

Economic Commission for Europe

Inland Transport Committee

2 December 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)**

Twenty-sixth session

Geneva, 27-30 January 2015

Agenda item 6

Reports of informal working groups

**Minutes of the meeting on
stability software for tank vessels**

Transmitted by the Recommended ADN Classification Societies



Date:

22-10-2014

Meeting:

ADN Recommended Classification Societies,
European Barge Union, Software Manufacturers

Report made by:

Bas Joormann (chairman)
Torsten Dosdahl

Attendees:

See separate list (26 persons)

Subject:

Stability software IWW tankers

1. Opening

The meeting was opened with a word of welcome from the chairman, followed by a short introduction of all attendees.

Then the chairman gives an overview of the reason for this meeting and the goals which are to be achieved.

After the 'Waldhof' accident the ADN Safety Committee discussed the need for additional requirements on stability. These discussions have resulted in a change of the ADN in 2013 with a.o. a requirement for an approved computer loading instrument. This requirement will enter into force on January 2015 for type C tankers.

In mid-2014 only a very limited number of vessels out of the fleet of just over 700 ships seem to comply with this requirement. Up till that date on only 20 vessels an approved software programs has been installed.

Therefor the European Barge Union (EBU) has made a proposal for discussion in the ADN Safety Committee meeting of August 2014 (doc. ECE/Trans/WP.15/AC.2/2014/39). The result of the discussion in the ADN Safety Committee meeting was a question towards the Recommended Classification Societies to organise a meeting to discuss the issue with EBU and the software manufacturers.

The goal of this meeting is to find a solution for the issue of the majority of the fleet not complying with the ADN requirements on January 1st 2015.

The meeting should address two different issues. The first is to find some arguments to postpone the requirements, with a planning on which date the fleet will comply. These arguments will be included in a new document of the EBU for discussion in the ADN Safety Committee meeting of January 2015. The second is to discuss the issues the software manufacturers face with the development and approval of their programs.

It's not the goal of the meeting to discuss the content of the present ADN requirements.

2. Presentation on the subject

A presentation is held by Mr. Kind on behalf of the EBU. In this presentation an overview of the requirements is given. Summarized it can be concluded that it can be split in three requirements. These are intact stability, damage stability and longitudinal strength. Only an approved software program is allowed to use to calculate all these items.

3. Discussion

After the presentation the discussion on the subject is held.

It is stated by Mr. Van IJken that his company SARC has delivered over 200 programs already but that the ship owners didn't ask for approval from the classification societies. According both Mr. Kuhlmann and Mr. Lorenz this is mainly due to uncertainties on items like openings or partial different technical requirements of the classification societies, and the comparison between the old existing stability booklets and the new software.

Mr. Rommerts states that although only the 200 vessels have the software program, the other vessels have other means of calculating the stability.

Mr. Van IJken explains that their program has been approved by Bureau Veritas and Lloyd's Register, but that approval by DNV-GL lasts already for several years. According Mr. Dosdahl the program is also already approved for one vessel and this period is not only the result of the time needed by DNV-GL, but also from the whole approval process in which additional information needs to be submitted, as well as the adaptation of the software according the remarks of the DNV-GL at the approval process.

The chairman asks the attendees not to discuss specific cases here, but keep it general, as it's not useful to blame each other, but a common solution should be found.

Mr. Mertens states that for ship owners it hadn't been clear that the loading software which is already on board didn't comply with the requirements, and they weren't aware of the issues with the approval of the software by the classification societies.

Mr. Kind says that until now damage stability and longitudinal strength weren't any issue at all.

Mr. De Maat warns the attendees not to count that much on postponement of the requirements unless at least a well-argued document with a planning for compliance with the ADN requirements has to be sent to the ADN Safety Committee meeting. The chairman of this Committee has made it clear that only with strong arguments the issue will make a chance. Mr. De Maat is also wondering why the whole issue wasn't raised in an earlier stage.

In reply to this, both Mr. Holmberg and Mr. Van der Graaf tell that on older existing vessels the right information isn't always available and that this also doesn't contribute to a fast solution.

Mr. Rommerts explains that the development of the software is a time consuming process anyway.

