Inland Waterways Ships

BinSmart-Begleitforschungsgruppe

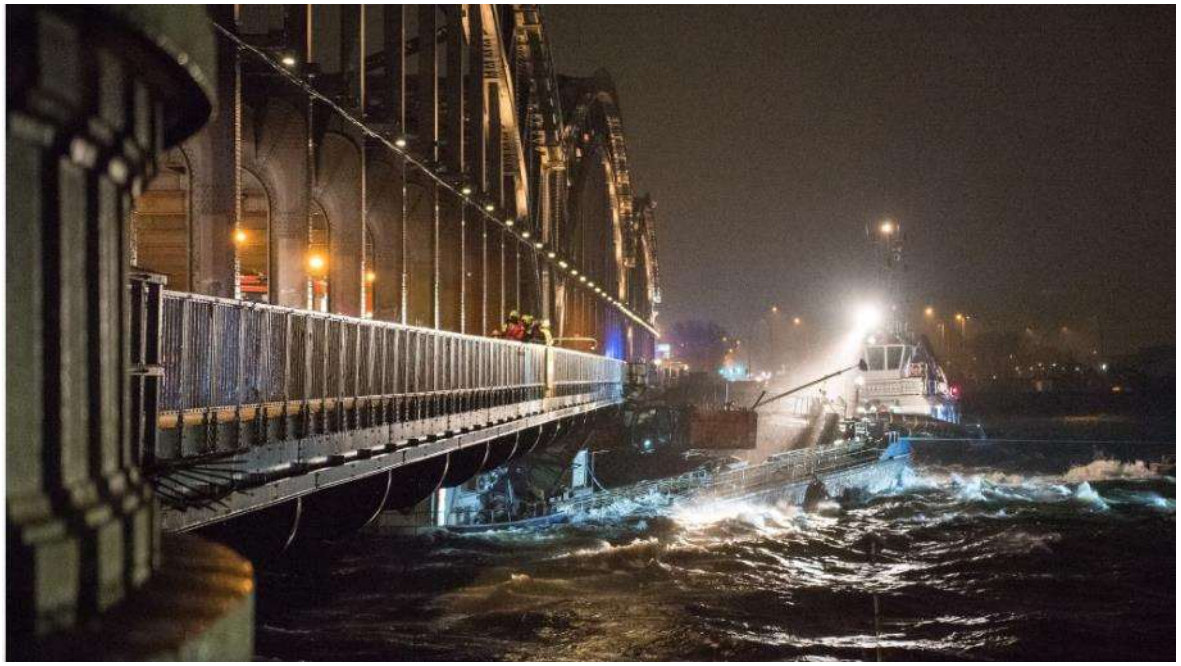
November 2023

Content

Current state of rule development for alternative fuels

- IWW Operational areas
- Inland Waterways Ship fleet
- Classification Rules
- Regulations CESNI
- I.W.W. with Lloyd’s Register

Why do we need technical requirements for inland navigation vessels and what requirements are needed?



31.01.22 Vessel got stuck below Freihafenbrücke

Taken from: https://www.ndr.de/nachrichten/hamburg/Schiff-bleibt-unter-Hamburger-Freihafenelbbruecke-haengen,schiffskollision246.html

