and containment.
- A list of terms and abbreviations has been added in both project description and Hazid.
- The lay out of the project description has been updated in accordance with a proposal of the German delegation.
- The chapter on ESD is moved from the Hazid to chapter 4 of the project description.
- Annex 2 (deviations from the IGF code) has been updated in accordance with questions raised during the meeting in Bruxelles.
- The Hazid is adapted to reflect the new system as mentioned in paragraph 2 of the Hazid.

2. Ships data

2.1 Introduction

The vessel will have the following main dimensions:

Length over all	110,00 m
Breadth	11,40 m
Depth	5,65 m
Max draft	3,15 m
Airdraft	4,60 m (in ballast condition)

The cargo tank capacity is 6 tanks of 437m^3 each, adding up to 2620 m^3 in total. Due to the size of the cargo tanks, the design complies with ADN 9.3.4. In appendix 1, the general arrangement of the vessel is added.

2.2 Fuel tank

The LNG fuel tank is a cylindrical independent pressure vessel, as defined in ADN, with a design pressure of 10 bar. The total tank volume is about 85 m^3. The LNG fuel tank fully complies with the existing ADN requirements for a refrigerated cargo tank. The tank is of single wall construction and insulated. Advantages of such tank are proven technology concerning crashworthiness, no sensitive connections below deck and access for inspection. The tank is located below the uppermost deck, while the dome of the tank protrudes through the uppermost deck as is usually done with cargo tanks. All connections to the tank are located above deck at the dome.

The access for inspection allows for the possibility to conduct periodical inspections on the tank construction. The tank is positioned in transverse direction on tank seating's as required for cargo tanks.
Excessive transfer of low temperatures to the ship's construction is prevented. The insulation complies with the requirements of the classification society and shall consist of 300mm PIR-insulation with a metal outer layer in order to minimize the absorption of moisture and avoid damage to the insulation. The LNG tank space is equipped with dry air for additional protection against the absorption of moisture.
The tank is placed in the forward part of the vessel in a separate compartment below deck within the cargo area. The tank space has a double bottom and double hull construction in accordance with ADN requirements for cargo tank locations. The hull in way of the fuel tank is designed in a similar way as is done for "large" cargo tanks. This means that in the event of a collision the shell absorbs more energy than a standard hull construction (ADN 9.3.4).
The construction of the tank is such that it can resist an internal pressure of 10 bars. The relief pressure of the safety valves on the tanks will be so designed that the vessel can remain in idle condition for not less than 15 days without the necessity to blow off, as required in the IGF code.

2.3 Piping and installations

A small centrifugal pump is located in the tank and supplies LNG to a gas conditioning unit on open deck where the evaporation will take place and the temperature of the NG is increased to at least 0^{o} Celsius. The pressure can be adjusted to a maximum of 8 bars. Under these conditions the NG will be lead to the main and auxiliary engines within the engine room. The average LNG content in this gas conditioning unit will be approx.450 ltr (0.45 m^3).

The electric equipment for the part of the LNG/NG system which is located within the cargo area complies with the requirements set forth for the cargoes to be carried and, in addition, to those applicable to LNG.
LNG runs from the tank dome on open deck to the gas conditioning unit where the evaporation will take place and the temperature of the NG is increased to at least 0^{o} Celsius. The pressure can be adjusted to a maximum of 8 bars. Under these conditions the NG will be lead to the main and auxiliary engines within the engine room.
The connections at the tank dome, all located above deck, are equipped with the following:

- Gas and liquid lines are equipped with an ESD valve and an hand operated valve, both located as close to the dome as possible with the exception of connections with a diameter restriction of 1,5 mm.
- Safety valves of piping which may contain liquid are directed to the LNG fuel tank by means of 2 hand operated valves at the dome and with an excessive flow valve within the tank.
- Hand operated valves are fitted below both tank safety valves. It is not possible to close both valves at the same time and the closing is only allowed in order to exchange a safety relieve valve.

The discharge from the tank safety valves is lead to a vent mast with an opening height up to the air draft with a minimum height of 1 meter above deck. The opening of the vent mast is located within the cargo area and has a minimum distance of 10 meter to the openings, accesses and engine outlets located outside the cargo area in accordance with the IGF code. The pressure build up within the LNG fuel tank will be gradually and the discharge will not be sudden. This will be known well in advance and necessary measures, as prescribed in the ship's manual, can be taken to prevent the discharge.
The LNG bunkering connections are located both on port- and starboard side on open deck within the cargo area and are located at a minimum distance of 6 meter from the openings, accesses and engine outlets located outside the cargo area. In the event of emergency it is possible to discharge the LNG fuel tank.
The gas conditioning unit is located on open deck within the cargo area and also at least 6 meter away from the openings.
Where leakage of LNG is possible, drip trays of stainless steel are provided. These drip trays are free from the deck construction and have a drain leading outside the vessel. This is done to protect the ships construction from low temperatures.

2.4 Engine room

The engine room will be designed and executed as a gas safe machinery space. This means that all gas piping, valves, reducers and connections are of the double wall principle or located within a gastight casing, with the exception of a small length of single wall piping for a pressure of 50 mbar between the LPRS and the auxiliary engine. This in accordance with the IGF code. The casing is equipped with a gas detection system and provided with ventilation leading to a safe location on open deck.
In case of a failure in the gas supply, the main engine will, without interruption, automatically switch from gas to diesel. If a NG auxiliary engine stops, the second NG auxiliary engine will automatically be started. If this second NG auxiliary engine is also stopped, an automatic switchover to a diesel generator is started. This diesel generator is located in the forward part of the vessel. This automatic takeover of the auxiliary engines has no influence on the propulsion and safety aspects of the vessel.
The evaporator/heater will be indirectly heated using the cooling water of the engines. This is done indirectly in order to prevent that possible leakage of gas is lead to the engine room.

3. Fire protection

The vessel is a type-G vessel with all required fire extinguishing systems. In addition, the vessel is equipped with a water spray installation within the cargo area for the cargoes to be carried. In case of LNG leakage on deck, this installation can also be used to assist in the quick evaporation of LNG and to cool down and/or protect other parts of the vessel.

4. Safety provisions &ESD

4.1 Safety provisions

In relation to various dangerous situations, scenarios have been envisaged which will be mentioned in the ship's manual.
In the ship's manual procedures will be prescribed which deal with the following issues:

- Fire in the engine room
- Fire on deck
- Collision
- Grounding
- Damage from falling objects
- Bunkering
- Discharge of the LNG fuel tank
- Purging
- Pressure build up which may lead to discharge

4.2 ESD system

The ESD system makes sure that, in case of a possible irregularity with the LNG/NG system, the consequences will be prevented or minimized by shutting down (parts of) the system. In this paragraph the various ESD parts are described.

4.2.1 ESD during LNG bunkering

The ESD will be activated automatically in the event of filling the LNG tank above the allowed limit. In the wheelhouse and on suitable places on deck, the emergency switches are positioned with a text plate indicating “emergency stop bunkering” to manually activate the ESD. In addition a portable emergency stop is available to be carried onboard the bunker barge or the bunkering station ashore. After activating the ESD system, the following will occur:

- The valves on the bunker manifold in use will be automatically closed.
- An audible and visible alarm will be activated
- A signal will be send to the bunkerer.

4.2.2 Additional ESD valves on deck

In the event of a casualty all ESD valves on deck can be closed simultaneously by pressing a LNG emergency stop button. The LNG pump will be stopped immediately. The emergency stop button will be placed on 3 locations on deck and 1 in the wheelhouse.

4.2.3 ESD valves in the NG lines to the main engine

The ESD valve closes automatically if the gas detection system within the gas valve unit of the Wärtsilä dual-fuel main engine is activated. It can also be closed in the wheelhouse by activating the emergency stop “closing NG supply to main engine”. This ESD valve will be supplied by the engine manufacturer. Due to the closing of the valve, the main engine will switch over to diesel and remain fully functional. The gas/air mixture within the gas valve unit will be ventilated to a safe location on open deck.

4.2.4 ESD valves in the NG lines to the auxiliary engines

When the gas detection system above one of the auxiliary engines or within the LPRS is activated, the NG supply to the auxiliary engine in question is shut down and an alarm will sound within the wheelhouse and accommodation. As a consequence, the auxiliary engine will stop and the other NG auxiliary engine will be started automatically.

4.3 Protection from collision and fallen objects

The tank dome and the gas conditioning unit are located on open deck in the forward part of the vessel. In case of a collision with e.g. a bridge they will be the first parts to be damaged.
To avoid such damage and also damage due to falling objects, dome and unit are protected by bull bars which can be seen in attached drawings.

List of terms and abbreviations

Abbreviation	Explanation
ADN	“Accord Européen relative au transport International des marchandises Dangereuses par voies de Navigation intérieures.
ALARP	As Low As Reasonably Possible
BLG 17 wp.5/add1	Draft IGF Code 2013
Cargo area	Part of vessel where all cargo tanks &LNG fuel tank are located
Cause	What leads to the deviation
Conditioning block	Transfer LNG to NG
Consumer block	Part where NG is consumed/used, aux engines, incl gas valve unit & HPRS
Containment block	Storage of LNG & bunker connections
De-bunkering	
Deviation	An event (failure mode) deviated of the normal operational situation or technical status of the installation
ESD	Emergency Shut Down
Fail safe valve	Close automatically after any failure of the control system
FMEA	Failure Mode Effect Analysis
Gas safe machinery space	Arrangements in machinery spaces are sucht tat the spaces are considered gas safe under all conditions, normal as well as abnormal conditions, ie inherently gas safe (BLG 17)
Gas valve block	Regulator of gas on deck
Gas valve cabinet	Gas regulator for main engine
Hazard	What are the dangers of the deviation
HPRS	High Pressure Reducing Station
ID	Indentification number used by Dutch Authorities
IGF-Code	International Code of Safety for Gas-fuelled Ships
LNG	Liquified Natural Gas
LPRS	Low Pressure Reducing Station
NG	Natural Gas
P&ID fuel system	Process & Instrumentation Diagram
PIR	Insulation of tank
Potential effects	What ill be the effect to vesse, crew, environment
PS	Port Side
Purging	Replace present gas in tank or pipe with another gas.
RosR	Rhine Rules
Safeguards	Technical solutions (design, control & monitoring systems) to reduce the probability to happen the deviation (event). Operational procedures and/or preventive measures, carried out by human, to reduce the probability to happen of the deviation (event).
SB	Starboard Side

Attachments:

1) General Arrangement

2) Location LNG tank, Fuel tank arrangement and Layout engine room

3) Bow of the vessel

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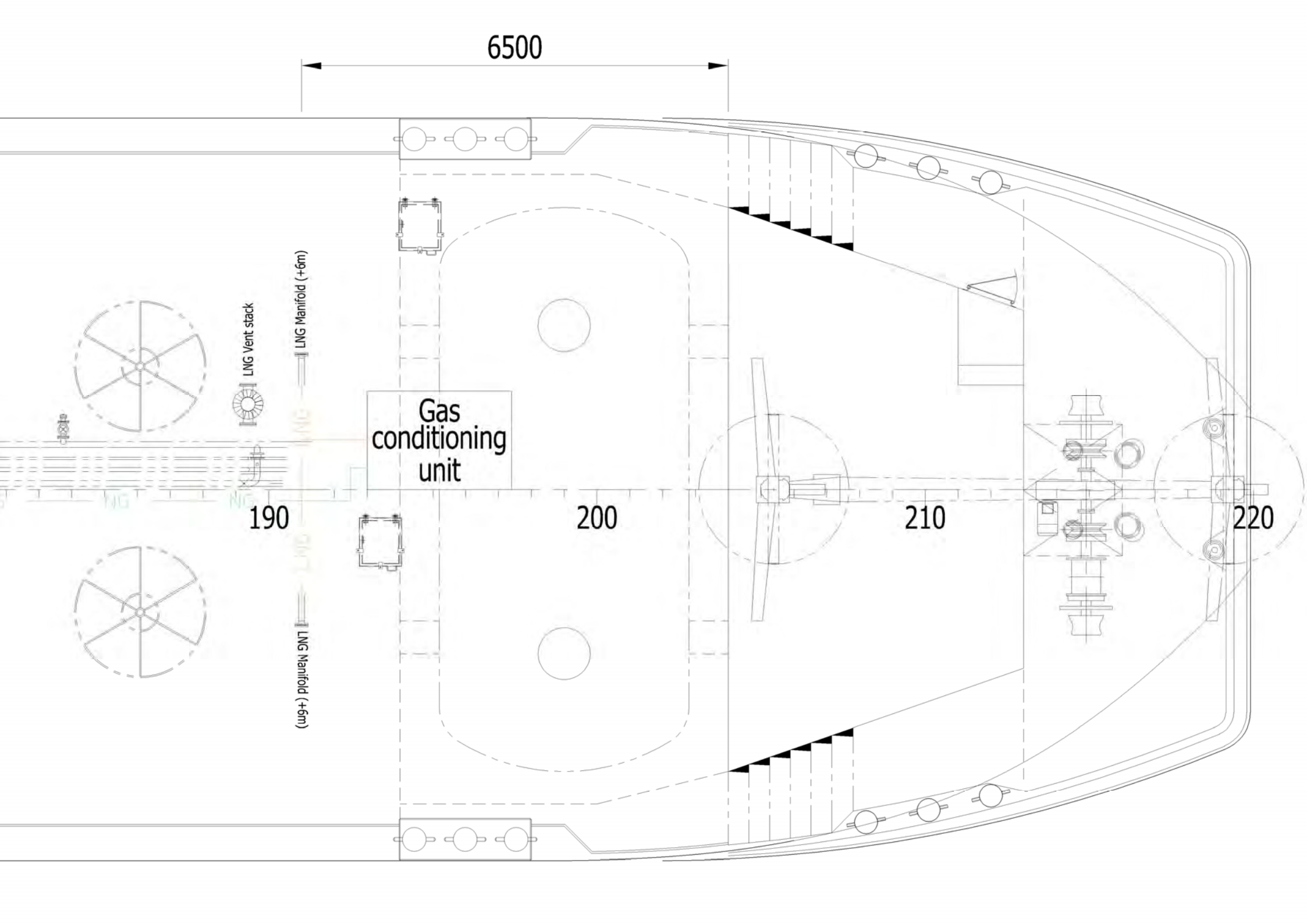
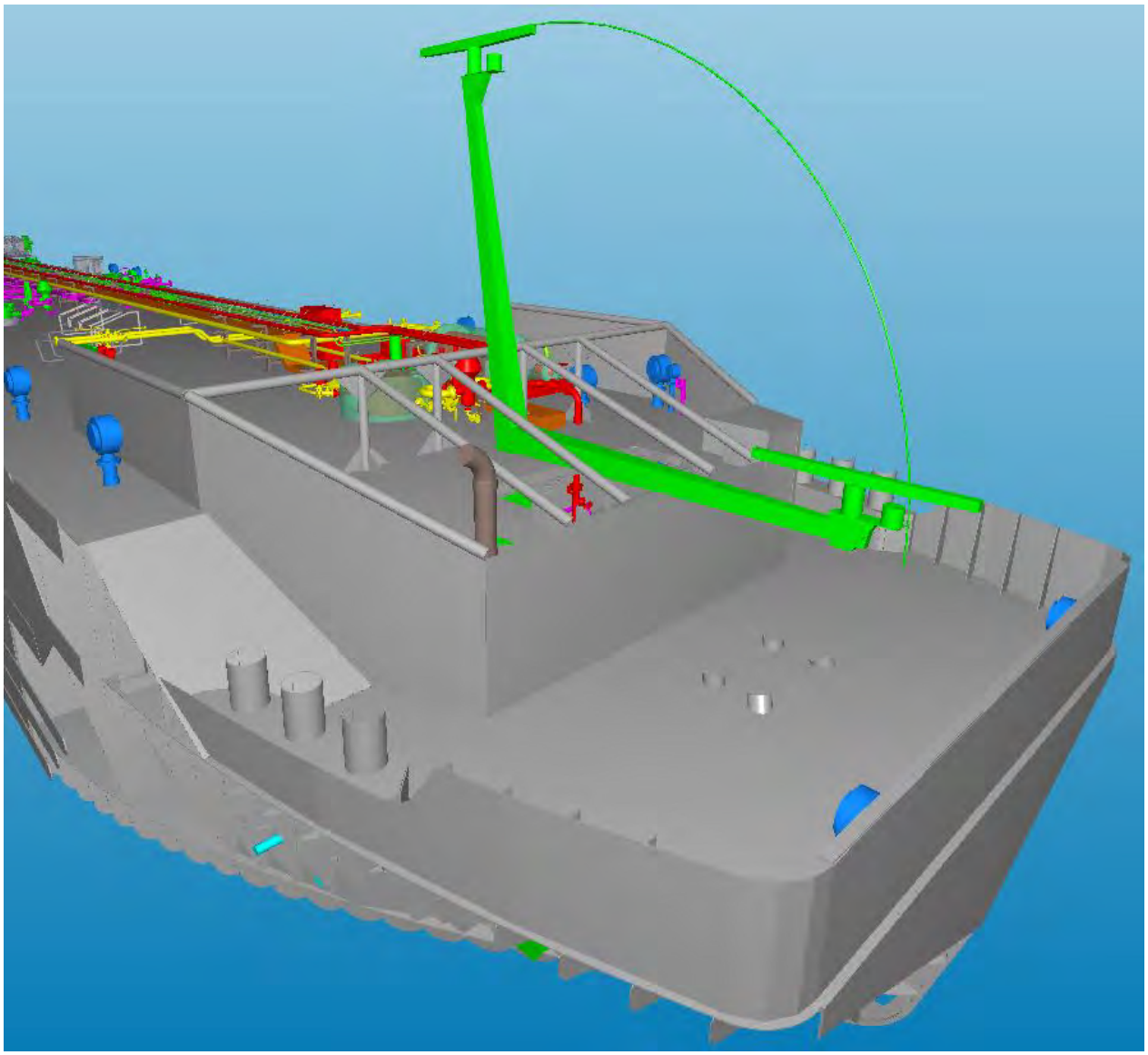
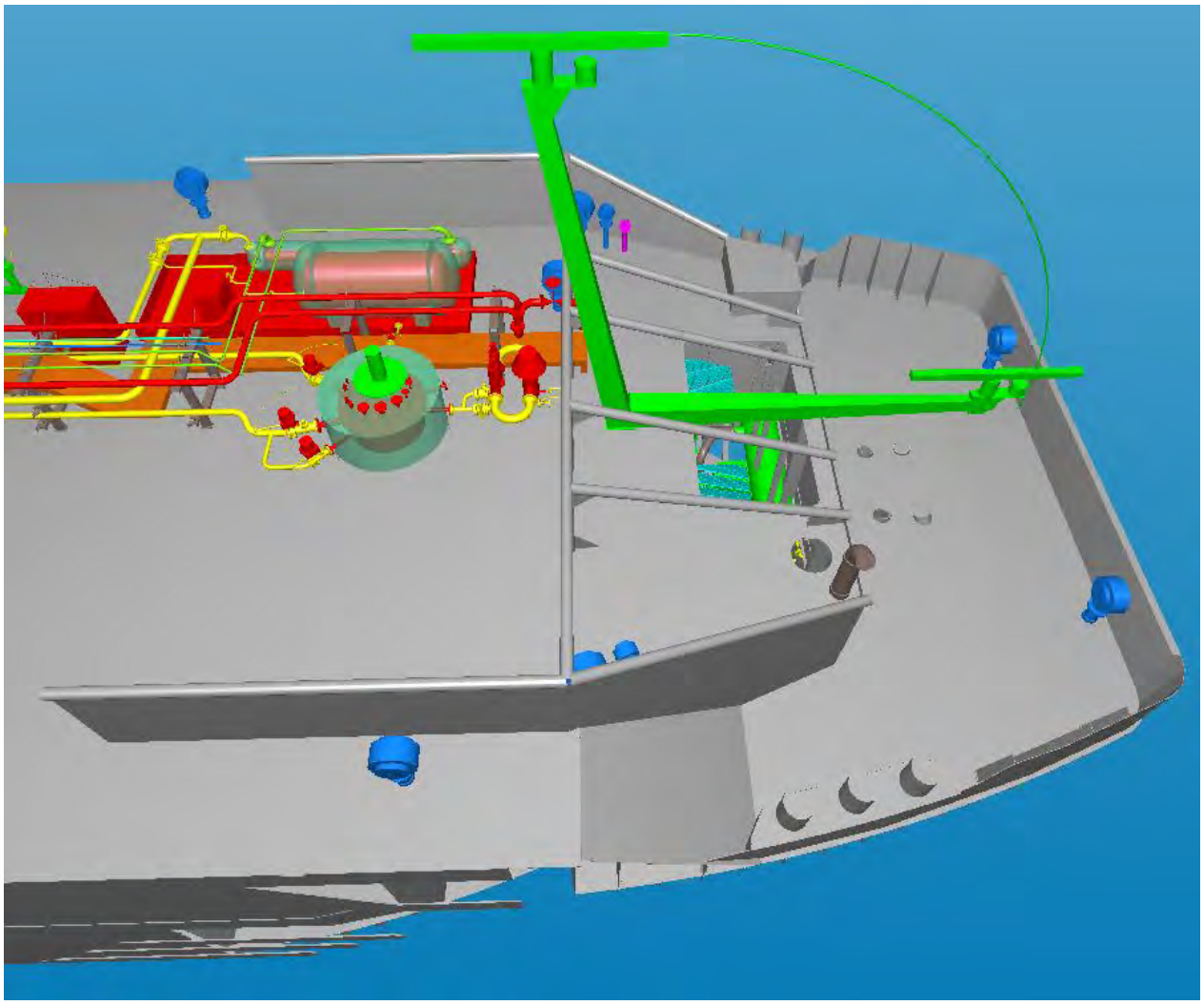
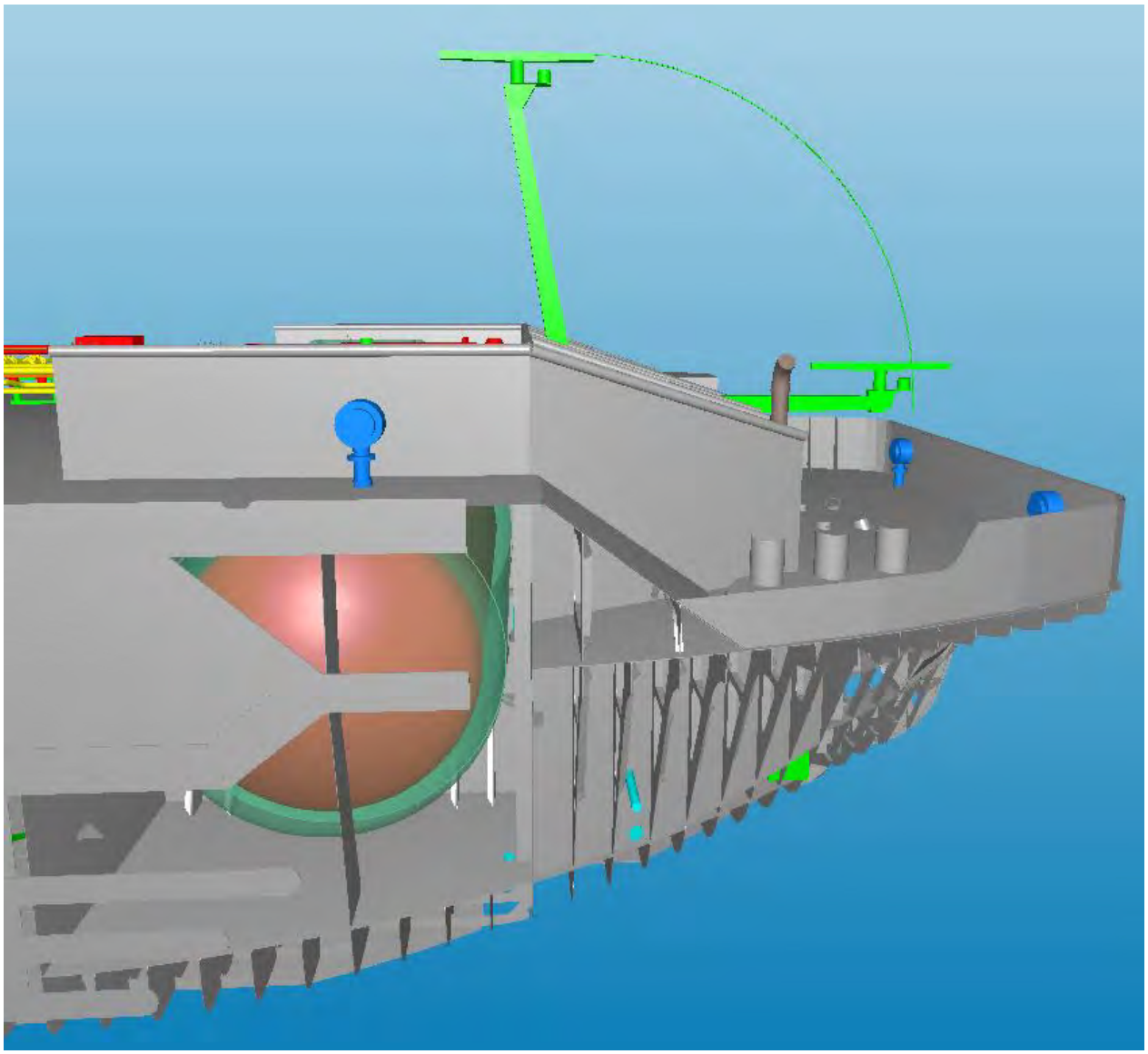
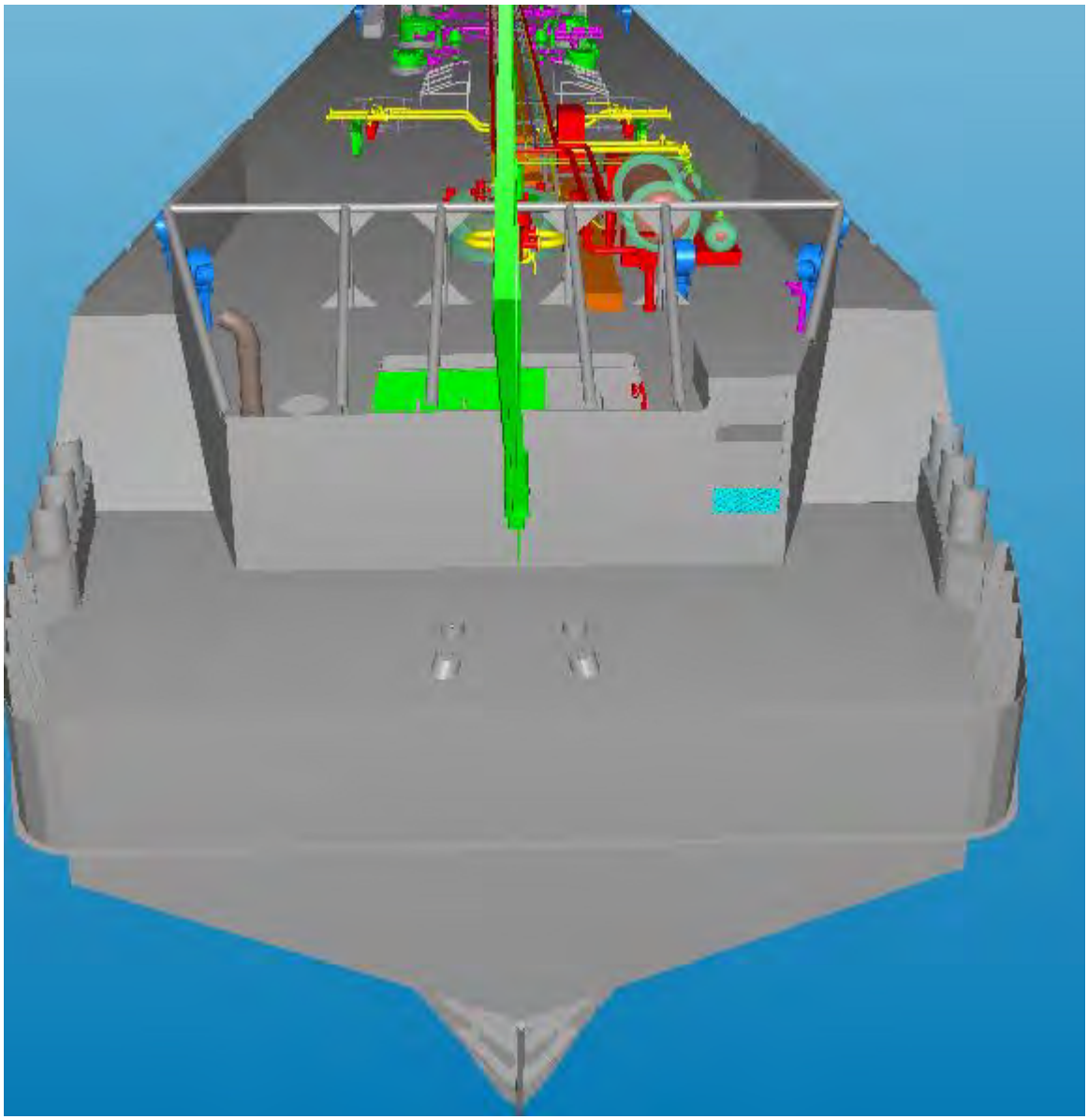