Mr. Joormann asks the software manufacturers if it's possible to send him an overview of the actual status of their software development, including the number of programs already sold. They agree to do so. This info can be useful for the document towards the ADN Safety Committee.

4. Presentation on approval issues

Mr. Van IJken gives a brief overview of the issue his company faces with the approval of the software by the different classification societies. These issues are also mentioned in the document provided by him before the meeting. It can be summarized that the issues are mainly on the interpretations of openings, read-out points for bending moments, missing info about the structure and weight distribution on older vessels, requirements on the hardware, survey of the loading computer on board, and tolerances for maximum draught calculated by the software. He asks for harmonized interpretations by the different flag state authorities and classification societies.

Mr. Joormann asks the other software manufacturers if they can also send their questions regarding the approval to the classification societies. Then the classification societies will discuss these issues and give a common view. All agree to do so.

Mr. Cocito states that the stability software should always be in line with the approved stability booklets, so if these aren't according the actual situation on board they need to be updated.

Mr. De Maat asks if it will be possible for the software manufacturers to deliver a presentation at the ADN Safety Committee on the issue of the different interpretations by different flag states.

5. Conclusions

Mr. Joormann concludes that the arguments discussed during the meeting can be summarized as follows:

- A more common approval procedure is needed.
- More time is needed for the final development and approval of the several software programs.
- The majority of the fleet (approximately 700 barges) will not comply on January 1st 2015.
- Almost all vessels however have already an (not approved) stability program, stability calculation tool, or stability booklet on board, so there is already something done.
- It would be desirable to postpone the date on which vessels need to comply and also bring this date in line with the renewal of the Certificate of Approval.

Mr. Joormann proposes to install a small ad-hoc working group of EBU in which the proposed document will be drafted. Mr. Kind agrees to take this up on behalf of EBU.

Then the chairman closes the meeting with thanking everyone for his contribution to this fruitful meeting.

Actions

- Software manufacturers: send info on the status of the development and numbers of installed programs to the chairman
- Software manufacturers: send their questions regarding interpretations and approval to the classification societies (via chairman)
- Classification societies: develop harmonised interpretations
- EBU: Make a new proposal for postponement of the requirements

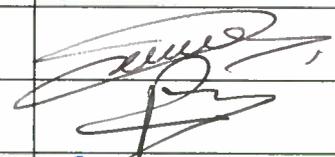
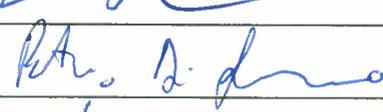
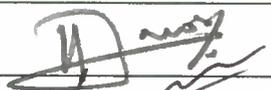
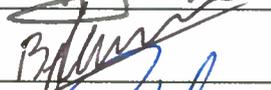
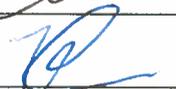
Attachments

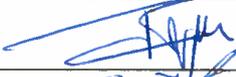
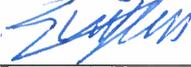
- List of attendees
- Document SARC
- Presentation Mr. Kind

Meeting of ADN recognised classification societies, EBU, and stability software manufacturers

October 22nd 2014, Rotterdam

List of attendees

| Name | Organisation | Signature |
|---------------------------|--|---|
| Gerrit Bedet | EBU |  |
| Thorsten Bönke | DNV-GE | |
| Robert Broere | Bureau Veritas |  |
| Raffaele Cocito | Bureau Veritas |  |
| Torsten Dossdahl | DNV-GL |  |
| Patrizio di Francesco | RINA |  |
| Matthijs van der Graaf | Rommerts Ship Design |  |
| Ihno Herbst | DNV-GL |  |
| Olle Holmberg | Kockun Sonics / Marine Alignment |  |
| Guy Jacobs | Bureau Veritas |  |
| Bas Joormann (chairman) | Lloyd's Register |  |
| Peter van Kessel | Lloyd's Register |  |
| Marcel Kind | EBU |  |
| Mikhail Kozin | Russian River Register |  |
| Sergey Legusha | Russian Maritime Register |  |
| Jean-Paul de Maat | Dutch Ministry of Infrastructure and the Environment |  |
| Dave Mertens | EBU |  |
| Etienne de Montgolfier | Segula |  |
| Markus Mohmann | Mitsubishi | |
| René Rapati | Groenendijk & Soetermeer |  |