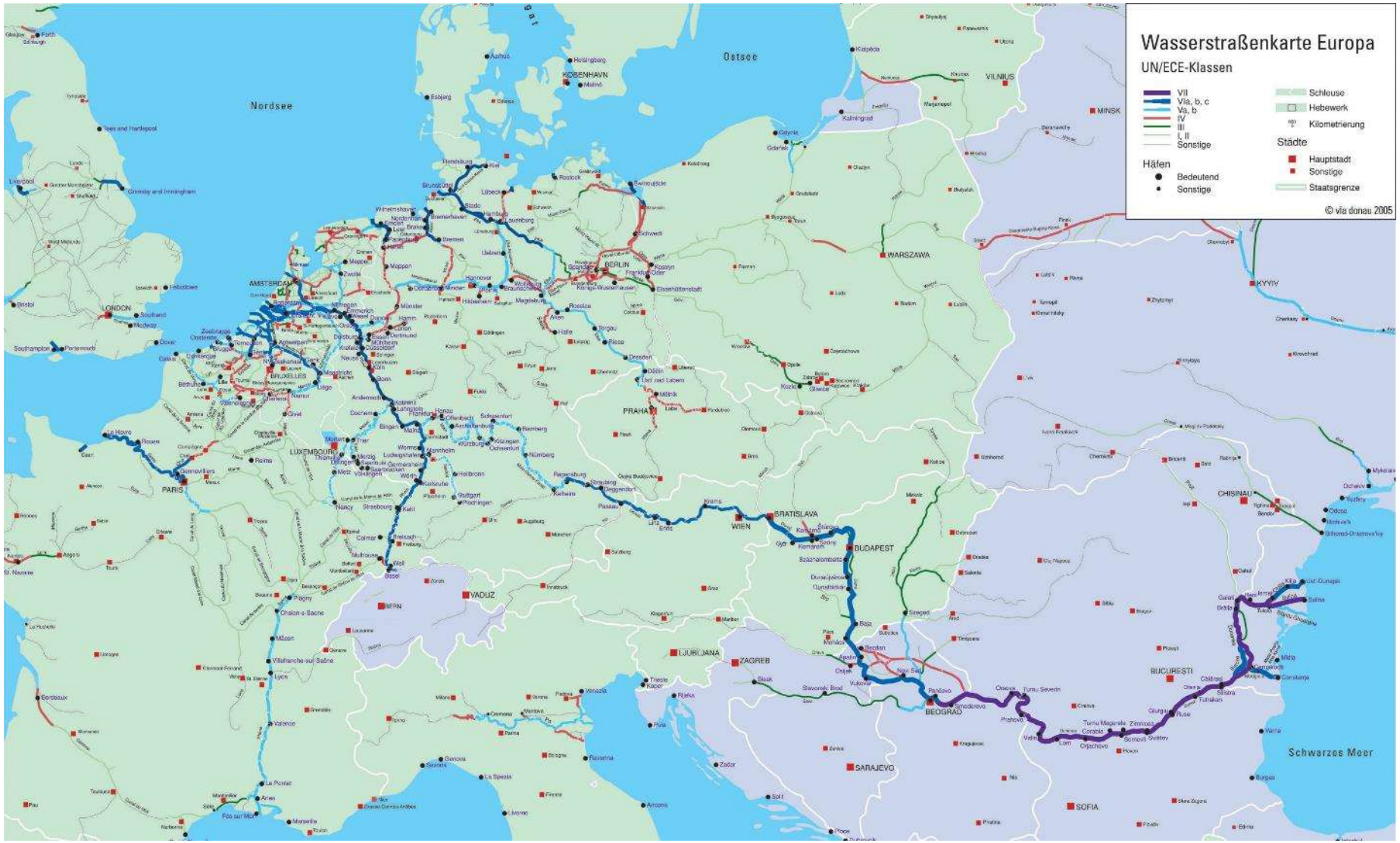
Wheelhouse

Taken from: https://www.ndr.de/nachrichten/hamburg/Schiff-bleibt-unter-Hamburger-Freihafenelbbruecke-haengen,schiffskollision246.html

Why do we need technical requirements for inland navigation vessels and what requirements are needed?

Taken from: https://www.youtube.com/watch?v=ROjm1W5N77g&t=46s

Operational areas



Operational areas

- Total length of waterways in Europe 40.000 km
- European inland waterways divided in zones
  - Zone 4 .. 1 - depending on wave height
  - Zone R - Rhine from Basel (SWZ)
    to open sea (Hoek van Holland)
- Statutory requirements depending on zone
- Ships are certified for specific zones
- Most common are
  - Zone 4, 3, R in the EU
  - Zone 2 in The Netherlands

Inland Waterways Ship Fleet

	Rhine	Danube	Other
• Dry cargo ships	6.950	2.650	1.550
• Tankers	1.450	200	20
• Tugs and pushers	1.350	650	750
• Passengers ships			1.800
• Cabin passenger ships			450

- Total approximately 18.000 ships

- Transport in Rhine area - about 120 Billion ton-kilometre
- Transport in Danube area - about 25 Billion ton-kilometre

Inland Waterways Ship Fleet

- Average age dry cargo ships 35 years
- Average age tanker 12 years

- Abt. 60% I.W.W. fleet Dutch owned
- Abt. 80% private owners

Inland Waterways Ship Fleet

Typical ship size

- Tanker
  - 86.00 × 9.60 × 4.50 × 3.30 / 1.800 DWT
  - 110.00 × 11.45 × 4.65 × 3.80 / 3.200 DWT
  - 135.00 × 17.50 × 5.80 × 4.70 / 8.000 DWT
  - 135.00 × 22.80 × 7.10 × 5.50 / 13.000 DWT
- Dry cargo ships
  - 110.00 × 11.45 × 4.30 × 3.60 / 208 TEU
  - 135.00 × 14.50 × 4.80 × 3.90 / 420 TEU
- Cabin passenger ships
  - 110.00 × 11.45 × 3.60 × 1.20 / 150 pax
  - 135.00 × 11.45 × 3.60 × 1.20 / 180 pax

Inland Waterways Ship Fleet

Schleusen am Hoch- und Oberrhein [Bearbeiten | Quelltext bearbeiten]

Von Augst bis Birsfelden (Hochrhein) und von Kembs bis Iffezheim (Oberrhein) hat der Rhein 12 Fallstufen.[6]

Name	Rhein-km	Schleusenabmessungen (m)	Fallhöhe (m)
Augst (CH)	155,50	110,00 × 11,45	4,63 bis 6,65
Birsfelden (CH)	163,43	187,50 × 11,45 und 180,00 × 11,45	5,91 bis 9,28
Kembs (F)	179,10	185,00 × 22,80 und 186,50 × 22,80	14,26
Ottmarsheim (F)	193,64	185,00 × 22,80 und 185,00 × 12,50	15,50
Fessenheim (F)	210,51	185,00 × 22,80 und 185,00 × 12,50	15,70
Vogelgrün (F)	224,54	185,00 × 22,80 und 185,00 × 12,50	12,30
Marckolsheim (F)	239,88	185,00 × 22,80 und 185,00 × 12,50	13,20
Rhinau (F)	256,15	185,00 × 22,80 und 185,00 × 12,50	13,30
Gerstheim (F)	272,23	185,00 × 22,80 und 185,00 × 12,50	11,75
Straßburg (F)	287,36	185,00 × 22,80 und 185,00 × 12,50	13,25
Gambsheim (F)	308,83	270,00 × 22,80 und 270,00 × 22,80	10,35
Iffezheim (D)	334,00	270,00 × 24,00 und 270,00 × 24,00	10,30