6500
LNG Vent stack
LNG Manifold (+6m)
Gas conditioning unit
190
200
210
220
LNG Manifold (+6m)









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TNO report

TNO 2013 R11557 | Final report

Assessment HAZID LNG Fuel type G tanker design Chemgas 851 ID55679/ 852 ID55678

Date	17 October 2013
Author(s)	Ir. Alex W. Vredeveldt
Copy no	
No. of copies	
Number of pages	12 (incl. appendices)
Number of appendices	
Sponsor	Chemgas Barging Sarl
Project name	LNG tanks safety assessment
Project number	060.04474

Summary

A hazard identification study (HAZID) on the preliminary design of a natural gas fuelled inland waterway type G tankers, referred to by the owner as ***B851 ID55679 and B852 ID 55678***, has been assessed. Technical evidence, supporting the HAZID has also been considered.
The storage of the gas will be as liquid at cryogenic temperature (LNG). With the chosen design concept, LNG as bunker fuel is considered sufficiently safe. The safety issues which have been identified are adequately being dealt with in the engineering phase, which is currently in progress.
Hence TNO supports a recommendation to grant these vessels an exemption to allow them to use LNG as fuel.

Contents

1 Introduction

Chemgas Barging Sarl is planning two new build inland waterway type G tankers which will use both marine fuel oil and liquefied natural gas (LNG) as fuel. The ships will sail European waters, mostly the ARA (Amsterdam Rotterdam Antwerp) waterways and the river Rhine with adjacent rivers and canals. The natural gas will be stored in liquefied condition in a single shell insulated pressure vessel. There will be no liquefaction facility on board, hence the tanks will be designed to cope with a pressure build up.

A safety study has been carried out. Documentation related to the study has been submitted to the responsible authorities, CCNR (Central Commission for the Navigation of the Rhine) and UN ECE (United Nations Economic Council Europe).

The Netherlands Directorate General for Civil Aviation and Maritime Affairs (DGLM) has stipulated that an independent competent organisation reviews the documentation and formulates a recommendation on how to proceed.
Chemgas Barging Sarl has requested TNO to conduct this review.

TNO has used the concept of a formal safety assessment to conduct this review. According IMO standards [5] a formal safety assessment (FSA) consists of five distinctive steps as shown in Table 1.1.

Table 1.1 FSA steps

step	***description***
1	HAZARD IDENTIFICATION
2	RISK ANALYSIS
3	RISK CONTROL OPTIONS
4	COST BENEFIT ASSESSMENT
5	RECOMMENDATIONS FOR DECISION MAKING

Although named Hazard Identification Study, the documentation submitted to CCR/UN-ECE, is not restricted to a hazard identification study (step 1). Mitigation actions are also reported which formally are a part of the “*risk control options*” activity (step 3).
Many hazards as identified, are already covered in the IGC [3] code, the IGF [1] code (IGF has a preliminary status only). It is reasonable to state that when the LNG fuel system complies with these codes with respect to a hazard, sufficient safety is ensured related to this hazard. In such cases the associated risk needs not to be quantified as such and the FSA need not be carried out to its full effect. From the available documentation it becomes evident that this approach has been followed where possible. However some hazards are outside the scope of current (safety) codes. Obviously these need to be addressed (at least to some extent) in a FSA fashion.

2 Approach

The work allocated to TNO has been carried out through making seven distinct steps:

1. Attend the HAZID exercise as an observer;
2. Study available information;
3. Identify additional information required;
4. Obtain additional information required;
5. Study additional information;
6. Discuss findings with relevant stakeholders;
7. Assess and verify available material;
8. Report the assessment.

In activities 2 and 3 a review of a number of HAZID documents [1] was carried out. A request for additional information was made. Discussions were held with representatives from Bureau Veritas in Rotterdam in which the findings of this initial assessment were discussed. Additional meetings were held with the designers/ builders of the type G-tanker. An important aim of the discussions was to acquire additional information identified by TNO to be missing in the HAZID study. Moreover clarifications were obtained on some issues.

Some reference material, available in the public domain, has also been considered while making the assessment.

When dealing with industrial activities where safety issues are relevant, such as building and operating chemical plants or building and operating (offshore) oil exploitation facilities, it is common to conduct an FSA (formal safety assessment, see introduction). The philosophy related to FSA [5] has been used by TNO as a guideline while assessing the available technical evidence.

As already said, a HAZID is only one step in a safety assessment. In principle the other steps should be dealt with as well in order to complete the assessment. However it should be mentioned that a break-down of a safety assessment into steps should be regarded as a guideline. Hence discarding some of the steps may be quite acceptable as long as the safety assessments yields convincing results.

3 Technical evidence for CCR - UN ECE, Oct. 2013

3.1 Description technical evidence

The following documents have been made available to TNO by Bureau Veritas during to the study:

- RV/G (13) 46 add. 1, JWG (13) 31 add. 1, 27 augustus 2013, Aanhangsels voor de aanvraag voor een aanbeveling voor de type G-tankers Chemgas 851 en 852
- 450-001-1: General arrangement with block division
- 450-001-2: General arrangement with LNG & NG lines
- 450-001-3: P&ID Fuel system with block division
- 450-001-4: P&ID Fuel system with LNG & NG lines during normal operation
- 450-001-5: P&ID Fuel system with LNG & NG lines during time vessel is idle
- 450-001-6: P&ID Fuel system with LNG & NG lines during bunkering

These documents were reviewed by TNO. The following criteria were considered:
- Was a structured, generally accepted, approach used for the HAZID?
- Were all Hazards addressed / identified?
- Were corrective measures proposed for these hazards?
- Do the corrective measures proposed provide a sufficient risk reduction?