| | | |
|--------------------------|--------------------------------|---|
| Ubbo Rommerts | Rommerts Ship Design |  |
| Mykola Slyozko | Ukrainian Register of Shipping |  |
| Bart Spede | SARC | |
| Edwin Spitzer | EBB | |
| Paul Wylock | RINA |  |
| Egbert van IJken | SARC |  |
| François CHANONY | SEGULA |  |
| Sja Wyalst | Rommerts Ship Design |  |
| NORBERT KUHLMANN | REEDEREI XEGERS |  |
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To whom it may concern

Our ref : Uniform approach for stability appraisal for inland waterway tankers

Bussum, October 17, 2014

Ladies and gentlemen,

SARC has produced and delivered stability booklets and/or Locopias loading software for more an estimated 600 inland waterway tankers. Some of these documents and/or this software has been issued at a shipping inspection or a classification society for appraisal. From this process we have learned that at a few issues these parties adhere different points of view. These items are addressed briefly in this letter.

The nature of an opening

The relevance of this matter lies in the fact that for the determination of the area under the GZ-curve, the curve is limited by the angle at which **open** openings are immersed, and not by the angle at which **weathertight** openings are immersed (if this angle is larger than the equilibrium angle)¹. The different bodies apply a different classification of the openings, which is summarized in the table below.

Another matter is the question which rule or interpretation is leading; either that of the flag state, or the classification society, or the most stringent one?

| opening | I LENT (Dutch flag) | Bureau Veritas (Belgian flag) | GL (German flag) |
|--|------------------------|----------------------------------|---------------------|
| Ventilation included fire valve ² | open | open | open |
| Gooseneck limited diameter ³ | weathertight | weathertight | open |
| Gooseneck unlimited diameter | weathertight | open | open |
| Closable gooseneck ⁴ | weathertight | weathertight | weathertight |
| Aluminum door to accommodation | weathertight | open | open |
| Aluminum door to accommodation demonstrated by a spray test | weathertight | weathertight | open |
| Aluminum full glass door with certificate for water tightness | watertight | ? | ? |
| Doors and hatches with rubber and clamps | watertight | watertight | watertight |
| Fixed windows complies with article 4 ⁵ | watertight | ? | ? |
| Fixed windows not comply with article 4 | weathertight | ? | ? |
| Windows with the possibility to open | ? | ? | ? |
| Chain pipe to chain locker | open | open | open |
| Wynel / Winteb automatic closing device (with a floating ball) | watertight | weathertight | weathertight |

¹ see appendix 3

² see appendix 2

³ for example less then 100 mm, please refer to appendix 4

⁴ it is important, that the closing device is attached to the opening; e.g. with a chain or similar, in order to have it at hand, if necessary

⁵ appendix 'stcrt-2013-29915.pdf' paragraph 4

Furthermore, the tightness of goose neck de-aeration pipe is not treated uniformly. For which the reason might be the lack of experimental or other data of empirical source. Therefore it might be considered to perform realistic tests to measure the actual amount of ingressed water, under realistic circumstances. It would at this stage be a bit overdone to discuss test details, although SARC is always prepared to contribute in this field.

Read out points for longitudinal strength

Please refer to letter: 'Uniform approach to establishing read out points for inland waterway vessels', as provided in appendix 1.

How to proceed with elder vessels without stability booklets

One way would be to produce a regular stability booklet, however, it is questionable whether this is feasible and necessary for vessels of sometimes a significant age, where not always sufficient data or drawings are available. Loading computer software should always be accompanied by a manual, which contains appendices with ship-specific particulars and test conditions of intact and damage stability. Such appendices could be regarded as a concise stability booklet. With such an approach two requirements would be combined, which would be rather efficient, and might also be beneficial for the whole appraisal process. If data or results which are considered to be vital for a regular stability booklet would be missing from these appendices they could be included as well, leading to an *extended appendices* chapter in the loading software manual.

Marinized type-approved hardware

Some bodies require marinized hardware, others don't. Marinized hardware is tested and approved for application in sea-going ships. However, it is questionable whether computers on inland vessels should be subject to the same requirements as those on sea-going ship. After all, there are a few differences, such as a less aggressive environment and the option to have a defunct computer quickly replaced because the shore is never far away.