Inland Waterways Ship Fleet

- Ships which are mandatory to be certified
  - Length > 20 m
  - L × B × T > 100 m^3
  - > 12 passenger
- Ships which are mandatory to be classed
  - ADN tankers
  - High speed vessels > 40 km/hr
- Ships which are mandatory to be build with class
  - L > 110 m

Statutory legislation

- Central Commission for the Navigation of the Rhine (CCNR)
  - 5 member states + classification societies
  - Committee → technical working group → ad-hoc working groups
- European Union (EU)
  - 27 member states + classification societies + industry NGOs
  - CESNI Committee → technical working group → ad-hoc working groups
- United Nations Economic Commission for Europe ADN Safety Committee (ADN-SC)
  - 18 member states + classification societies + industry NGOs
  - Safety Committee → permanent working groups

Statutory Legislation

Central Commission for the Navigation of the Rhine

Rhine Vessels Inspection Regulations

Cesni Committee

EU 2016/1629

ES-TRIN

Statutory legislation

- ES-TRIN updated bi-annually
- ES-TRIN contains general technical requirements
  - Strength
  - Stability
  - Steering installations + maneuverability
  - Machinery + emissions
  - Electrical installations
  - Lay-out
  - Specific requirements for certain ship types
  - Low flash point fuels

Statutory legislation

- ADN updated bi-annually
- ADN contains additional requirements for the transport of dangerous goods
- Dry cargo and tankers
- Type G - Type C - Type N
- Table C with substances
- Cargo list issued by classification society

Lloyd's Register Marine

31 Mrz 2017

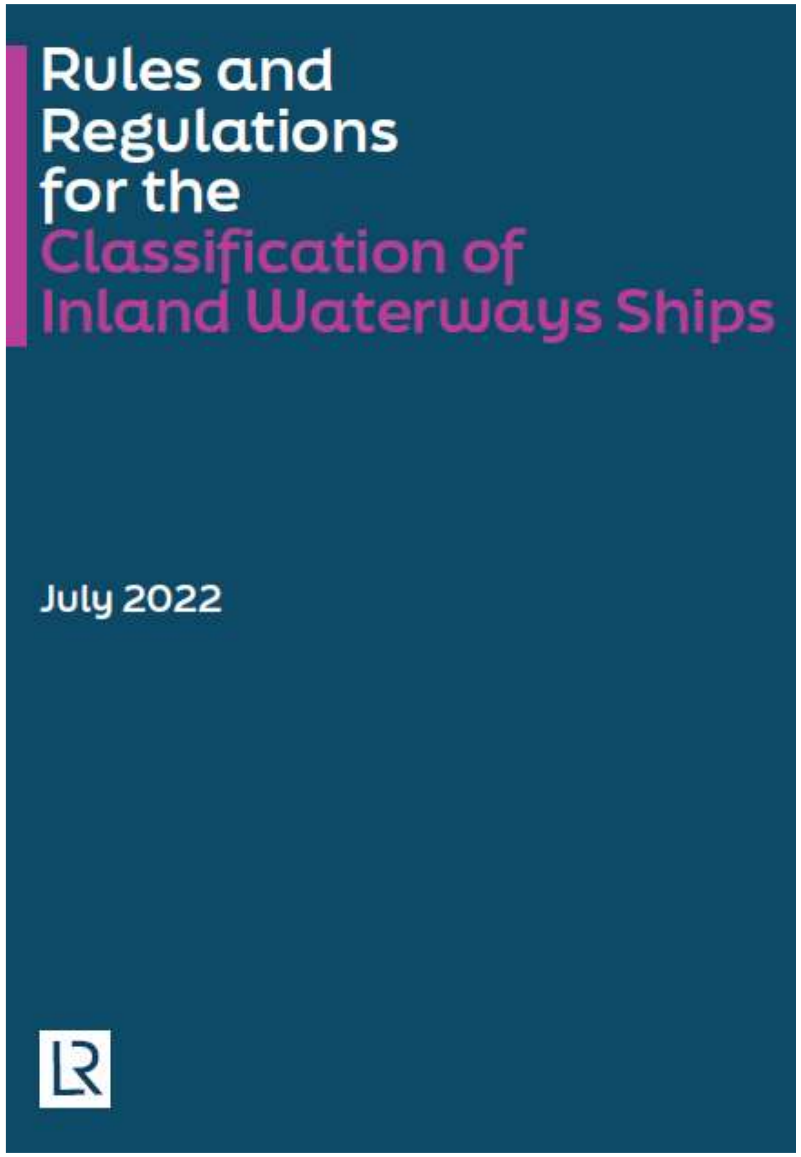
EDGAR JAEGERS/

UN-Nummer		Klasse	Klassifizierungscode	Verpackungsgruppe	Gefahren	Maximal zulässiger Tankfüllungsgrad in %	Ausrüstung erforderlich	Zusätzliche Anforderungen/Bemerkungen
1179	ETHYLBUTYLETHER (ETHYL-tert-BUTYLETHER)	3	F1	II	3, N3	97	PP, EX, A	100
1184	ETHYLENDICHLORID (1,2-Dichlorethan)	3	FT1	II	3, 6.1, CMR	84	PP, EP, EX, TOX, A	100
1191	OCTYLALDEHYDE (2-ETHYLCAPRONALDEHYD)	3	F1	III	3, F	95	PP, EX, A	100

Classification Rules

Lloyd's Register I.W.W. Rules

- Developed at LR in Rotterdam
- Rules for seagoing ships as basis
- Annual update
- Statutory requirements partly incorporated