3.2 Issues identified for further consideration

The review of the HAZID study resulted in a request for further considerations on issues as listed below.
These issues have been discussed with Bureau Veritas, Chemgas Barging Sarl, the design team the equipment manufacturers and the shipbuilder. As a consequence, design improvements were made and additional analyses were carried out.

Issues identified for further consideration:

1. Pressure build up unit below deck,
2. Full burst of containment system,
3. Inspection of containment system,
4. Penetrations below deck in collision scenario,
5. Penetrations below deck, fracture due to fatigue,
6. Collision with a bridge,
7. In service inspection of LNG tanks,
8. Bunkering procedure,
9. Drip tray below conditioning system, may discharge LNG on deck
10. Effect analysis LNG spill from conditioning system on deck
11. LNG spill from a fractured bunkering hose
12. Education and awareness

4 Additional evidence

4.1 Discussions

The issues mentioned in the previous paragraph were discussed through e-mails and telephone conversations. Also various meetings were held with parties involved. Further evidence was either presented or generated as discussed in the following paragraphs.

Issue1. Pressure build up unit below deck.
In accordance with IGC-code and ADN regulations, tankers, both at sea and on inland waterways, do not feature any equipment, piping or tank penetrations below deck. The initial LNG fuel tank arrangement had the pressure build up (PBU) unit attached to the tank, which implies a location below deck. The owner considered this arrangement to be inferior to the usual arrangement of the gas cargo tanks. Consequently it was decided to detach the PBU from the tank and locate it on deck. As a consequence liquid fuel supply has to be realised through a submerged pump instead of relying on gravity and a tank-pipe penetration at the bottom of the tank.

Issue 2. Full burst of containment system
A full burst of the fuel tank due to a collision is considered qualitatively. Since the fuel tank is now designed, located and equipped in the same way as conventional cargo gas tanks and the ship structure complies with the requirements of chapter 9.3.4. of ADN (alternative side structures) a full burst is therefore considered unlikely.

Issue 3. Inspection of containment system,
The initial tank design featured an inner tank in an outer tank with the intermediate space vacuumed. The disadvantage of this tank concept is that in-service inspections of the inner tank and the penetrations is not possible because the inner tank and the vacuum space are not accessible. In view of the required life time of the barge and hence the LNG fuel tank and the class requirements with respect to inspections, the owner considers this feature as a disadvantage compared to conventional cargo gas tanks. Therefore it was decided to abandon the vacuum tank concept and adopt the single shell tank with ample heat insulation. The tank will be fitted with a dome, similar to conventional gas tanks and will be accessible through a manhole.

Issue 4. Penetrations below deck, fracture in a collision scenario,
Issue 5. Penetrations below deck, fracture due to fatigue,
Both these issues are pertinent to vacuum type of cryogenic tanks. The choice for a single shell tanks resolves these issues because they do not feature any penetrations in the tank body.

Issue 6. Collision with a bridge,
This issue becomes relevant due to the introduction of a single shell type of gas tank with a dome. This mechanism can only occur at a very limited range of air draughts.

Issue 7. In service inspection of LNG tanks,
See issue 3.

Issue 8. Bunkering procedure,
The bunkering process is susceptible to error, the major hazard being overfilling. In the case of pressurised cryogenic fuel tank on a gas tanker, the expectation is that the crew is sufficiently aware of the danger of overfilling and will act accordingly. Moreover technical safety measures will be implemented.

Issue 9. Drip tray below conditioning system, may discharge LNG on deck
Issue 10. Effect analysis LNG spill from conditioning system on deck
These issues are particularly relevant in case of mechanical impact, either due to a collision or a dropped object where the conditioning system will suffer damage but also the drip tray, which may therefore not be effective. An LNG spill analysis was proposed and carried out (see section 4.2).

Issue 11. LNG spill from a fractured bunkering hose
This scenario is considered less severe than the one mentioned as issue 10 because of the smaller amount of liquid gas involved. If the danger of the latter proves to be negligible, this scenario is not an issue anymore.

Issue 12. Education and awareness
As already mentioned, the competence and awareness of the crew in relation to handling LNG has a dominant effect on the hazardousness of LNG as fuel on board. The owner is a gas tanker operator, where gaseous substances are handled as a core activity. Therefore it is to be expected that this issue is sufficiently covered.

4.2 Additional evidence

Issues 2, 3, 4, 5, 7
As already mentioned, the owner has decided to change the cryogenic fuel tank concept from a vacuum insulated tank to a single shell tank. As a consequence these issues are considered to be resolved.

Issues 9,10.
In both cases the severest consequence is a spill of a limited amount of cryogenic liquid gas on deck. The worst case has been analysed through a LNG pool development calculation where liquid gas spreads on deck while it evaporates, in conjunction with a gas vapour cloud development and spreading analysis. The results show that for this particular design, the LNG pool develops towards a pool diameter of 11 m, over a time span of less than 50 seconds. The deck plating temperature does drop to a level where brittle cracking will occur. However the affected deck area is limited to 11 m and well outside the highly stressed region (i.e. at 10 % of the ship length from the bow). Therefore the structural integrity of the ship is not jeopardised. The cloud development proves to be of limited extent and lasts less than 1.5 minutes. The consequences of any LNG spill are considered very limited and are not expected to cause any grave danger to the ship.

4.3 Assessment

LNG fuel tank concept
The decision to apply a single wall cryogenic pressurised LNG fuel tank with a dome accommodating all tank penetration has resolved issues 1,2,3,4,5 and 7. Issue 6, collision with a bridge, can be resolved through fitting a sloped protection bracket in front of the dome, which will push the bow of the ship downwards in case of bridge contact.

LNG spill on deck
From discussions with the yard is has become clear that various means are available to prevent LNG storage tank overloading. Several options are under consideration; e.g. through liquid level detection and high-high alarms. The final arrangement will be chosen during the engineering process and subjected to approval by the classification society. The largest amount of LNG on deck due to a spill will be released in case of a rupture in the conditioning unit. An effect analysis demonstrates that the consequences are limited and do not pose a danger to the integrity of the ship (structure). Moreover the evaporation time and vapour cloud dispersion time are very short, less than 2 minutes. Fracture of the bunker hose is another mechanism which may cause LNG spill on deck. The amount of LNG in the hose however is smaller than the amount in the condition system. Therefore the effects are expected to be smaller as well. It is noted that the bunker valves are at same longitudinal location as the conditioning unit.

Human element
There is a general consensus that ample knowledge, skills and attitude of crew dealing with LNG bunker fuel is paramount. It is fortunate that two gas tankers are proposed as pioneers in using LNG as bunker fuel, because crews are qualified (ADN) to deal with hazardous substances, i.e. the cargo. However handling LNG requires additional knowledge and skill. It is still to be resolved who will teach the knowledge and skills and how many crew members, trained on the LNG aspect, must be on board.
When LNG fuel is considered for general cargo or container ships, the training of crew needs to be addressed because crews are not required to have any ADN qualification.

General remarks
Any safety assessment on a technology used in a new environment is a tremendous task. The main issue is overlooking the obvious. Also in the case of LNG as bunker fuel on inland waterway ships making sure that all relevant hazards have been addressed must remain on top of the priority list.
Allowing a limited number of ship, subject to ADN, with LNG bunker fuel, offers a splendid opportunity to gain experience. Proper incident reporting for learning purposes is therefore suggested.

5 Conclusions and recommendations

General
The general conclusion from the technical evidence studied so far, is that applying LNG as bunker fuel will not cause any safety issues which cannot be resolved within the engineering process. All issues identified in the HAZID are adequately addressed in the current engineering approach. The classification society is well poised to judge the proposed technical solutions.

The human element
Parties involved clearly realise that the attitude, knowledge and skills of the crew with respect handling LNG is crucial from a safety point of view. It is considered an advantage that the type G-tanker is a chemical pressurised gas tanker which implies that the crew is already used to handling hazardous pressurised cargo.

References

[1] RV/G (13) 46 add. 1, JWG (13) 31 add. 1, 27 augustus 2013, Aanhangsels voor de aanvraag voor een aanbeveling voor de type G-tankers Chemgas 851 en 852

[2] IGF, draft International code on safety for Gas-Fuelled ships, IMO

[3] IGC, International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1993 Edition, IMO

[4] NFPA 57, Liquefied Natural (LNG) Vehicular Fuel Systems Code 2002 Edition

[5] Guidelines for formal safety assessment (FSA) for use in the IMO rule making process, MSC/Circ.1023, MEPC/Circ.392, 5 April 2002

[6] Minorsky, V.U., “An Analysis of Ship Collisions with Reference to Protection of Nuclear Power Plants”, *Journal of Ship Research*, Vol. 3, No. 1, pp. 1-4, 1959.

[7] ADN, 2009, UN-ECE

[8] Guidance on performing risk assessment in the design of onshore LNG installations including the ship/shore interface, OGP Draft 116901, 2013-02-08.

6 Signature

Delft, 16 October 2013

Drs. P.P. van ‘t Veen
Head of department

Ir. Alex W. Vredeveldt
Author

ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

RV (13) 89
RV/G (13) 115
JWG (13) 83
10. Dezember 2013
Or. de fr/de/nl/en

UNTERSCHUNGSAUSSCHUSS
ARBEITSGRUPPE UNTERSUCHUNGSORDNUNG
GEMEINSAME ARBEITSGRUPPE

Empfehlung für Typ-G-Tanker, Chemgas 851

Mitteilung des Sekretariats

Das Sekretariat übermittelt zur Information anliegend die von der Arbeitsgruppe Untersuchungsordnung nach § 2.19 RheinSchUO ausgesprochene Empfehlung.

ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

EMPFEHLUNGEN AN DIE SCHIFFSUNTERSUCHUNGSKOMMISSIONEN ZUR RHEINSCHIFFSUNTERSUCHUNGSORDNUNG

EMPFEHLUNG Nr. 22/2013
vom 27. November 2013

CHEMGAS 851

Das Motortankschiff "Chemgas 851" (ID-Nummer 55679 und Registernummer BV 24521F), wird hiermit als Typ-G-Tanker, so die Bezeichnung im ADN, für den Einsatz von Diesel und Flüssigerdgas (LNG) als Brennstoff für die Antriebsanlage zugelassen.

Gemäß § 2.19 Nr. 3 ist für das Fahrzeug eine Abweichung von den §§ 8.01 Nr. 3, 8.05 Nr. 6, Nr. 11 und
Nr. 12 bis zum 30.6.2017 zulässig. Der Einsatz von LNG gilt als hinreichend sicher, wenn folgende Bedingungen zu jeder Zeit erfüllt sind:

1. Die Konstruktion und Klassifikation des Schiffes soll unter der Aufsicht und Einhaltung der zu befolgenden Regeln einer anerkannten Klassifikationsgesellschaft erfolgen, welche besondere Regeln für Flüssigerdgas-Antriebssysteme hat. Die Klassifikation ist beizubehalten.

2. Das Flüssigerdgas-Antriebssystem muss jährlich von der Klassifikationsgesellschaft, welche das Schiff klassifiziert hat, inspiziert werden.

3. Von der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat, wurde eine umfassende HAZID-Studie (siehe **Anlage 1**) vorgenommen.

4. Das Flüssigerdgas-Antriebssystem erfüllt den IGF-Code (IMO Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013, mit Ausnahme der in **Anlage 2** aufgelisteten Punkte.

5. Das Flüssigerdgas-Antriebssystem ist so ausgeführt, dass Methan-Emissionen auf ein Minimum reduziert werden.

6. Die Flüssigerdgas-Vorratstanks erfüllen die Anforderungen des ADN an Tieftemperaturtanks. Auf dem Schiff wird deutlich darauf hingewiesen, dass das Fahrzeug mit LNG angetrieben wird, und angegeben, wo sich die Flüssigerdgas-Vorratstanks befinden.