On-board verification of test conditions

Some bodies require stability test conditions to be verified on-board by a surveyor. The added value of this requirement is questionable. It could be considered, for the sake of efficiency, combine this test with a regular five year class survey.

Maximum draft

On one hand it is expected that a loading computer, such as Locopias, approximates reality as closely as possible, while on the other hand differences between calculated drafts and observed drafts (as read from the draft marks) are not allowed. Occasionally, these two requirements are slightly in conflict, because there are a few practical reasons for differences between calculated and observed drafts.

One such a cause might be the deflection of the vessel, due to bending and torsion. In general, this is not taken into account in the calculation of the drafts at the draft marks in the loading computer⁶. Additionally, small reading inaccuracies will contribute.

To avoid being overly strict, Locopias represents the calculated drafts at draft mark positions in various colours:

- Green, if the calculated draft is less than the maximum allowable.
- Yellow, if the calculated draft exceeds the maximum allowable by less than 0.05 m.
- Red, if the calculated draft exceeds the maximum by more than 0.05 m. This indicates non-compliance.

Note that the mean draft at $\frac{1}{2}$ Lpp at CL is never allowed to exceed the maximum draft, this case is always signalled as non-compliant by Locopias.

This approach might provide a practical solution for a practical source of confusion.

When the draft marks are yellow the print-out shows a warning: *After loading none of the six draft marks may be immersed, which should be verified in reality.*

Agreement on these topics between classification societies and/or flag states would be efficient for all parties involved, and would lead to more general understanding for the rules and the appraisal process. And if agreement is not feasible, a short table, containing an overview of the points-of-view on the individual topics would be a proper, albeit second-best, solution.

With kind regards

Egbert van IJken
SARC BV

⁶ Actually, Locopias is potentially capable to include the effects of hull deflections.

APPENDIX 1



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To whom it may concern

Our ref : Uniform approach to establishing read out points for inland waterway vessels Bussum, June 30, 2014

Dear sirs,

Our loading computer software LOCOPIAS includes longitudinal strength evaluations, where actual bending moments and shear forces are evaluated against allowable values. At this moment there is no unified approach to establishing allowable values between different classification societies.

For LR and BV, evaluation of longitudinal strength is typically based on the mainframe drawings from which allowable bending moments are derived. The allowable bending moment as per main frame are used for the entire vessel and no allowable values are defined for shear forces. LR may require maximum values for shear forces to be included, which are easily found using a fairly simple formulae.

GL is far more strict than other classification societies with respect to longitudinal strength: they require allowable values (both bending moments and shear forces) to be calculated for: main section, aft end of cargo hold area and fore end of cargo hold area. In addition, the allowable values are taken (nearly) 0 at the ship's extremes.

Furthermore, even the limit values derived from identical midship sections differ between classification societies.

This puts us in an awkward position: for identical or similar vessels, the allowable values may be vastly different. Even when not considering the effect on associated cost of providing information, as required for different classification societies, it is becoming increasingly difficult for us to explain different classification societies' positions to our clients. After all, the actual strength limits are governed by scantlings and loads, not by registration. Some examples of the different approaches are attached as appendices.

Please note that, particularly for older vessels, information is scarce. In many cases we are lucky to even find a main frame drawing. In addition to that, it seems overkill to implement very strict limits on vessels that have been sailing for decades. In our view, very strict limits would solve a non-existing problem.

We kindly ask you to discuss the above issues and come to a more uniform approach to establishing limit values for longitudinal strength on inland waterway vessels.

Kind regards

Bart Soede and Egbert van IJken.

APPENDIX 2

RVS AFSLUITBARE ROOSTERS/ BRANDKLEPPEN TYPE NAR®



novetec

RVS roosters model NAR® zijn goedgekeurd door de Scheepvaart Inspectie voor het gebruik ervan als brandklep in de lucht toe- en afvoerkanalen aan boord van schepen, leverbaar in RVS304, 316 en in RVS304 hoogglans.

De roosters zijn uitgevoerd met schanierbare jalouzie-schoepen, welke voorzien van een regenkering.