Regulations CESNI

Rule development Inland Navigation Vessels CESNI

- Requirements for low-flashpoint fuels
- Final draft requirements for methanol storage

Current work of non-temporary working group CESNI/PT/FC

Regulations CESNI

- Restructured and updated general requirements for all low flashpoint fuels (Chapter 30)

- Restructured requirements for storage and use of LNG (Annex 8)

New requirements for energy converter: fuel cells

- Definitions
- Fuel cell spaces (inerted, explosion-protected , ventilated)
- Fuel piping systems
- Reformer
- Buffer vessels
- Fuel cell sytems
- Ventilation systems
- Exhaust systems
- Purging systems
- Control, monitoring and safety systems

Regulations CESNI Edition 2021/2023

2021

- Article 30.01 *General*
- Article 30.02 *Testing*
- Article 30.03 *Safety organisation*
- Article 30.04 *(left void)*
- Article 30.05 *Marking*
- Article 30.06 *Independent propulsion*
- Article 30.07 *Technical services*

2023

Article 30.00 Definition

Article 30.01 Scope of application

Article 30.02 General

Article 30.03 Tasks of the inspection body and technical service, documentation

Article 30.04 Risk assessment

Article 30.05 Safety organisation

Article 30.06 Marking

Article 30.07 Independent propulsion

Article 30.08 Fire safety

Article 30.09 Electrical installations

Article 30.10 Control, monitoring and safety systems

Article 30.11 Testing

Regulations CESNI Edition 2023

ANNEX 8 SUPPLEMENTARY PROVISIONS APPLICABLE TO CRAFT EQUIPPED WITH PROPULSION OR AUXILIARY SYSTEM OPERATING ON FUELS WITH A FLASHPOINT EQUAL TO OR LOWER THAN 55 °C

Contents

Section I Definitions

Section II Fuel storage

- Chapter 1 **LNG**
- Chapter 2 **Methanol** (left void)
- Chapter 3 **Hydrogen** (left void)

Section III Energy converters

- Chapter 1 Propulsion or auxiliary systems with **fuel cells**
- Chapter 2 Propulsion or auxiliary systems with internal **combustion engines using LNG** as primary fuel
- Chapter 3 Propulsion or auxiliary systems with internal **combustion engines using methanol** as fuel (left void)

Regulations CESNI

Final draft requirements for methanol storage (CESNI/PT/FC (22) 7 rev.3)

Revised draft requirements for propulsion or auxiliary systemswith internal combustion enginesusing methanol as fuel (CESNI/PT/FC (23)2 rev.3)

In June 2022, the Working group CESNI/PT approved

- the final draft requirements for methanol storage (Annex 1), as an addition to ES-TRIN 2023
- the sketches regarding the arrangements of the tanks and piping systems (Annex 2), as possible instructions to the inspection bodies (ESI).
- recommended to use
- current state-of-play, not binding
- for collection of experience

The Working group CESNI/PT invited the recognised associations, in particular those representing the shipowners, the shipyards and the classification societies, to disseminate the draft requirements.

CESNI

CESNI/PT/FC (22) 7 rev. 3
CESNI/PT (22) 44 rev. 1
12th July 2022

TEMPORARY WORKING GROUP ON TECHNICAL REQUIREMENTS FOR FUEL CELLS (ABOARD INLAND NAVIGATION VESSELS)
WORKING GROUP ON TECHNICAL REQUIREMENTS

Final draft requirements for methanol storage (June 2022)

Communication from the Secretariat

In June 2022, the Working group CESNI/PT approved

- the final draft requirements for methanol storage (**Annex 1**), as an addition to ES-TRIN 2023 (especially Chapter 30 and Annex 8);
- the sketches regarding the arrangements of the tanks and piping systems (**Annex 2**), as possible instructions to the inspection bodies (ESI).

As these draft requirements are not part of ES-TRIN 2023, the Working group recommended using them as guidelines. These provisions are not binding and only reflect the current state-of-play of the regulatory work.

The early approval of these draft requirements for methanol storage aims to facilitate pilot projects, especially the submission of requests of derogations to ES-TRIN and the related vessel certification. The experience collected in implementing these draft requirements should allow for a revision, before the end of 2023, with a view to include them in ES-TRIN 2025.

The Working group CESNI/PT invited the recognised associations, in particular those representing the shipowners, the shipyards and the classification societies, to disseminate the draft requirements.

Regulations CESNI

Final draft requirements for methanol storage (CESNI/PT/FC (22) 7 rev.3)