7. Das Bunkern des Flüssigerdgases muss unter Einhaltung der im **Anlage 3** aufgeführten Verfahren erfolgen.

8. Die Instandhaltung des Flüssigerdgas-Antriebssystems muss unter Einhaltung der Anweisungen des Herstellers erfolgen. Die Anweisungen sind an Bord mitzuführen. Nach jeder erheblichen Änderung oder Reparatur muss das Flüssigerdgas-Antriebssystem vor der erneuten Inbetriebnahme von der Klassifikationsgesellschaft untersucht werden, die die Klassifikation des Schiffs vorgenommen hat.

9. Alle Besatzungsmitglieder sind zu den Gefahren, zum Einsatz, zur Instandhaltung und Inspektion des Flüssigerdgas-Antriebssystems nach den in **Anlage 4** festgelegten Verfahren zu schulen.

10. Eine Sicherheitsrolle ist an Bord des Schiffes vorzusehen. Die Sicherheitsrolle beschreibt die Pflichten der Besatzung und enthält einen Sicherheitsplan.

11. Alle Daten zum Einsatz des Flüssigerdgas-Antriebssystems sind vom Betreiber zu erfassen und müssen mindestens fünf Jahre lang aufbewahrt werden. Die Daten sind der zuständigen Behörde auf Anfrage zuzuschicken.

12. Ein jährlicher Auswertungsbericht, der alle erfassten Daten enthält, wird zur Verteilung an die Mitgliedstaaten an das Sekretariat der ZKR gesandt. Der Auswertungsbericht soll wenigstens die folgenden Informationen enthalten:
    a) Systemausfall;
    b) Leckage;
    c) Bunkerdaten (Diesel und LNG);
    d) Druckdaten;
    e) Abweichungen, Reparaturen und Änderungen des Flüssigerdgassystems einschließlich der Tanks;
    f) Betriebsdaten;
    g) Emissionsdaten, einschließlich Methan-Emissionen;
    h) Prüfbericht der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat.

Anlagen:

Anlage 1: HAZID-Studie für Chemgas 851/852
Anhang 1: Zeichnungen
Anhang 2: TNO Bericht (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Anlage 2: Übersicht über die Abweichungen vom IGF-Code (IMO-Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013)

Anlage 3: Verfahren für das Bunkern von Flüssigerdgas

Anlage 4: Beschreibung der Schulung von Besatzungen an Bord von Binnenschiffen mit Flüssigerdgasantrieb

Anlage 5: Beschreibung des Projekts Chemgas 851/852
Anhang 1: Grafiken des veränderten Vorschiffes
Anhang 2: General arrangement
Anhang 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Anlage 6: GL Bericht (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

Annexes are located on website under	**RV 2012 EN**	**rv13_89en_2 and _3**
and	**RVG 2012 EN**	**rvg13_115en_2 and _3**
	JWG 2012 EN	**jwg13_83en_2 and _3**
Les annexes sont enregistrées sur le site sous	**RV 2012 EN**	**rv13_89en_2 et _3**
et	**RVG 2012 EN**	**rvg13_115en_2 et _3**
	JWG 2012 EN	**jwg13_83en_2 et _3**
Die Anlagen stehen auf der Website unter	**RV 2012 EN**	**rv13_89en_2 und _3**
und	**RVG 2012 EN**	**rvg13_115en_2 und _3**
	JWG 2012 EN	**jwg13_83en_2 und _3**
De bijlagen staan op de website onder	**RV 2012 EN**	**rv13_89en_2 en _3**
en	**RVG 2012 EN**	**rvg13_115en_2 en _3**
	JWG 2012 EN	**jwg13_83en_2 en _3**

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COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RV (13) 89
RV/G (13) 115
JWG (13) 83
10 décembre 2013
Or. de fr/de/nl/en

COMITE DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL COMMUN

Recommandation pour le bateau-citerne de type G, Chemgas 851

Communication du Secrétariat

Le Secrétariat a l'honneur de distribuer en annexe pour information la recommandation formulée par le groupe de travail du règlement de visite conformément à l'article 2.19 du RVBR.

COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RECOMMANDATIONS AUX COMMISSIONS DE VISITE
RELATIVES AU REGLEMENT DE VISITE DES BATEAUX DU RHIN

RECOMMANDATION N° 22/2013
du 27 novembre 2013

CHEMGAS 851

L'automoteur-citerne "Chemgas 851 (numéro d'identification 55679 et numéro de registre BV 24521F) est autorisé par la présente à utiliser en tant que bateau-citerne de type G au sens de l'ADN du carburant diesel et du gaz naturel liquéfié (GNL) en tant que combustible pour l'installation de propulsion.

Conformément à l'article 2.19, chiffre 3, le bâtiment est autorisé à déroger aux dispositions des articles 8.01, chiffre 3 et 8.05, chiffres 6, 11 et 12 jusqu'au 30.6.2017. L'utilisation du GNL est réputée suffisamment sûre sous réserve que les conditions ci-après soient respectées à tout moment :

1. Le bâtiment doit être construit et classé conformément aux règles et sous le contrôle d'une société de classification agréée ayant établi des règles spécifiques pour les installations fonctionnant au GNL. La classe doit être maintenue.

2. Le système de propulsion au GNL doit être inspecté annuellement par la société de classification qui a classé le bateau.

3. Une étude HAZID exhaustive doit avoir été réalisée par la société de classification qui a classé le bateau (voir **annexe 1**).

4. Le système de propulsion au GNL doit être conforme au code IGF (Résolution MSC.285(86) du 1er juin 2009) et BLG du 17 février 2013, à l'exception des points mentionnés en **annexe 2**.

5. Le système de propulsion au gaz naturel liquéfié est conçu de manière à limiter autant que possible les émissions de méthane.

6. Les réservoirs de stockage de GNL doivent être conformes aux exigences de l'ADN relatives aux réservoirs à basse température. A bord du bateau doit être clairement indiqué que la propulsion est assurée par du GNL et à quel endroit sont placés les réservoirs de stockage du gaz naturel liquéfié.

7. L'avitaillement au GNL doit être réalisé conformément aux procédures figurant à l'**annexe 3.**

8. L'entretien du système de propulsion au GNL doit être assuré conformément aux instructions du fabricant. Ces instructions doivent être conservées à bord. Préalablement à toute remise en service à la suite d'une réparation ou d'une modification substantielles, le système de propulsion au GNL doit être examiné par la société de classification qui a classé le bateau.

9. Tous les membres d'équipage doivent avoir suivi une formation sur les dangers, l'utilisation, l'entretien et l'inspection du système de propulsion au GNL conformément aux procédures figurant en **annexe 4**.

10. Un dossier de sécurité doit être prévu à bord du bâtiment. Le dossier de sécurité doit décrire les tâches de l'équipage et doit comporter un plan de sécurité.

11. Toutes les données relatives à l'utilisation du système de propulsion au GNL doivent être conservées par le transporteur durant au moins cinq ans. Ces données doivent être communiquées à l'autorité compétente sur demande.

12. Un rapport annuel d'évaluation comportant l'ensemble des données collectées doit être adressé au Secrétariat de la CCNR pour distribution aux Etats membres. Ce rapport d'évaluation doit comporter au minimum les informations suivantes :
    a) panne du système ;
    b) fuites ;
    c) données relatives à l'avitaillement (carburant diesel et GNL) ;
    d) données relatives à la pression ;
    e) dérogations, réparations et modifications subies par le système GNL, réservoirs compris ;
    f) données de fonctionnement ;
    g) données relatives aux émissions, y compris les émissions de méthane ;
    h) rapport d'inspection de la société de classification qui a classé le bateau.

Annexes :

Annexe 1 : Etude HAZID pour Chemgas 851/852
Appendice 1: Croquis
Appendice 2: Rapport TNO (TNO 2013 R11557/Final report): "Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)"

Annexe 2 : Synthèse des dérogations au Code IGF (IMO-Résolution MSC.285(86), 1er juin 2009) et BLG 17 de février 2013)

Annexe 3 : Procédure pour l'avitaillement de gaz naturel liquéfié

Annexe 4 : Description de la formation des équipages à bord de bateaux de la navigation intérieure dont la propulsion est assurée par du GNL

Annexe 5 : Description du projet Chemgas 851/852
Appendice 1: Croquis d'avant de bateau modifié
Appendice 2: Disposition générale
Appendice 3: Emplacement réservoir GNL, situation du réservoir à carburant et salle à machines

Annexe 6: Rapport GL (Report No. RD-ER 2011.130): "Safety analysis for the Wärtsilä Gas Valve Unit"

Annexes are located on website under	**RV 2012 EN**	**rv13_89en_2 and _3**
and	**RVG 2012 EN**	**rvg13_115en_2 and _3**
	JWG 2012 EN	**jwg13_83en_2 and _3**
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	JWG 2012 EN	**jwg13_83en_2 en _3**

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CENTRALE COMMISSIE VOOR DE RIJNVAART

RV (13) 89
RV/G (13) 115
JWG (13) 83
10 december 2013
Or. de fr/de/nl/en

COMITÉ REGLEMENT VAN ONDERZOEK
WERKGROEP REGLEMENT VAN ONDERZOEK
GEMEENSCHAPPELIJKE WERKGROEP

Aanbeveling Type G Tanker, Chemgas 851

Mededeling van het secretariaat

Het secretariaat heeft het genoegen u hierbij ter informatie de door de Werkgroep Reglement van onderzoek overeenkomstig artikel 2.19 van het ROSR geuite aanbeveling te doen toekomen.

CENTRALE COMMISSIE VOOR DE RIJNVAART

AANBEVELINGEN AAN DE COMMISSIES VAN DESKUNDIGEN MET BETREKKING TOT DE TOEPASSING VAN HET REGLEMENT ONDERZOEK SCHEPEN OP DE RIJN

AANBEVELING Nr. 22/2013
van 27 november 2013

CHEMGAS 851

Voor het tankschip “Chemgas 851” (ID nummer 55679 and BV register nummer 24521F), type G tanker als bedoeld in het ADN, wordt bij dezen de vergunning afgegeven voor het gebruik van diesel en vloeibaar aardgas (LNG, Liquefied Natural Gas) als brandstof voor de voortstuwingsinstallatie.

Op grond van artikel 2.19, derde lid, mag bij genoemd schip worden afgeweken van de artikelen 8.01, derde lid, 8.05, zesde lid, elfde lid en twaalfde lid, tot en met 30.6.2017. Het gebruik van LNG wordt geacht voldoende veilig te zijn indien te allen tijde aan de volgende voorwaarden wordt voldaan:

1. Het schip wordt gebouwd en geclassificeerd onder toezicht en overeenkomstig de van toepassing zijnde voorschriften van een erkend classificatiebureau dat specifieke voorschriften voor LNG-installaties hanteert. De klasse blijft gehandhaafd.

2. Het LNG-voortstuwingssysteem wordt jaarlijks gekeurd door het classificatiebureau dat het schip heeft geclassificeerd.

3. Een volledige HAZID-keuring door het classificatiebureau dat het schip heeft geclassificeerd (zie **bijlage 1**) is uitgevoerd.

4. Het LNG-voortstuwingssysteem voldoet aan de IGF-Code (IMO-Resolutie MSC.285(86) van 1 juni 2009) en BLG17 van februari 2013, behoudens de in **bijlage 2** vermelde onderdelen.

5. Het LNG-voortstuwingssysteem is zodanig uitgevoerd dat uitstoot van methaan maximaal wordt beperkt.

6. De LNG-opslagtanks voldoen aan de voorschriften die op basis van het ADN aan cryogene tanks worden gesteld. Op het schip wordt duidelijk aangegeven dat het schip door middel van LNG wordt aangedreven en wordt aangeduid waar de LNG-opslagtanks zich bevinden.