Kleppen en omkasting zijn uitgevoerd met onderhoudsvrije bronzen lagers. Uitgevoerd met montageflens aan de voorzijde van het rooster welke standaard voorzien is van montagegaten.

Afmetingen:

Hoogte maten conform bijgaande maattabel, minimale breedte = 200mm, maximale breedte = 1.350mm, voor bredere afmetingen wordt een tussenstijl toegepast. Afwijkende maten in overleg.

Bediening:

D.m.v. een gepatenteerd bewegingsmechaniek blijven de jaloezieën in de gewenste open- of dichtstand staan, optioneel leverbaar met servomotorbediening, hendel aan buiten-/binnenzijde en morskabel.

Opmerking:

In gesloten toestand is het rooster voor circa 99% dicht.

Vrije doorlaat:

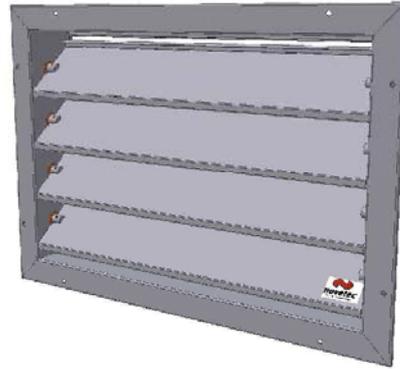
Deze is afhankelijk van de hoogtemaat, zie tabel 1.

Drukval:

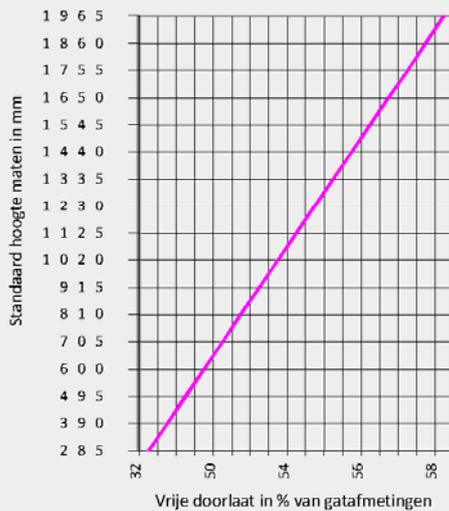
Deze is afhankelijk van de vrije doorlaat, zie tabel 2.

Opties:

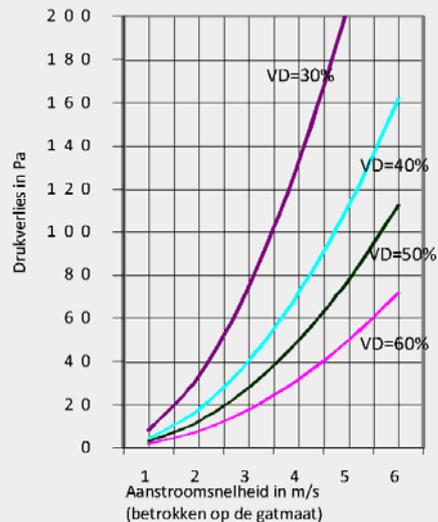
Leverbaar met stalen opbouw kader, filterdoek en geluidgedempt plenum.



Tabel 1: vrije doorlaat NAR roosters - standaard



Tabel 2: drukverschil over NAR rooster



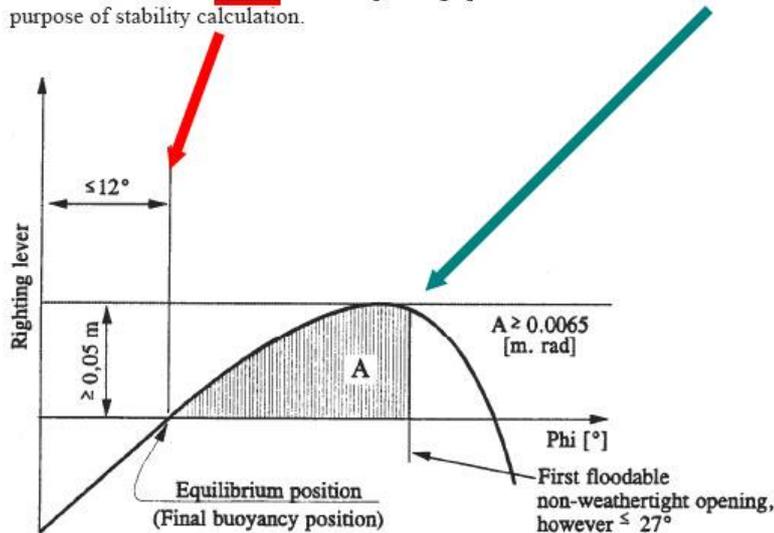
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APPENDIX 3

