



INF. 21

16 November 2017

Original: English

RID: 8th Session of the RID Committee of Experts' standing working group
(Utrecht, 20 to 24 November 2017)

Subject: Comments on informal document INF.18 (Switzerland)

Information from Belgium

SUMMARY

Executive summary: Additional explanation on "extra-large tank-containers".

Decision to be taken: /

Related document: Informal document INF.18

1. In informal document INF.18, Switzerland asks questions about a new type of tank-container developed by BASF and the Belgian tank-container manufacturer Van Hool.
2. The answers from the manufacturer are reproduced below (the numbering corresponds to the paragraphs of informal document INF.18):
 1. *The 45' and 52' tank-containers are based on the technology of 20', 30', 40' and 45' containers which are already used in combined transport.*
 6. *These B-TCs are 100% compliant with RID, CSC and UIC regulations and are approved by the competent authorities.*
 7. *Some point of the requirements for tank-containers differ from the provisions for tank-wagons and from the provisions for tank-vehicles (ADR).*

For information:

- *the equivalent thickness in reference steel is 6 mm for the VAN HOOL built B-TCs; the thickness was not reduced according to RID 6.8.2.1.19;*
- *UIC 592 specifies 2g dynamic testing for tank ITUs and 3g for tank swap bodies intended to carry dangerous goods;*
- *CSC does not require dynamic longitudinal impact tests;*
- *the VAN HOOL built B-TCs have tank codes L4BH or L4DH. These groups of permitted substances do not require special provision TE 22.*

8. B-TCs are **often** more than twice the size of **most** commonly available tank-containers:

- *VAN HOOL has produced several series 40' and 45' tank-containers, mainly for liquefied gases and (non dangerous) powders;*
- *wagons frequently carry 2 x 7.82m – 35000 litres – swap tanks each, which means 70000 litres capacity per wagon.*

10. VAN HOOL performed 3 series of practical tests for 3 different models of B-TCs according to CSC, UIC 592 and ISO 1496-3.

These practical tests include 3g dynamic longitudinal impact tests according to UIC 592.

In addition, SRS curves were created for the last impact at maximum speed. The minimum SRS curve according to ISO 1496-3/Amdt.1 and UN (Manual of Tests and Criteria, 5th rev., Part IV Section 41) was exceeded in all points of the frequency range as well.

3. The annex to this document contains the test reports of these 3 series of practical tests. (BVCT 15.07.0054/A, BVCT 17.07.0064/A and BVCT 17.07.0108/A).
4. Van Hool is able to provide more technical documentation if necessary.



TECHNICAL DEPARTMENT OF TRANSPORTATION

Examination report of the CSC/ISO 1496-3 prototype tests

Characteristics of the prototype
Hoyer 119446
ADR/RID Tank container

Tested at: Lier- Belgium – Van Hool NV
Görlitz – Germany – TÜV SÜD Rail GmbH

22/03/2017 to 31/03/2017

Manufacturer : Van Hool NV
Container Type : TMI45-62/0
Kind of freight : Liquids
List of drawings : General drawing : 119446-006
ISO - type designation : LMK2
Maximum gross weight : 75000 kg
Tare : 6200 kg
Maximum payload : 68800 kg
Capacity : Ca. 62500 L

In attendance of	- Daniel Zingelmann	TÜV SÜD Rail GmbH
	- Luc Borstlap	Van Hool
	- Bart Zuidhoek	Bureau Veritas
	- Koen De Gruyter	Bureau Veritas

Issued at Antwerp on the 25th of April 2017
The surveyor,



B. ZUIDHOEK



- I. Condition of tank container on arrival at test centre (Checking of dimensions: p. 3)
- II. Aim of the test: To ascertain the performance of the tank container according to the following conditions:
- Loads in kilograms
 - Forces in daN (1kg = 0,98daN)
 - Dimensions in mm
 - Pressure in Bars

TESTS

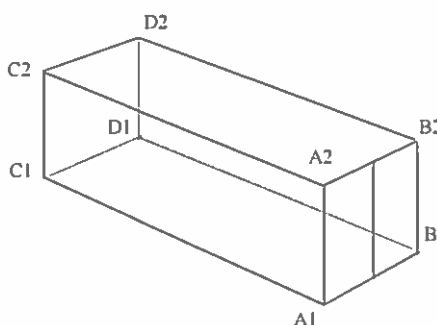
List of tests carried out	Order of tests	Comments	Page
- Dimensions check: Before test	1	Passed	3
After test	8	Passed	3
- Internal longitudinal restraint (dynamic)	2	Passed	4-5
- Stacking	3	Passed	6-7
- Transverse racking test	4	Passed	8
- Lifting from the four top corner fittings	5	Passed	9-10
- Longitudinal racking test	6	Passed	11