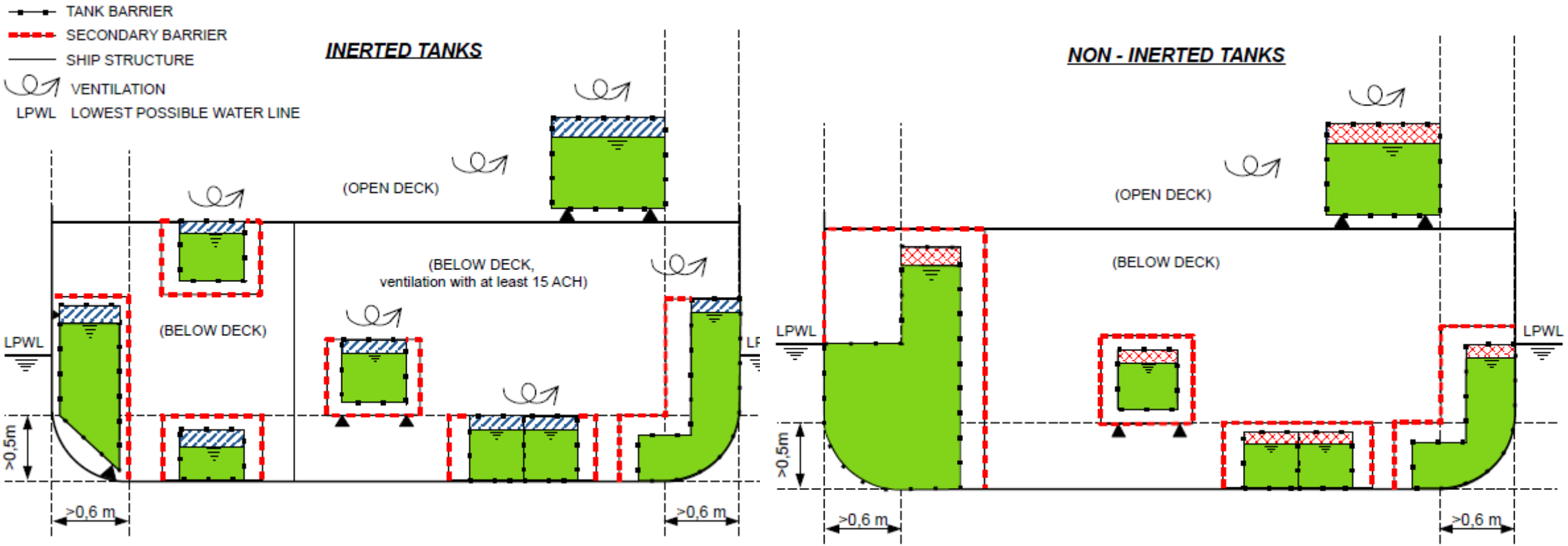
- Definitions
- Meoh fuel tanks (inerted, non-inerted)
- Tank venting
- Piping sytems
- Drainage systems
- Arrangement for entrances and other openings
- Bunkering systems
- Fuel supply
- Fire safety
- Control, monitoring and safety systems

Revised draft requirements for propulsion or auxiliary systemswith internal combustion enginesusing methanol as fuel (CESNI/PT/FC (23)2 rev.3)

- Energy converters
- Requirements for gas safe engine rooms
- Requirements for ventilated engine rooms
- Engines
- Exhaust system

Regulations CESNI

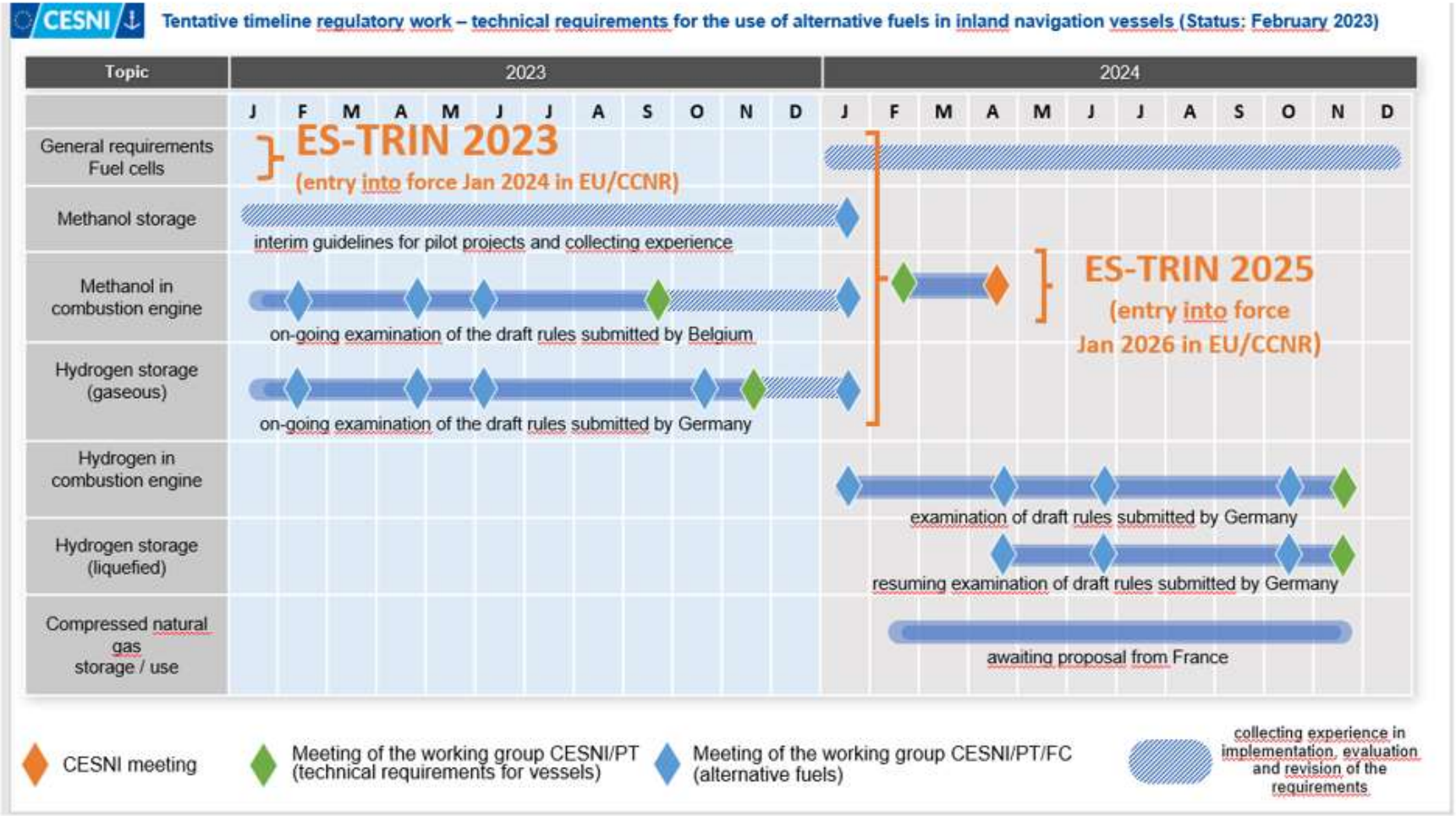
Final draft requirements for methanol storage (CESNI/PT/FC (22) 7 rev.3 Annex 2)