- 9.3.1.15.2 At the stage of equilibrium (final stage of flooding), the angle of heel shall not exceed 12° . Non-watertight openings shall not be flooded before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

The positive range of the righting lever curve beyond the stage of equilibrium shall have a righting level of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weather-tight opening and in any event up to an angle of heel $\leq 27^\circ$. If non-watertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.



APPENDIX 4

Hoofdstuk 1 Algemene voorschriften

1.2.1 Definities watertight and weathertight ECE/TRANS/WP.15/AC.2/2010/23 (IACS)

De zogenoemde "Recommendations on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels" kent een aantal definities die raakvlakken hebben met het ADN en de EU Technische richtlijn. Deze laatste is wat 'losser'. In richtlijn 2006/87/EC wordt de term "weathertight" gelijkwaardig ingezet als "spray-proof".

Watertight means a structural component or device so fitted as to prevent any ingress of water;

Weathertight means a structural component or device so fitted that in normal conditions it allows only a negligible quantity of water to penetrate;

Wooden barrel means a packaging made of natural wood, of round cross-section, having convex walls, consisting of staves and heads and fitted with hoops;

Wooden IBC means a rigid or collapsible wooden body, together with an inner liner (but no inner packaging) and appropriate service and structural equipment;

Working pressure means the settled pressure of a compressed gas at a reference temperature of 15° C in a full pressure receptacle.

NOTE: For tanks, see Maximum working pressure.

APPENDIX 5

Sealing Standard I (hydrostatic tank test):

The door/hatch to be tested as installed into watertight tank with a static head of water to a predetermined head pressure applied to the unseating side of the closure. The head height shall continue for at least 30 minutes. After this duration, there shall be no evidence of any water leakage.

Note: The predetermined head pressure (column of water) to be defined by the customer and referenced on the quotation, approval drawing and inspection documents.

Sealing Standard II (hydrostatic tank test):

The door/hatch to be tested as installed into watertight tank with a static head of water to a predetermined head pressure applied to the unseating side of the closure. The head height shall continue for at least 30 minutes. After this duration, the ingress of water shall not exceed 0.5 liters.

Note: The predetermined head pressure (column of water) to be defined by the customer and referenced on the quotation, approval drawing and inspection documents.

Sealing Standard III (fire hose test):

The door/hatch to be tested with a water jet positioned outside the vessel. The water jet shall be a dense water spray aiming everywhere in an area located within 50mm each side of the periphery of the appliance. This test to be performed with a 38mm diameter hose, the static pressure of which, when the tap is closed, is 200kPa. The spray nozzle shall be 1.5 meters from the tested object and up to 45° from the plane of the tested surface.

Spraying shall continue for at least 3 minutes. After this duration, there shall be no evidence of any water leakage.

Sealing Standard IV (hose test):

The door/hatch to be tested with a water jet positioned outside the vessel. The water jet shall be a dense thin water jet aiming directly at the seal of the appliance. This test to be performed with a 12mm diameter hose, the static pressure of which, when the tap is closed, is 200kPa. The spray nozzle shall be 1.5 meters from the tested object and up to 45° from the plane of the tested surface.

Spraying shall continue for at least 3 minutes. After this duration, there shall be no evidence of any water leakage.