7. Bunkeren van LNG wordt uitgevoerd conform de in **bijlage 3** vermelde procedures.

8. Het onderhoud van het LNG-voortstuwingssysteem wordt uitgevoerd overeenkomstig de instructies van de fabrikant. De instructies worden aan boord bewaard. Voordat het voortstuwingssysteem na een aanzienlijke wijziging of reparatie opnieuw in bedrijf wordt gesteld, moet het door het classificatiebureau dat het schip heeft geclassificeerd onderzocht worden.

9. Alle bemanningsleden zijn opgeleid in de bestrijding van gevaren alsmede in het gebruik, hetonderhoud en de inspectie van het LNG-voortstuwingssysteem overeenkomstig de in **bijlage 4** vermelde procedures.

10. Een veiligheidsrol is beschikbaar aan boord van het schip. De veiligheidsrol beschrijft de taken van de bemanning en bevat tevens een veiligheidsplan.

11. Alle gegevens betreffende het gebruik van het LNG-voortstuwingssysteem worden verzameld door de vervoerder en moeten minstens vijf jaar worden bewaard. Deze gegevens worden op verzoek naar de bevoegde autoriteit verzonden.

12. Er wordt jaarlijks een evaluatierapport, waarin alle verzamelde gegevens zijn opgenomen, opgesteld en naar het secretariaat van de CCR gezonden, ter uitdeling onder de lidstaten. Dit evaluatierapport bevat ten minste de volgende informatie:
    a) systeemuitval;
    b) lekkage;
    c) bunkergegevens (diesel en LNG);
    d) drukgegevens;
    e) afwijkingen, reparaties en wijzigingen van het LNG-systeem inclusief de tank;
    f) functioneringsgegevens;
    g) uitstootgegevens, methaan hieronder begrepen;
    h) verslag van het onderzoek opgesteld door het classificatiebureau dat het schip heeft geclassificeerd.

Bijlagen:

Bijlage 1: HAZID Study for Chemgas 851/852
Aanhangsel 1: Tekeningen
Aanhangsel 2: Verslag TNO (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Bijlage 2: Overzicht van afwijkingen van de IGF Code (IMO Resolutie MSC.285(86), 1 juni 2009 en BLG 17 van februari 2013)

Bijlage 3: Procedure voor het bunkeren van vloeibaar aardgas

Bijlage 4: Beschrijving van de opleiding van bemanningen aan boord van binnenschepen die met vloeibaar aardgas worden aangedreven

Bijlage 5: Description of project Chemgas 851/852
Aanhangsel 1: Plaatjes herzien voorschip
Aanhangsel 2: General arrangement
Aanhangsel 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Bijlage 6: Verslag GL (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

Annexes are located on website under	**RV 2012 EN**	**rv13_89en_2 and _3**
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	JWG 2012 EN	**jwg13_83en_2 en _3**

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ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

RV (13) 89
RV/G (13) 115
JWG (13) 83
10. Dezember 2013
Or. de fr/de/nl/en

UNTERSCHUNGSAUSSCHUSS
ARBEITSGRUPPE UNTERSUCHUNGSORDNUNG
GEMEINSAME ARBEITSGRUPPE

Empfehlung für Typ-G-Tanker, Chemgas 851

Mitteilung des Sekretariats

Das Sekretariat übermittelt zur Information anliegend die von der Arbeitsgruppe Untersuchungsordnung nach § 2.19 RheinSchUO ausgesprochene Empfehlung.

ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

EMPFEHLUNGEN AN DIE SCHIFFSUNTERSUCHUNGSKOMMISSIONEN ZUR RHEINSCHIFFSUNTERSUCHUNGSORDNUNG

EMPFEHLUNG Nr. 22/2013
vom 27. November 2013

CHEMGAS 851

Das Motortankschiff "Chemgas 851" (ID-Nummer 55679 und Registernummer BV 24521F), wird hiermit als Typ-G-Tanker, so die Bezeichnung im ADN, für den Einsatz von Diesel und Flüssigerdgas (LNG) als Brennstoff für die Antriebsanlage zugelassen.

Gemäß § 2.19 Nr. 3 ist für das Fahrzeug eine Abweichung von den §§ 8.01 Nr. 3, 8.05 Nr. 6, Nr. 11 und
Nr. 12 bis zum 30.6.2017 zulässig. Der Einsatz von LNG gilt als hinreichend sicher, wenn folgende Bedingungen zu jeder Zeit erfüllt sind:

1. Die Konstruktion und Klassifikation des Schiffes soll unter der Aufsicht und Einhaltung der zu befolgenden Regeln einer anerkannten Klassifikationsgesellschaft erfolgen, welche besondere Regeln für Flüssigerdgas-Antriebssysteme hat. Die Klassifikation ist beizubehalten.

2. Das Flüssigerdgas-Antriebssystem muss jährlich von der Klassifikationsgesellschaft, welche das Schiff klassifiziert hat, inspiziert werden.

3. Von der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat, wurde eine umfassende HAZID-Studie (siehe **Anlage 1**) vorgenommen.

4. Das Flüssigerdgas-Antriebssystem erfüllt den IGF-Code (IMO Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013, mit Ausnahme der in **Anlage 2** aufgelisteten Punkte.

5. Das Flüssigerdgas-Antriebssystem ist so ausgeführt, dass Methan-Emissionen auf ein Minimum reduziert werden.

6. Die Flüssigerdgas-Vorratstanks erfüllen die Anforderungen des ADN an Tieftemperaturtanks. Auf dem Schiff wird deutlich darauf hingewiesen, dass das Fahrzeug mit LNG angetrieben wird, und angegeben, wo sich die Flüssigerdgas-Vorratstanks befinden.

7. Das Bunkern des Flüssigerdgases muss unter Einhaltung der im **Anlage 3** aufgeführten Verfahren erfolgen.

8. Die Instandhaltung des Flüssigerdgas-Antriebssystems muss unter Einhaltung der Anweisungen des Herstellers erfolgen. Die Anweisungen sind an Bord mitzuführen. Nach jeder erheblichen Änderung oder Reparatur muss das Flüssigerdgas-Antriebssystem vor der erneuten Inbetriebnahme von der Klassifikationsgesellschaft untersucht werden, die die Klassifikation des Schiffs vorgenommen hat.

9. Alle Besatzungsmitglieder sind zu den Gefahren, zum Einsatz, zur Instandhaltung und Inspektion des Flüssigerdgas-Antriebssystems nach den in **Anlage 4** festgelegten Verfahren zu schulen.

10. Eine Sicherheitsrolle ist an Bord des Schiffes vorzusehen. Die Sicherheitsrolle beschreibt die Pflichten der Besatzung und enthält einen Sicherheitsplan.

11. Alle Daten zum Einsatz des Flüssigerdgas-Antriebssystems sind vom Betreiber zu erfassen und müssen mindestens fünf Jahre lang aufbewahrt werden. Die Daten sind der zuständigen Behörde auf Anfrage zuzuschicken.

12. Ein jährlicher Auswertungsbericht, der alle erfassten Daten enthält, wird zur Verteilung an die Mitgliedstaaten an das Sekretariat der ZKR gesandt. Der Auswertungsbericht soll wenigstens die folgenden Informationen enthalten:
    a) Systemausfall;
    b) Leckage;
    c) Bunkerdaten (Diesel und LNG);
    d) Druckdaten;
    e) Abweichungen, Reparaturen und Änderungen des Flüssigerdgassystems einschließlich der Tanks;
    f) Betriebsdaten;
    g) Emissionsdaten, einschließlich Methan-Emissionen;
    h) Prüfbericht der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat.

Anlagen:

Anlage 1: HAZID-Studie für Chemgas 851/852
Anhang 1: Zeichnungen
Anhang 2: TNO Bericht (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Anlage 2: Übersicht über die Abweichungen vom IGF-Code (IMO-Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013)

Anlage 3: Verfahren für das Bunkern von Flüssigerdgas

Anlage 4: Beschreibung der Schulung von Besatzungen an Bord von Binnenschiffen mit Flüssigerdgasantrieb

Anlage 5: Beschreibung des Projekts Chemgas 851/852
Anhang 1: Grafiken des veränderten Vorschiffes
Anhang 2: General arrangement
Anhang 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Anlage 6: GL Bericht (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

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COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RV (13) 89
RV/G (13) 115
JWG (13) 83
10 décembre 2013
Or. de fr/de/nl/en

COMITE DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL COMMUN

Recommandation pour le bateau-citerne de type G, Chemgas 851

Communication du Secrétariat

Le Secrétariat a l'honneur de distribuer en annexe pour information la recommandation formulée par le groupe de travail du règlement de visite conformément à l'article 2.19 du RVBR.

COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RECOMMANDATIONS AUX COMMISSIONS DE VISITE
RELATIVES AU REGLEMENT DE VISITE DES BATEAUX DU RHIN

RECOMMANDATION N° 22/2013
du 27 novembre 2013

CHEMGAS 851

L'automoteur-citerne "Chemgas 851 (numéro d'identification 55679 et numéro de registre BV 24521F) est autorisé par la présente à utiliser en tant que bateau-citerne de type G au sens de l'ADN du carburant diesel et du gaz naturel liquéfié (GNL) en tant que combustible pour l'installation de propulsion.

Conformément à l'article 2.19, chiffre 3, le bâtiment est autorisé à déroger aux dispositions des articles 8.01, chiffre 3 et 8.05, chiffres 6, 11 et 12 jusqu'au 30.6.2017. L'utilisation du GNL est réputée suffisamment sûre sous réserve que les conditions ci-après soient respectées à tout moment :

1. Le bâtiment doit être construit et classé conformément aux règles et sous le contrôle d'une société de classification agréée ayant établi des règles spécifiques pour les installations fonctionnant au GNL. La classe doit être maintenue.

2. Le système de propulsion au GNL doit être inspecté annuellement par la société de classification qui a classé le bateau.

3. Une étude HAZID exhaustive doit avoir été réalisée par la société de classification qui a classé le bateau (voir **annexe 1**).

4. Le système de propulsion au GNL doit être conforme au code IGF (Résolution MSC.285(86) du 1er juin 2009) et BLG du 17 février 2013, à l'exception des points mentionnés en **annexe 2**.

5. Le système de propulsion au gaz naturel liquéfié est conçu de manière à limiter autant que possible les émissions de méthane.

6. Les réservoirs de stockage de GNL doivent être conformes aux exigences de l'ADN relatives aux réservoirs à basse température. A bord du bateau doit être clairement indiqué que la propulsion est assurée par du GNL et à quel endroit sont placés les réservoirs de stockage du gaz naturel liquéfié.

7. L'avitaillement au GNL doit être réalisé conformément aux procédures figurant à l'**annexe 3.**

8. L'entretien du système de propulsion au GNL doit être assuré conformément aux instructions du fabricant. Ces instructions doivent être conservées à bord. Préalablement à toute remise en service à la suite d'une réparation ou d'une modification substantielles, le système de propulsion au GNL doit être examiné par la société de classification qui a classé le bateau.

9. Tous les membres d'équipage doivent avoir suivi une formation sur les dangers, l'utilisation, l'entretien et l'inspection du système de propulsion au GNL conformément aux procédures figurant en **annexe 4**.

10. Un dossier de sécurité doit être prévu à bord du bâtiment. Le dossier de sécurité doit décrire les tâches de l'équipage et doit comporter un plan de sécurité.

11. Toutes les données relatives à l'utilisation du système de propulsion au GNL doivent être conservées par le transporteur durant au moins cinq ans. Ces données doivent être communiquées à l'autorité compétente sur demande.

12. Un rapport annuel d'évaluation comportant l'ensemble des données collectées doit être adressé au Secrétariat de la CCNR pour distribution aux Etats membres. Ce rapport d'évaluation doit comporter au minimum les informations suivantes :
    a) panne du système ;
    b) fuites ;
    c) données relatives à l'avitaillement (carburant diesel et GNL) ;
    d) données relatives à la pression ;
    e) dérogations, réparations et modifications subies par le système GNL, réservoirs compris ;
    f) données de fonctionnement ;
    g) données relatives aux émissions, y compris les émissions de méthane ;
    h) rapport d'inspection de la société de classification qui a classé le bateau.