ANNEX

Annex 1	General drawing	119446-006
Annex 2	Test program	119446-proefprogramma
Annex 3	Weight note	119446+21-Wiegeschein

CHECK OF DIMENSIONS

Category		
Design dimensions		±
Length	13716	+0 -6
Width	2550	+0 -5
Height	2700	+0 -5



Temperature: Before: 20 °C After: 20 °C

Position	Ref	Diagonals		
		Before	After	±Δ
End wall	A2 → B1			
	A1 → B2			
Front wall	C2 → D1			
	C1 → D2			
Side walls	A2 → C1			
	A1 → C2			
	B2 → D1			
	B1 → D2			
Floor	A1 → D1			
	B1 → C1			
Roof	A2 → D2			
	B2 → C2			

Position	Ref	Length		
		Before	After	±Δ
End wall	A1 → A2	2735	2734	1
	B1 → B2	2738	2737	1
	A1 → B1			
	A2 → B2			
Front wall	C1 → C2			
	D1 → D2			
	C1 → D1			
	C2 → D2			
Side walls	A1 → C1	12184	12185	1
	A2 → C2			
	B1 → D1	12191	12192	1
	B2 → D2			

- Dimensions to be taken at start and finish of the test program.
- Diagonal dimensions are not possible to measure.
- In particular cases, some dimensions may not be checked
- Add a complementary sheet to specify checks of temperature which might be applied.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory





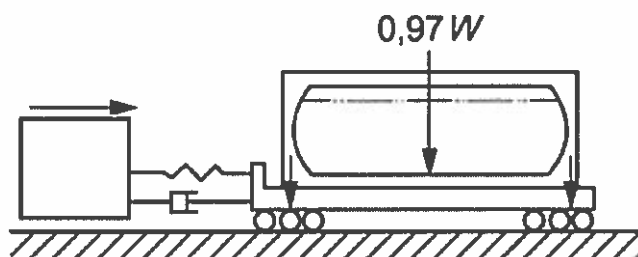
DYNAMIC RESTRAINT TEST (IMPACT TEST)

The container under test shall be filled with a quantity of water or any other non-pressurized product to approximately 97% volumetric capacity, ensuring that it is not pressurized during the test. However, if for reasons of overload it is not possible to fill to 97% of the capacity, then the test mass of the container (tare and product) shall be as close as possible to R. Measure and record the as-tested payload.

The container under test shall be placed on the test platform as close as possible to the impacting end, with the container end considered to be more vulnerable to impact damage facing the point of impact. All four bottom corners of the container shall be locked in position by means of corner fittings restraining movement in all directions.

Create an impact such that for a single impact the as tested SRS at both corner fittings equals or exceeds the minimum SRS curve* at all frequencies within the range 3Hz to 100 Hz.

* SRS curve according to ISO 1496-3 Amendment 1-2006 Figure D.1





DYNAMIC RESTRAINT TEST (IMPACT TEST)

R =	75000 kg
Theoretical load R-T =	68840 kg
Actual load =	38910 kg (32750 L Water)

Nr.	Speed of wagon	Change of diagonal length A-side	Change of diagonal length B-side	Curve above required SRS*	G forces Left / Right
1	4,3 km/h	0	0	No	-
2	12,4 km/h	0	0	No	5 / 5
3	12,7 km/h	0	0	Yes	5,69 / 5,73
4	12,9 km/h	0	0	Yes	5,93 / 5,92
		Total change of length	Total change of length		
		0	0		

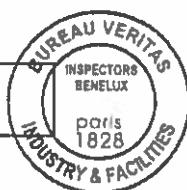
* SRS curve according to ISO 1496-3 Amendment 1-2006

Comments: - The SRS curves for the highest impact speed were created in respect of an increased maximum gross weight of 75 000 kg and exceeded the minimum SRS curve in all points of the frequency range evaluated as well.
 - Impact test approved for 75000 kg with use of safety factor 1,93 (5,79 G).
 - For complete TÜV SUD rail report see; Project 717513886
 Document 717513886_Test report_A
 Dated 24/04/2017