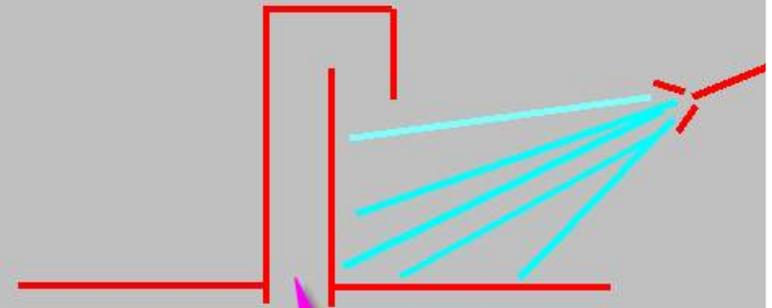
Sealing Standard V (spray test):

The door/hatch to be tested with a water jet positioned outside the vessel. The water jet shall be a light spray with a fan pattern simulating heavy rain. No water flow is specified however not to exceed 10 l/min. Aiming everywhere in an area located within 100mm each side of the periphery of the appliance. This test can be performed with a 12mm diameter hose with an adjustable fan spray nozzle to a tap, the static pressure of which, when the tap is closed, is 200kPa. The spray nozzle shall be 2 meters from the tested object and up to 15° from the plane of the tested surface. Spraying shall continue for at least 3 minutes. After this duration, the ingress of water shall not exceed 0.5 liters.

Sealing Standard VI (chalk test):

The door/hatch to be tested by applying marking chalk to the sealing surface and closing the appliance one closing cycle. After opening, the sealing gasket is to be inspected to insure marking chalk transfer is continuous along the seal verifying full contact without any disruptions.

gooseneck



ingress of water
less then 0.5 liter

Appendix 6

Dear Mr van IJken

Thank you for your explanation about tightness status of openings. There is one important question regarding gooseneck with less than 100mm in diameter.

If a gooseneck is mechanically closed before departure and the closing procedure is explained on the damage control plan (ADN chapter 1.2) from stability point of view it can be considered as weather tight as agreed with Mr. Altmayer. Other aspects for example from machinery-department or steel-department point of view are not a subject matter of this discussion.

In your paper 'Approval of Locopias for inland water way Tankers...' goosenecks with less than 100mm in diameter are considered to have a status of weather tight.

We don't agree to consider a (not closed) gooseneck with less than 100 mm to be weather tight .
Instead it should be considered unprotected.

Please find an extract of our rules Chapter 4 Section 4 F 2.2.7:

2.2.7 Weathertight

Weathertight is the term used to describe a closure or structure which prevents water from penetrating into the vessel under any service conditions. Weathertight designates structural elements or devices which are so designed that the penetration of water into the inside of the vessel is prevented:

- for one minute when they are subjected to a pressure corresponding to a 1 m head of water, or
- for ten minutes when they are exposed to the action of a jet of water with a minimum pressure of 1 bar in all directions over their entire area

Following constructions are regarded as weathertight:

- weathertight doors complying with ISO 6042
- ventilation flaps complying with ISO 5778
- airpipe heads of automatic type and of approved design

Weathertightness shall be proven by hose tests or equivalent tests accepted by GL before installing.



Loading computer....

 **TRANSAFE**
GET A GRIP ON SAFETY

Stability for Tank Barges

- Incident with the barge Waldhof in 2011;
- New legislation included as from 2013:
 - a) Definition Loading Instrument (ADN 1.2);
 - b) Temporary provision up to 31 december 2014 (ADN 1.6.7.2.2.4) – Type C;
 - c) ADN Basic and ADN Refresher Training course (ADN 8.2.2.3) ;
 - d) Stability requirements (ADN 9.3.X.13.3)

Stability for Tank Barges

Definition ADN 1.2

Loading instrument: A loading instrument consists of a computer (**hardware**) and a programme (**software**) and offers the possibility of ensuring that in every ballast or loading case:

Stability for Tank Barges

- Definition ADN 1.2
 - the permissible values concerning **longitudinal strength** as well as the maximum permissible draught are not exceeded; and
 - the stability of the vessel complies with the requirements applicable to the vessel. For this purpose **intact stability** and **damage stability** shall be calculated.