Annexes :

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Appendice 1: Croquis
Appendice 2: Rapport TNO (TNO 2013 R11557/Final report): "Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)"

Annexe 2 : Synthèse des dérogations au Code IGF (IMO-Résolution MSC.285(86), 1er juin 2009) et BLG 17 de février 2013)

Annexe 3 : Procédure pour l'avitaillement de gaz naturel liquéfié

Annexe 4 : Description de la formation des équipages à bord de bateaux de la navigation intérieure dont la propulsion est assurée par du GNL

Annexe 5 : Description du projet Chemgas 851/852
Appendice 1: Croquis d'avant de bateau modifié
Appendice 2: Disposition générale
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Annexe 6: Rapport GL (Report No. RD-ER 2011.130): "Safety analysis for the Wärtsilä Gas Valve Unit"

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CENTRALE COMMISSIE VOOR DE RIJNVAART

RV (13) 89
RV/G (13) 115
JWG (13) 83
10 december 2013
Or. de fr/de/nl/en

COMITÉ REGLEMENT VAN ONDERZOEK
WERKGROEP REGLEMENT VAN ONDERZOEK
GEMEENSCHAPPELIJKE WERKGROEP

Aanbeveling Type G Tanker, Chemgas 851

Mededeling van het secretariaat

Het secretariaat heeft het genoegen u hierbij ter informatie de door de Werkgroep Reglement van onderzoek overeenkomstig artikel 2.19 van het ROSR geuite aanbeveling te doen toekomen.

CENTRALE COMMISSIE VOOR DE RIJNVAART

AANBEVELINGEN AAN DE COMMISSIES VAN DESKUNDIGEN MET BETREKKING TOT DE TOEPASSING VAN HET REGLEMENT ONDERZOEK SCHEPEN OP DE RIJN

AANBEVELING Nr. 22/2013
van 27 november 2013

CHEMGAS 851

Voor het tankschip “Chemgas 851” (ID nummer 55679 and BV register nummer 24521F), type G tanker als bedoeld in het ADN, wordt bij dezen de vergunning afgegeven voor het gebruik van diesel en vloeibaar aardgas (LNG, Liquefied Natural Gas) als brandstof voor de voortstuwingsinstallatie.

Op grond van artikel 2.19, derde lid, mag bij genoemd schip worden afgeweken van de artikelen 8.01, derde lid, 8.05, zesde lid, elfde lid en twaalfde lid, tot en met 30.6.2017. Het gebruik van LNG wordt geacht voldoende veilig te zijn indien te allen tijde aan de volgende voorwaarden wordt voldaan:

1. Het schip wordt gebouwd en geclassificeerd onder toezicht en overeenkomstig de van toepassing zijnde voorschriften van een erkend classificatiebureau dat specifieke voorschriften voor LNG-installaties hanteert. De klasse blijft gehandhaafd.

2. Het LNG-voortstuwingssysteem wordt jaarlijks gekeurd door het classificatiebureau dat het schip heeft geclassificeerd.

3. Een volledige HAZID-keuring door het classificatiebureau dat het schip heeft geclassificeerd (zie **bijlage 1**) is uitgevoerd.

4. Het LNG-voortstuwingssysteem voldoet aan de IGF-Code (IMO-Resolutie MSC.285(86) van 1 juni 2009) en BLG17 van februari 2013, behoudens de in **bijlage 2** vermelde onderdelen.

5. Het LNG-voortstuwingssysteem is zodanig uitgevoerd dat uitstoot van methaan maximaal wordt beperkt.

6. De LNG-opslagtanks voldoen aan de voorschriften die op basis van het ADN aan cryogene tanks worden gesteld. Op het schip wordt duidelijk aangegeven dat het schip door middel van LNG wordt aangedreven en wordt aangeduid waar de LNG-opslagtanks zich bevinden.

7. Bunkeren van LNG wordt uitgevoerd conform de in **bijlage 3** vermelde procedures.

8. Het onderhoud van het LNG-voortstuwingssysteem wordt uitgevoerd overeenkomstig de instructies van de fabrikant. De instructies worden aan boord bewaard. Voordat het voortstuwingssysteem na een aanzienlijke wijziging of reparatie opnieuw in bedrijf wordt gesteld, moet het door het classificatiebureau dat het schip heeft geclassificeerd onderzocht worden.

9. Alle bemanningsleden zijn opgeleid in de bestrijding van gevaren alsmede in het gebruik, hetonderhoud en de inspectie van het LNG-voortstuwingssysteem overeenkomstig de in **bijlage 4** vermelde procedures.

10. Een veiligheidsrol is beschikbaar aan boord van het schip. De veiligheidsrol beschrijft de taken van de bemanning en bevat tevens een veiligheidsplan.

11. Alle gegevens betreffende het gebruik van het LNG-voortstuwingssysteem worden verzameld door de vervoerder en moeten minstens vijf jaar worden bewaard. Deze gegevens worden op verzoek naar de bevoegde autoriteit verzonden.

12. Er wordt jaarlijks een evaluatierapport, waarin alle verzamelde gegevens zijn opgenomen, opgesteld en naar het secretariaat van de CCR gezonden, ter uitdeling onder de lidstaten. Dit evaluatierapport bevat ten minste de volgende informatie:
    a) systeemuitval;
    b) lekkage;
    c) bunkergegevens (diesel en LNG);
    d) drukgegevens;
    e) afwijkingen, reparaties en wijzigingen van het LNG-systeem inclusief de tank;
    f) functioneringsgegevens;
    g) uitstootgegevens, methaan hieronder begrepen;
    h) verslag van het onderzoek opgesteld door het classificatiebureau dat het schip heeft geclassificeerd.

Bijlagen:

Bijlage 1: HAZID Study for Chemgas 851/852
Aanhangsel 1: Tekeningen
Aanhangsel 2: Verslag TNO (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Bijlage 2: Overzicht van afwijkingen van de IGF Code (IMO Resolutie MSC.285(86), 1 juni 2009 en BLG 17 van februari 2013)

Bijlage 3: Procedure voor het bunkeren van vloeibaar aardgas

Bijlage 4: Beschrijving van de opleiding van bemanningen aan boord van binnenschepen die met vloeibaar aardgas worden aangedreven

Bijlage 5: Description of project Chemgas 851/852
Aanhangsel 1: Plaatjes herzien voorschip
Aanhangsel 2: General arrangement
Aanhangsel 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Bijlage 6: Verslag GL (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

Annexes are located on website under	**RV 2012 EN**	**rv13_89en_2 and _3**
and	**RVG 2012 EN**	**rvg13_115en_2 and _3**
	JWG 2012 EN	**jwg13_83en_2 and _3**
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ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

RV (13) 90
RV/G (13) 116
JWG (13) 84
10. Dezember 2013
Or. de fr/de/nl/en

UNTERSCHUNGSAUSSCHUSS
ARBEITSGRUPPE UNTERSUCHUNGSORDNUNG
GEMEINSAME ARBEITSGRUPPE

Empfehlung für Typ-G-Tanker, Chemgas 852

Mitteilung des Sekretariats

Das Sekretariat übermittelt zur Information anliegend die von der Arbeitsgruppe Untersuchungsordnung nach § 2.19 RheinSchUO ausgesprochene Empfehlung.

ZENTRALKOMMISSION FÜR DIE RHEINSCHIFFFAHRT

EMPFEHLUNGEN AN DIE SCHIFFSUNTERSUCHUNGSKOMMISSIONEN ZUR RHEINSCHIFFSUNTERSUCHUNGSORDNUNG

EMPFEHLUNG Nr. 23/2013
vom 27. November 2013

CHEMGAS 852

Das Motortankschiff "Chemgas 852" (ID-Nummer 55678 und Registernummer BV 25106R), wird hiermit als Typ-G-Tanker, so die Bezeichnung im ADN, für den Einsatz von Diesel und Flüssigerdgas (LNG) als Brennstoff für die Antriebsanlage zugelassen.

Gemäß § 2.19 Nr. 3 ist für das Fahrzeug eine Abweichung von den §§ 8.01 Nr. 3, 8.05 Nr. 6, Nr. 11 und Nr. 12 bis zum 30.6.2017 zulässig. Der Einsatz von LNG gilt als hinreichend sicher, wenn folgende Bedingungen zu jeder Zeit erfüllt sind:

1. Die Konstruktion und Klassifikation des Schiffes soll unter der Aufsicht und Einhaltung der zu befolgenden Regeln einer anerkannten Klassifikationsgesellschaft erfolgen, welche besondere Regeln für Flüssigerdgas-Antriebssysteme hat. Die Klassifikation ist beizubehalten.

2. Das Flüssigerdgas-Antriebssystem muss jährlich von der Klassifikationsgesellschaft, welche das Schiff klassifiziert hat, inspiziert werden.

3. Von der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat, wurde eine umfassende HAZID-Studie (siehe **Anlage 1**) vorgenommen.

4. Das Flüssigerdgas-Antriebssystem erfüllt den IGF-Code (IMO Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013, mit Ausnahme der in **Anlage 2** aufgelisteten Punkte.

5. Das Flüssigerdgas-Antriebssystem ist so ausgeführt, dass Methan-Emissionen auf ein Minimum reduziert werden.

6. Die Flüssigerdgas-Vorratstanks erfüllen die Anforderungen des ADN an Tieftemperaturtanks. Auf dem Schiff wird deutlich darauf hingewiesen, dass das Fahrzeug mit LNG angetrieben wird, und angegeben, wo sich die Flüssigerdgas-Vorratstanks befinden.

7. Das Bunkern des Flüssigerdgases muss unter Einhaltung der im **Anlage 3** aufgeführten Verfahren erfolgen.

8. Die Instandhaltung des Flüssigerdgas-Antriebssystems muss unter Einhaltung der Anweisungen des Herstellers erfolgen. Die Anweisungen sind an Bord mitzuführen. Nach jeder erheblichen Änderung oder Reparatur muss das Flüssigerdgas-Antriebssystem vor der erneuten Inbetriebnahme von der Klassifikationsgesellschaft untersucht werden, die die Klassifikation des Schiffs vorgenommen hat.

9. Alle Besatzungsmitglieder sind zu den Gefahren, zum Einsatz, zur Instandhaltung und Inspektion des Flüssigerdgas-Antriebssystems nach den in **Anlage 4** festgelegten Verfahren zu schulen.

10. Eine Sicherheitsrolle ist an Bord des Schiffes vorzusehen. Die Sicherheitsrolle beschreibt die Pflichten der Besatzung und enthält einen Sicherheitsplan.

11. Alle Daten zum Einsatz des Flüssigerdgas-Antriebssystems sind vom Betreiber zu erfassen und müssen mindestens fünf Jahre lang aufbewahrt werden. Die Daten sind der zuständigen Behörde auf Anfrage zuzuschicken.

12. Ein jährlicher Auswertungsbericht, der alle erfassten Daten enthält, wird zur Verteilung an die Mitgliedstaaten an das Sekretariat der ZKR gesandt. Der Auswertungsbericht soll wenigstens die folgenden Informationen enthalten:
    a) Systemausfall;
    b) Leckage;
    c) Bunkerdaten (Diesel und LNG);
    d) Druckdaten;
    e) Abweichungen, Reparaturen und Änderungen des Flüssigerdgassystems einschließlich der Tanks;
    f) Betriebsdaten;
    g) Emissionsdaten, einschließlich Methan-Emissionen;
    h) Prüfbericht der Klassifikationsgesellschaft, die die Klassifikation des Schiffs vorgenommen hat.