No leakage or permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

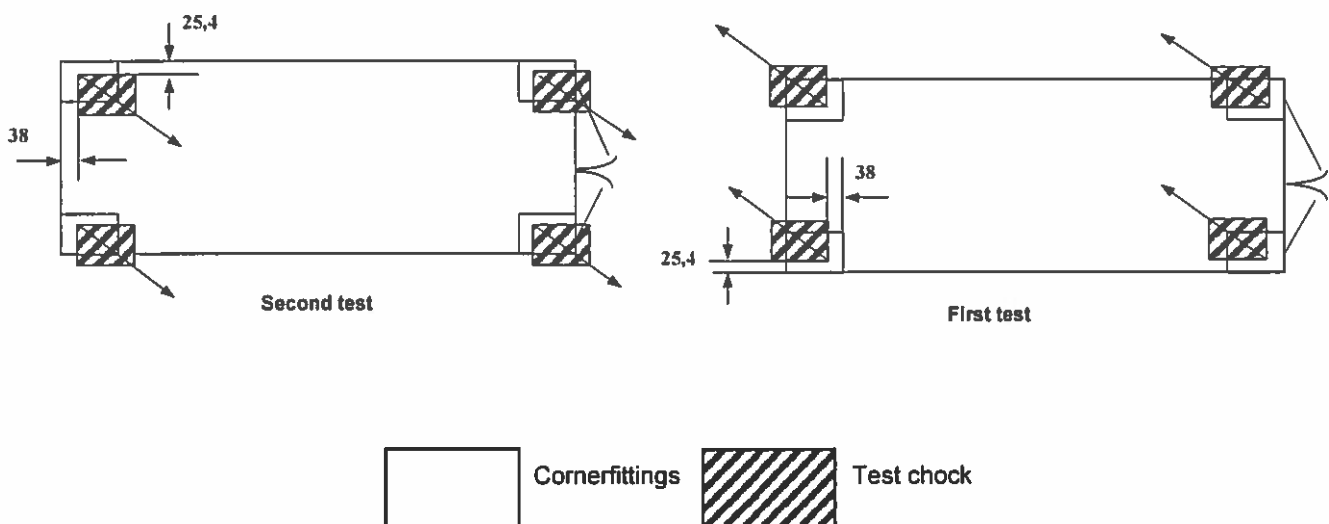
Satisfactory



STACKING TEST (1/2)

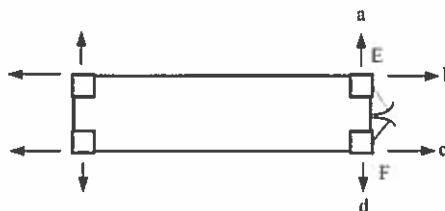
Test method :

The tank container will be placed on 4 level pads and subjected to vertical forces to all 4 corner fitting simultaneously, or to each pair of end fittings, at the appropriate level specified in table 2 of ISO 1496-3:1995(E). Each corner fitting or equivalent fitting shall be offset in the same direction by 25,4 mm laterally and 38 mm longitudinally. In the case of containers with identical ends, only one end needs to be tested.



STACKING TEST (2/2)

Note: Measurements will be taken at the centre of and at half the height of corner structures



Test load	Transverse corner structures deflections				Longitudinal corner structure deflections	
	a	b	c	d	E	F

1st test:



Before test					2738	2735
During test					2733	2732
After test					2737	2735

2nd test:



Before test					2737	2735
During test					2734	2732
After test					2739	2733
Total deformation					2	2

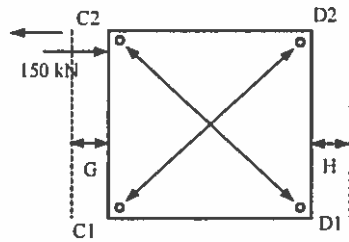
Comments: - Frame tested at stacking weight of 375000 kg
- Visual inspection of the integrity performed of the tank container.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

TRANSVERSE RACKING TEST



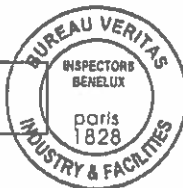
FRONT END				
Force (kN)	Diagonal length			Limit
	G	H	$\Delta G+H$	
Pushing				
0	113	116	3	
112	106	112	6	60
0	113	106		
Pulling				
0	113	106	3	
268	117	103	4	60
After tests				
0	112	106	4	10

Comments: Only one end is tested due to identical end of the frame.