Regulations CESNI

Updated the timetable for the work in the field of technical requirements for the use of alternative fuels

Annex to CESNI/PT (23) 20 = CESNI/PT/FC (22) 27 rev. 2



Regulations CESNI

Why are there challanges?

- Methods of storage
- Methods of processing
- Hazardous events and consequences
- Prescriptive / goal-based requirements

Prescriptive regulations:	Goal-based regulations:
Specific rules defining technical solutions	Regulators define specific objective
Reactive, driven by accident history	Nature of the technical solution is left to the operator
Regulators actively involved in drafting	Risk assessment fits well into this structure
	Potential for cost-benefit decision making

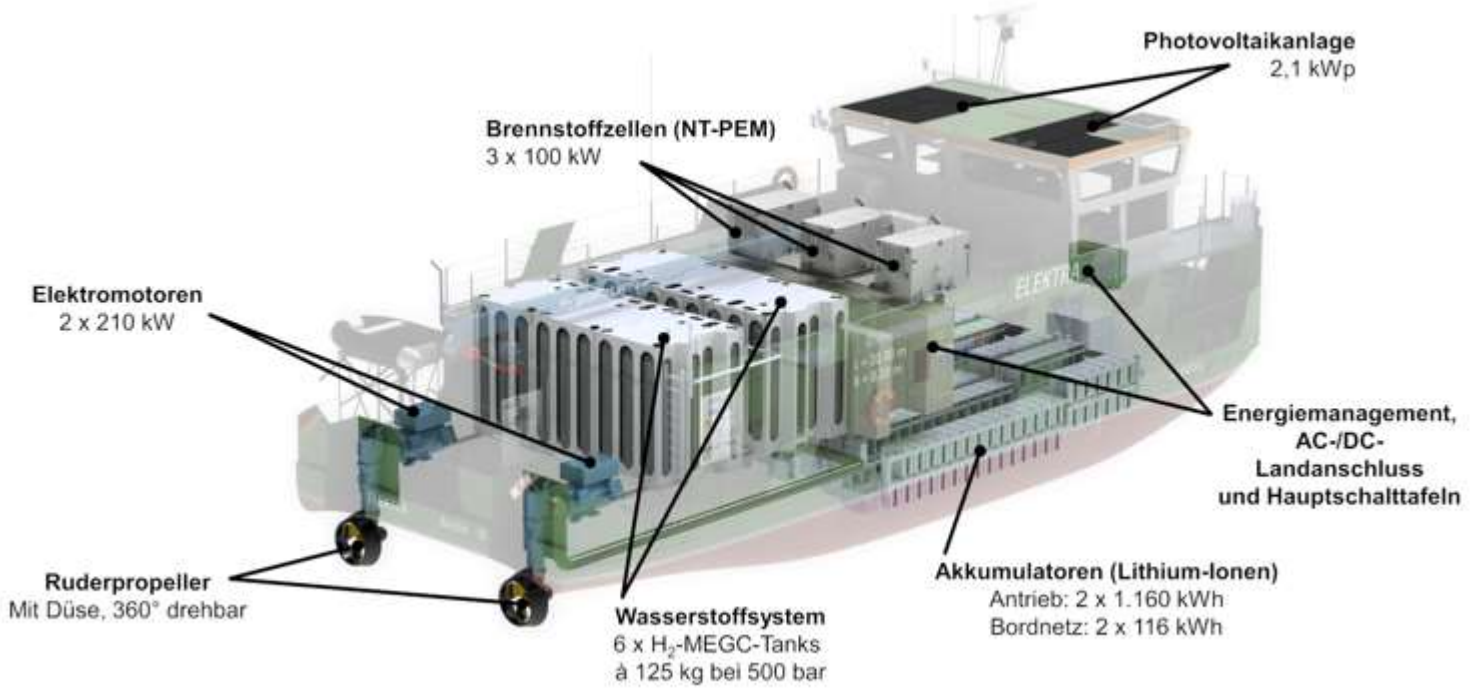
Table 2 Comparison of prescriptive and goal-based regulations

DMZ/LR, Development of a proposal for technical regulations on the use of hydrogen as fuel in inland navigation

Taken from: https://dmz-maritim.de/wasserstoffbetriebene-binnenschiffe/

Hydrogen projects

With ELEKTRA the German shipbuilding industry has demonstrated practical systems for essential ship types and transport tasks



Taken from: https://www.en-former.com/en/zero-emissions-elektra-powered-by-hydrogen-and-batteries/

Hydrogen projects

- First hydrogen-powered zero-emissions inland container ship, H2 Barge 1 (ex MSC Maas)
- First retrofit into H2 ship, LR certification and CCNR recommendation