Stability for Tank Barges

- Loading instrument has to be approved by the recognised classification society which classes the vessel
- Classification societies should align requirements for the Loading Instrument;
- Different software programs available on the market which are not approved (e.g. as part of tank measurement software)

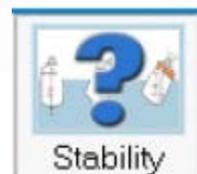
Approval of loading instrument

Stability for Tank Barges

■ 9.3.x.13.3 Stability

Proof of sufficient **intact stability** shall be furnished **for all stages** of loading and unloading and for the final loading condition for all the relative densities of substances transported....

- Real- life connection tank measurement tool?
- Many software tools comply with this!



Stability for Tank Barges

■ 9.3.x.13.3 Stabiliteit (2^e alinea)

For every loading operation, taking account of the actual fillings and floating position of cargo tanks, ballast tanks..... the vessel shall comply with the **intact and damage stability** requirements.

- Barge complies with damage stability – otherwise not build – reference damage-stability booklet;

Stability for Tank Barges

■ 9.3.x.13.3 Stability (3rd paragraph)

Intermediate stages during operations shall also be taken into consideration.

■ 9.3.x.13.3 Stability (4th paragraph)

The proof of sufficient stability shall be shown for every operating, loading and ballast condition **in the stability booklet**, to be approved by the relevant classification society, which classes the vessel.

Stability for Tank Barges

- 9.3.x.13.3 Stability (4th paragraph-continuation)
If it is unpractical to pre-calculate the operating, loading and ballast conditions, a loading instrument approved by Class shall be installed and used which **contains the contents of the stability booklet.**
- Loading instrument is not an obligation!
May other tools be used?!



Stability for Tank Barges

NOTE: A stability booklet shall be worded in a form comprehensible for the responsible master and containing the following details:

General description of the vessel:

- *General arrangement and capacity plans indicating the assigned use of compartments and spaces (cargo tanks, stores, accommodation, etc.);*
- *A sketch indicating the position of the draught marks referring to the vessel's perpendiculars;*
- *A scheme for ballast/bilge pumping and overflow prevention systems;*
- *Hydrostatic curves or tables corresponding to the design trim, and, if significant trim angles are foreseen during the normal operation of the vessel, curves or tables corresponding to such range of trim are to be introduced;*
- *Cross curves or tables of stability calculated on a free trimming basis, for the ranges of displacement and trim anticipated in normal operating conditions, with an indication of the volumes which have been considered buoyant;*
- *Tank sounding tables or curves showing capacities, centres of gravity, and free surface data for all cargo tanks, ballast tanks and compartments, drinking water and sewage water tanks and tanks containing products for the operation of the vessel;*

Stability for Tank Barges

- *Lightship data (weight and centre of gravity) resulting from an inclining test or deadweight measurement in combination with a detailed mass balance or other acceptable measures. Where the above-mentioned information is derived from a sister vessel, the reference to this sister vessel shall be clearly indicated, and a copy of the approved inclining test report relevant to this sister vessel shall be included;*
- *A copy of the approved test report shall be included in the stability booklet;*
- *Operating loading conditions with all relevant details, such as:*
 - *Lightship data, tank fillings, stores, crew and other relevant items on board (mass and centre of gravity for each item, free surface moments for liquid loads);*
 - *Draughts amidships and at perpendiculars;*
 - *Metacentric height corrected for free surfaces effect;*
 - *Righting lever values and curve;*
 - *Longitudinal bending moments and shear forces at read-out points;*
 - *Information about openings (location, type of tightness, means of closure);*
and
 - *Information for the master;*
- *Calculation of the influence of ballast water on stability with information on whether fixed level gauges for ballast tanks and compartments have to be installed or whether the ballast tanks or compartments shall only be completely full or completely empty when underway.*

Stability for Tank Barges

Requirements:

■ 3 requirements:

- a) Intact Stability
(Operational stability.)
- b) Damage Stability
(Design Condition)
- c) Longitudinal strength
(Operational / Design)

1.5 The scantlings and arrangements are approved on the understanding that the maximum still water bending moments will not exceed the following values:

Hogging: 11150 tonne f-m

Sagging : 11150 tonne f-m

Stability for Tank Barges

How to comply with this regulation:

- Manual calculations by crew;
- Use of a Tool including Loading Manual;
Loading Manual is a understandable guideline
with approved scenario's ;
- Loading Instrument
More precise calculations.

The End
“Thanks for your attention!!”

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