- No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory





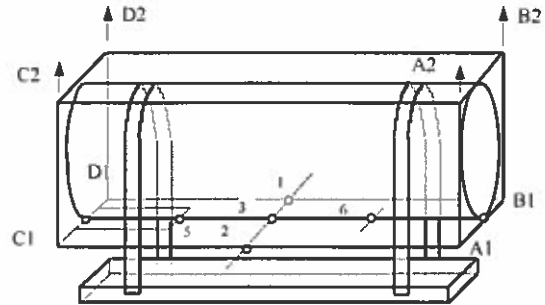
LIFTING TEST FROM TOP CORNER FITTINGS (1/2)

Test method :

The tank container under test is loaded to 2R, and is lifted by all four top corners in such a way that no significant acceleration or deceleration forces are applied.

The tank container shall be suspended for not less than 5 minutes and then lowered to the ground.

	2R = 150000 kg
Tare	6200 kg
Load (Water)	62500 kg
Extra Load (Belt)	81300 kg



Lifting from top corner fittings (2/2)

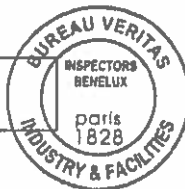
	1	2	A1 - C1	B1 - D1
Empty				
Deflections measured before lifting (on pads)				
Deflections measured during lifting (At least 5 min)				
Deflections measured after lifting (on pads)				
Permanent deformation (Container unloaded)				

Comments: Visual inspection of the integrity performed on the tank container.

- No leakage or permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

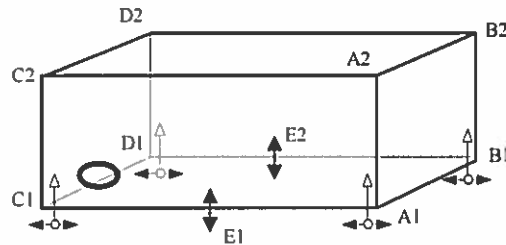


RESTRAINT TEST (STATIC RESTRAINT)

Test method

The tank container, loaded with a uniformity distributed load to a total weight of R, shall be secured to rigid anchor points by the bottom securing points, at one end. A load equal to 2 x R (daN) shall be applied longitudinally to the tank container, through the bottom securing points, at the other end, first in compression, and then in tension. These forces will be held for at least 5 minutes.

	R = 75000 kg
Tare	6200 kg
Load (Water)	62500 kg
Extra Load (plates)	6300 kg



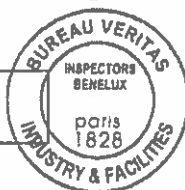
		Before test	During test	After test	Deformation
Compression	A1 → C1	12185	12179	12185	0
	B1 → D1	12192	12184	12190	1
	E1				
	E2				
Tension	A1 → C1	12184	12191	12185	1
	B1 → D1	12191	12197	12192	1
	E1				
	E2				