Anlagen:

Anlage 1: HAZID-Studie für Chemgas 851/852
Anhang 1: Zeichnungen
Anhang 2: TNO Bericht (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Anlage 2: Übersicht über die Abweichungen vom IGF-Code (IMO-Resolution MSC.285(86), 1. Juni 2009), und BLG 17 vom Februar 2013)

Anlage 3: Verfahren für das Bunkern von Flüssigerdgas

Anlage 4: Beschreibung der Schulung von Besatzungen an Bord von Binnenschiffen mit Flüssigerdgasantrieb

Anlage 5: Beschreibung des Projekts Chemgas 851/852
Anhang 1: Grafiken des veränderten Vorschiffes
Anhang 2: General arrangement
Anhang 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Anlage 6: GL Bericht (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

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	RVG 2012 EN	**rvg13_115en_2 and _3**
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	JWG 2012 EN	**jwg13_83en_2 en _3**

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COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RV (13) 90
RV/G (13) 116
JWG (13) 84
10 décembre 2013
Or. de fr/de/nl/en

COMITE DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL DU REGLEMENT DE VISITE
GROUPE DE TRAVAIL COMMUN

Recommandation pour le bateau-citerne de type G, Chemgas 852

Communication du Secrétariat

Le Secrétariat a l'honneur de distribuer en annexe pour information la recommandation formulée par le groupe de travail du règlement de visite conformément à l'article 2.19 du RVBR.

COMMISSION CENTRALE POUR LA NAVIGATION DU RHIN

RECOMMANDATIONS AUX COMMISSIONS DE VISITE
RELATIVES AU REGLEMENT DE VISITE DES BATEAUX DU RHIN

RECOMMANDATION N° 23/2013
du 27 novembre 2013

CHEMGAS 852

L'automoteur-citerne "Chemgas 852 (numéro d'identification 55678 et numéro de registre BV 25106R) est autorisé par la présente à utiliser en tant que bateau-citerne de type G au sens de l'ADN du carburant diesel et du gaz naturel liquéfié (GNL) en tant que combustible pour l'installation de propulsion.

Conformément à l'article 2.19, chiffre 3, le bâtiment est autorisé à déroger aux dispositions des articles 8.01, chiffre 3 et 8.05, chiffres 6, 11 et 12 jusqu'au 30.6.2017. L'utilisation du GNL est réputée suffisamment sûre sous réserve que les conditions ci-après soient respectées à tout moment :

1. Le bâtiment doit être construit et classé conformément aux règles et sous le contrôle d'une société de classification agréée ayant établi des règles spécifiques pour les installations fonctionnant au GNL. La classe doit être maintenue.

2. Le système de propulsion au GNL doit être inspecté annuellement par la société de classification qui a classé le bateau.

3. Une étude HAZID exhaustive doit avoir été réalisée par la société de classification qui a classé le bateau (voir **annexe 1**).

4. Le système de propulsion au GNL doit être conforme au code IGF (Résolution MSC.285(86) du 1er juin 2009) et BLG du 17 février 2013, à l'exception des points mentionnés en **annexe 2**.

5. Le système de propulsion au gaz naturel liquéfié est conçu de manière à limiter autant que possible les émissions de méthane.

6. Les réservoirs de stockage de GNL doivent être conformes aux exigences de l'ADN relatives aux réservoirs à basse température. A bord du bateau doit être clairement indiqué que la propulsion est assurée par du GNL et à quel endroit sont placés les réservoirs de stockage du gaz naturel liquéfié.

7. L'avitaillement au GNL doit être réalisé conformément aux procédures figurant à l'**annexe 3.**

8. L'entretien du système de propulsion au GNL doit être assuré conformément aux instructions du fabricant. Ces instructions doivent être conservées à bord. Préalablement à toute remise en service à la suite d'une réparation ou d'une modification substantielles, le système de propulsion au GNL doit être examiné par la société de classification qui a classé le bateau.

9. Tous les membres d'équipage doivent avoir suivi une formation sur les dangers, l'utilisation, l'entretien et l'inspection du système de propulsion au GNL conformément aux procédures figurant en **annexe 4**.

10. Un dossier de sécurité doit être prévu à bord du bâtiment. Le dossier de sécurité doit décrire les tâches de l'équipage et doit comporter un plan de sécurité.

11. Toutes les données relatives à l'utilisation du système de propulsion au GNL doivent être conservées par le transporteur durant au moins cinq ans. Ces données doivent être communiquées à l'autorité compétente sur demande.

12. Un rapport annuel d'évaluation comportant l'ensemble des données collectées doit être adressé au Secrétariat de la CCNR pour distribution aux Etats membres. Ce rapport d'évaluation doit comporter au minimum les informations suivantes :
    a) panne du système ;
    b) fuites ;
    c) données relatives à l'avitaillement (carburant diesel et GNL) ;
    d) données relatives à la pression ;
    e) dérogations, réparations et modifications subies par le système GNL, réservoirs compris ;
    f) données de fonctionnement ;
    g) données relatives aux émissions, y compris les émissions de méthane ;
    h) rapport d'inspection de la société de classification qui a classé le bateau.

Annexes :

Annexe 1 : Etude HAZID pour Chemgas 851/852
Appendice 1: Croquis
Appendice 2: Rapport TNO (TNO 2013 R11557/Final report): "Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)"

Annexe 2 : Synthèse des dérogations au Code IGF (IMO-Résolution MSC.285(86), 1er juin 2009) et BLG 17 de février 2013)

Annexe 3 : Procédure pour l'avitaillement de gaz naturel liquéfié

Annexe 4 : Description de la formation des équipages à bord de bateaux de la navigation intérieure dont la propulsion est assurée par du GNL

Annexe 5 : Description du projet Chemgas 851/852
Appendice 1: Croquis d'avant de bateau modifié
Appendice 2: Disposition générale
Appendice 3: Emplacement réservoir GNL, situation du réservoir à carburant et salle à machines

Annexe 6: Rapport GL (Report No. RD-ER 2011.130): "Safety analysis for the Wärtsilä Gas Valve Unit"

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and	**RVG 2012 EN**	**rvg13_115en_2 and _3**
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CENTRALE COMMISSIE VOOR DE RIJNVAART

RV (13) 90
RV/G (13) 116
JWG (13) 84
10 december 2013
Or. de fr/de/nl/en

COMITÉ REGLEMENT VAN ONDERZOEK
WERKGROEP REGLEMENT VAN ONDERZOEK
GEMEENSCHAPPELIJKE WERKGROEP

Aanbeveling Type G Tanker, Chemgas 852

Mededeling van het secretariaat

Het secretariaat heeft het genoegen u hierbij ter informatie de door de Werkgroep Reglement van onderzoek overeenkomstig artikel 2.19 van het ROSR geuite aanbeveling te doen toekomen.

CENTRALE COMMISSIE VOOR DE RIJNVAART

AANBEVELINGEN AAN DE COMMISSIES VAN DESKUNDIGEN MET BETREKKING TOT DE TOEPASSING VAN HET REGLEMENT ONDERZOEK SCHEPEN OP DE RIJN

AANBEVELING Nr. 22/2013
van 27 november 2013

CHEMGAS 852

Voor het tankschip “Chemgas 852” (ID nummer 55678 and BV register nummer 25106R), type G tanker als bedoeld in het ADN, wordt bij dezen de vergunning afgegeven voor het gebruik van diesel en vloeibaar aardgas (LNG, Liquefied Natural Gas) als brandstof voor de voortstuwingsinstallatie.

Op grond van artikel 2.19, derde lid, mag bij genoemd schip worden afgeweken van de artikelen 8.01, derde lid, 8.05, zesde lid, elfde lid en twaalfde lid, tot en met 30.6.2017. Het gebruik van LNG wordt geacht voldoende veilig te zijn indien te allen tijde aan de volgende voorwaarden wordt voldaan:

1. Het schip wordt gebouwd en geclassificeerd onder toezicht en overeenkomstig de van toepassing zijnde voorschriften van een erkend classificatiebureau dat specifieke voorschriften voor LNG-installaties hanteert. De klasse blijft gehandhaafd.

2. Het LNG-voortstuwingssysteem wordt jaarlijks gekeurd door het classificatiebureau dat het schip heeft geclassificeerd.

3. Een volledige HAZID-keuring door het classificatiebureau dat het schip heeft geclassificeerd (zie **bijlage 1**) is uitgevoerd.

4. Het LNG-voortstuwingssysteem voldoet aan de IGF-Code (IMO-Resolutie MSC.285(86) van 1 juni 2009) en BLG17 van februari 2013, behoudens de in **bijlage 2** vermelde onderdelen.

5. Het LNG-voortstuwingssysteem is zodanig uitgevoerd dat uitstoot van methaan maximaal wordt beperkt.

6. De LNG-opslagtanks voldoen aan de voorschriften die op basis van het ADN aan cryogene tanks worden gesteld. Op het schip wordt duidelijk aangegeven dat het schip door middel van LNG wordt aangedreven en wordt aangeduid waar de LNG-opslagtanks zich bevinden.

7. Bunkeren van LNG wordt uitgevoerd conform de in **bijlage 3** vermelde procedures.

8. Het onderhoud van het LNG-voortstuwingssysteem wordt uitgevoerd overeenkomstig de instructies van de fabrikant. De instructies worden aan boord bewaard. Voordat het voortstuwingssysteem na een aanzienlijke wijziging of reparatie opnieuw in bedrijf wordt gesteld, moet het door het classificatiebureau dat het schip heeft geclassificeerd onderzocht worden.

9. Alle bemanningsleden zijn opgeleid in de bestrijding van gevaren alsmede in het gebruik, hetonderhoud en de inspectie van het LNG-voortstuwingssysteem overeenkomstig de in **bijlage 4** vermelde procedures.

10. Een veiligheidsrol is beschikbaar aan boord van het schip. De veiligheidsrol beschrijft de taken van de bemanning en bevat tevens een veiligheidsplan.

11. Alle gegevens betreffende het gebruik van het LNG-voortstuwingssysteem worden verzameld door de vervoerder en moeten minstens vijf jaar worden bewaard. Deze gegevens worden op verzoek naar de bevoegde autoriteit verzonden.

12. Er wordt jaarlijks een evaluatierapport, waarin alle verzamelde gegevens zijn opgenomen, opgesteld en naar het secretariaat van de CCR gezonden, ter uitdeling onder de lidstaten. Dit evaluatierapport bevat ten minste de volgende informatie:
    a) systeemuitval;
    b) lekkage;
    c) bunkergegevens (diesel en LNG);
    d) drukgegevens;
    e) afwijkingen, reparaties en wijzigingen van het LNG-systeem inclusief de tank;
    f) functioneringsgegevens;
    g) uitstootgegevens, methaan hieronder begrepen;
    h) verslag van het onderzoek opgesteld door het classificatiebureau dat het schip heeft geclassificeerd.

Bijlagen:

Bijlage 1: HAZID Study for Chemgas 851/852
Aanhangsel 1: Tekeningen
Aanhangsel 2: Verslag TNO (TNO 2013 R11557/Final report): “Assessment HAZID LNG Fuel type G tanker design Chemgas 851 AD55679/ 852 ID55678)”

Bijlage 2: Overzicht van afwijkingen van de IGF Code (IMO Resolutie MSC.285(86), 1 juni 2009 en BLG 17 van februari 2013)

Bijlage 3: Procedure voor het bunkeren van vloeibaar aardgas

Bijlage 4: Beschrijving van de opleiding van bemanningen aan boord van binnenschepen die met vloeibaar aardgas worden aangedreven

Bijlage 5: Description of project Chemgas 851/852
Aanhangsel 1: Plaatjes herzien voorschip
Aanhangsel 2: General arrangement
Aanhangsel 3: Location LNG tank, Fuel tank arrangement and Layout engine room

Bijlage 6: Verslag GL (Report No. RD-ER 2011.130): “Safety analysis for the Wärtsilä Gas Valve Unit”

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