Taken from https://futureproofshipping.com/news/2023/future-proof-shipping-launches-first-hydrogen-powered-inland-container-ship/

Regulations CESNI

Current work/discussions

- MeoH combustion engines and engine rooms (gas detection, toxicity 250ppm)
- Hydrogen storage gaseous
  - Swapable systems
  - Tanks
  - Bunkering
  - safety distance, lack of marine H2 standards
- Hydrogen storage liquefied
- Compressed natural gas
- For the time being, ammonia is not seen as a suitable solution for inland navigation (CESNI/PT/FC (23)6)

Fuel tank projects

H2 Antiebsstrang / Drivetrain project

- Development of a hydrogen supply concept for inland shipping
- HGK Shipping, HTS, Rhenus, Argo Anleg, ZBT and Lloyd Register
- joint project to develop a common, standardised and approvable H2 supply concept

Specifically, the project pursues the following goals:

- Elaborating a recommendation as a basis for an H2 supply concept on an inland vessel
- Obtaining a recommendation for an exchangeable tank container to be used as a hydrogen tank on an inland vessel, including stackability;
- Determining permissible positions of an exchangeable tank container on the inland vessel;
- Standardisation of the interfaces, including the filling and withdrawal connection
- The final report of the project completed in 2023 will be published soon.

Quelle: https://rh2ine.eu/projects/best-practice

Taken from: Presentation ZBT, concept and location of swapable H2 tank container

Fuel tank projects

Condor H2

- To enable emission-free inland and near-shore shipping on hydrogen, using an innovative system of special ‘tanktainers’.
- Condor H2 will provide hydrogen storage and fuel cells with a battery pack on a pay-per-use basis, enabling ships to become zero emission with limited upfront investment for ship owners.
- The hydrogen will be supplied in modular, standardized and swappable 'tank-tainers', allowing longer voyages.

Quelle: https://rh2ine.eu/projects/best-practice

Inland Waterways Ships with Lloyd's Register

LR market share

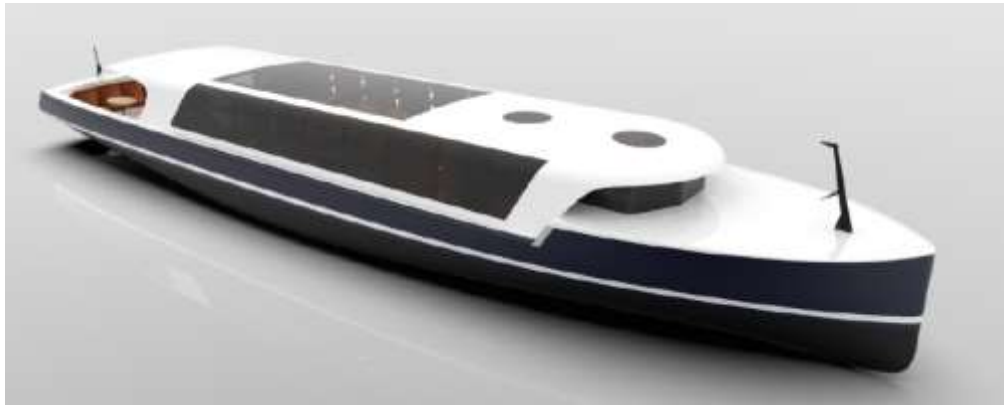
- 900 / 1.400 ADN tanker classed
- 250 / 450 cabin passenger ships certified
- 90% new con tankers
- 85% new con cabin passenger ships
- 50% new con dry cargo ships and barges
- 20 ToC-in per year (1 ToC-out)

Inland Waterways Ships with Lloyd's Register

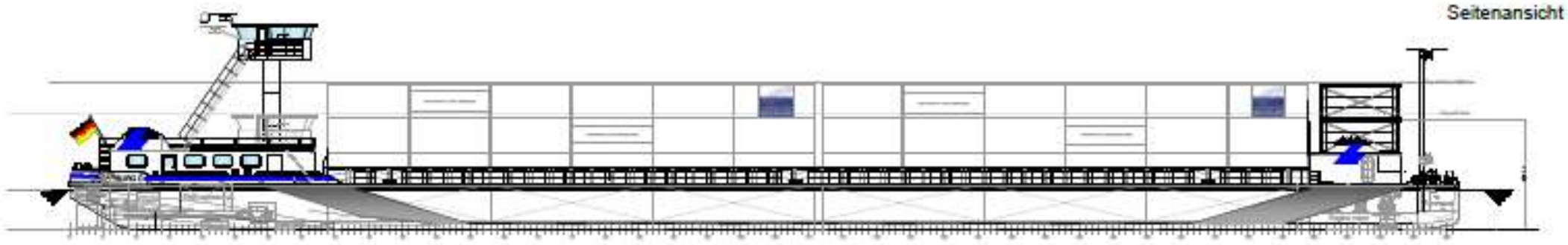
- I.W.W. offices in Rotterdam, Hamburg
- Rule development
- Contributing to statutory legislation
  - Member of CESNI, CCNR, ADN-SC
  - Member of technical working groups
  - Chairman of ad-hoc working groups (Pax, Elec)
- Chairman of ADN recommended Class Societies

Inland Waterways Ships with Lloyd's Register

- Contract for acting on behalf of Netherlands Shipping Inspectorate
- Mandate to issue certificates on behalf of NSI



- Recommendations for deviations from legislation
  - Risk analysis
  - Arrange it for clients



Inland Waterways Ships with Lloyd's Register

Example Tanker

BASF
We create chemistry

Presse-Information

P110/21
21. Januar 2021

BASF stellt innovatives Tankschiff für Rhein-Niedrigwasser vor

- **Tankschiff leistet einen wesentlichen Beitrag zur Versorgungssicherheit und Wettbewerbsfähigkeit des Standortes Ludwigshafen**
- **Bei Niedrigwasser deutliche Erhöhung der Transportmengen gegenüber konventionellen Tankschiffen**

Das neue Tankschiff wird zu den größten Tankschiffen auf dem Rhein gehören und seine Stärke insbesondere dann ausspielen, wenn am Rhein Niedrigwasser herrscht. Die kritische Stelle im Rhein bei Kaub wird es selbst bei einem Pegelstand von 30 Zentimetern (entspricht einer Wassertiefe von etwa 1,60 Meter) noch mit einer Ladung von 650 Tonnen passieren können, das ist deutlich mehr als bei jedem anderen heute verfügbaren Tankschiff. Bei mittlerem Niedrigwasser wird seine Transportkapazität mit rund 2500 Tonnen doppelt so hoch liegen wie die konventioneller Binnenschiffe. Jetzt wurden die Verträge für den Bau und die Nutzung des Schiffs unterschrieben.

„Nach unseren Erfahrungen mit dem Niedrigwasser des Rheins im Jahr 2018 und basierend auf unserer Einschätzung, dass derartige Ereignisse in Zukunft häufiger eintreten können, haben wir am Standort Ludwigshafen eine ganze Reihe von Maßnahmen ergriffen, um die Versorgungssicherheit der Produktion zu erhöhen. Ein wichtiges Element unserer Überlegungen war es, über ein Schiff zu verfügen, das selbst bei niedrigsten Rheinpegelständen noch wesentliche Mengen verlässlich transportieren kann", so Dr. Uwe Liebelt, Werksleiter des BASF-Standorts Ludwigshafen. „Wir haben dazu 2018 selbst die Initiative ergriffen, denn ein entsprechendes Schiff stand am Markt nicht zur Verfügung. Heute freue ich mich,

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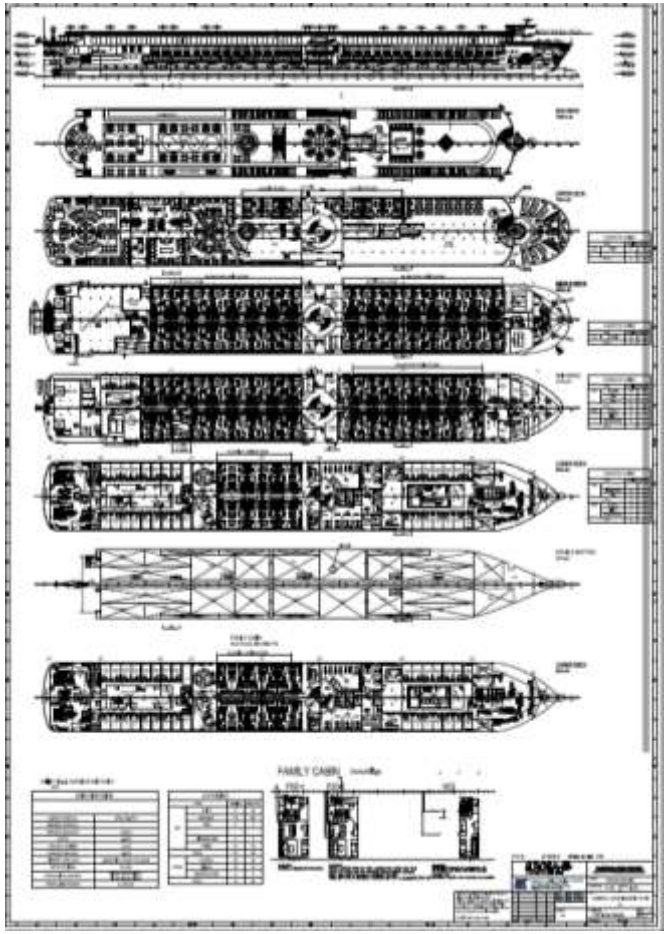
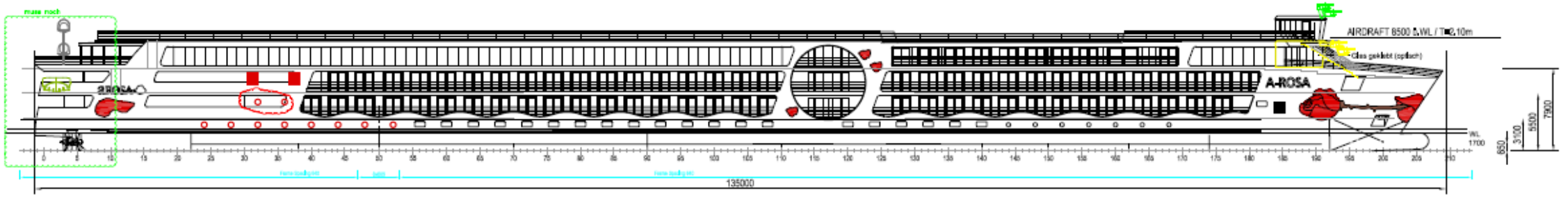
Inland Waterways Ships with Lloyd's Register

Example Cabin Passenger Ship





Thank you

Torsten Hacker

Lloyd’s Register EMEA

Hamburg Technical Support Office

www.lr.org