Comments: -

- No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory



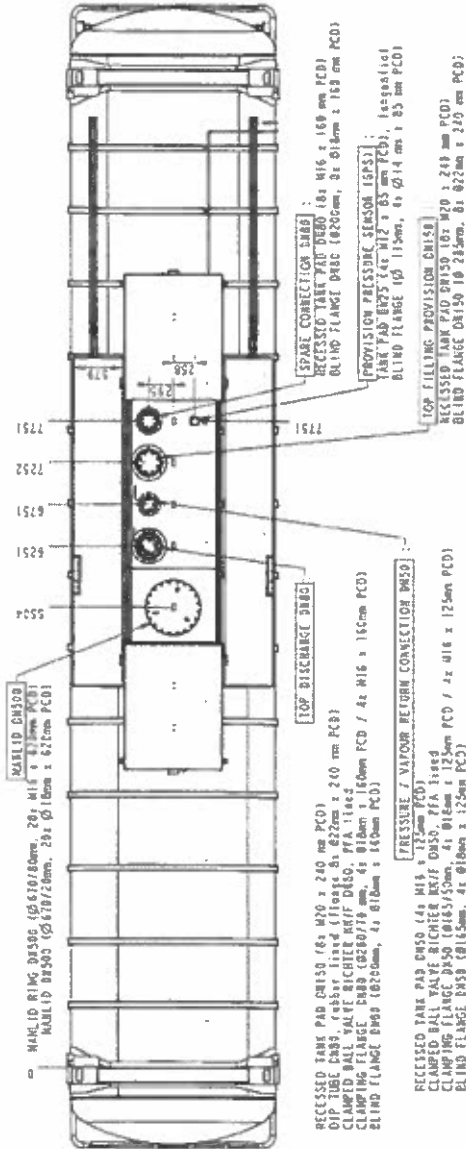
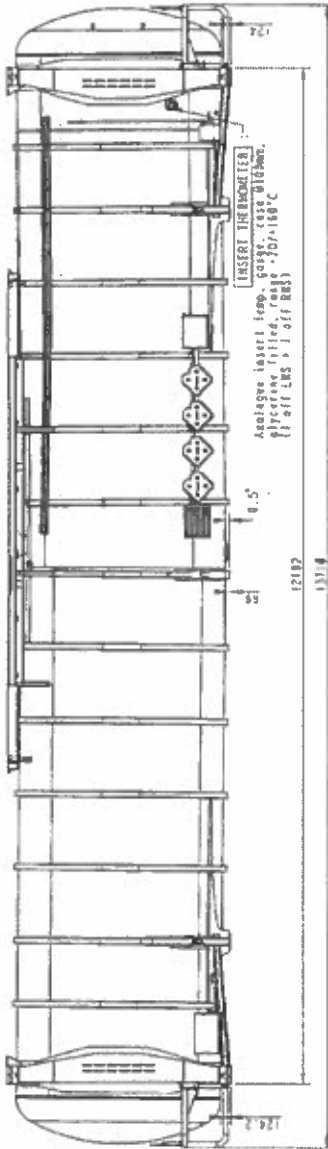
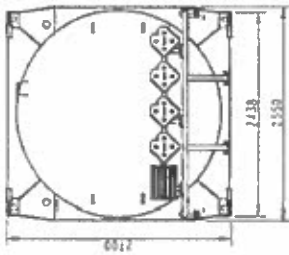


BUREAU VERITAS

ANNEX 1

Took heeft een V-vorm en ligt dus onder hoek in de kader, diameter is overal gelijk.

PNR:	119446-008
TJAZ:	AS WAGG TEST JANG C
ALT:	CUSTOMER DRAWING
ATK:	03001 JAFER LARRO
BON:	LUCBOR
VAN:	000217



45°-fonteinleider tot HCl 37%
 Capaciteit: 62.000 l
 Constructie: slijtsteels: steel 304
 Rubberering: Chlorbuta: 70
 ADR/R10: LDH (topdischarge)
 WAGP: 3 bar fillas
 without baffles
 without insulation
 without heating
 tare weight: ca 77001g

SCALE 23/1000

ELVB 3434 p.1



GEWICHTING: 6751.952

MEK-BLANSCHER VAN DE KUNSTEN, 12-14
 ALLEEN VERKRIJGBAAR BIJ
 DE VERKRIJGERS VAN DE
 NEDERLANDSE VERKRIJGERS



BUREAU
VERITAS

ANNEX 2

HOYER 119466

SO 7559

tarra 6200 kg
inhoud 62500 L
max. gross 75000 kg

containertestbank

grote cylinders

grote diameter 200.03 mm
kleine diameter 140.00 mm
grote sekte 31425 mm²
kleine sekte 16032 mm²
slaglengte 160 mm

kleine horizontale cylinders portaal

grote diameter 130.8 mm
kleine diameter 99.9 mm
grote sekte 13439 mm²
kleine sekte 5601 mm²
slaglengte 360 mm

water
balast

stacking 375000 kg
per cilinder 168750 kg
1655438 N
sekte 31425 mm²
druk 52.68 Mpa
527 bar

leeg

racking drukken 150000 N
sekte 13439 mm²
druk 11.16 Mpa
112 bar

racking trekken 150000 N
sekte 5601 mm²
druk 26.78 Mpa
268 bar

leeg

heffen boven 150000 kg
per cilinder (4x) 37500 kg
367875 N
sekte 16032 mm²
druk 22.95 Mpa
229 bar

vol
+
spanbanden over tank aan bank

trekken & drukken 75000 kg
per cilinder 735750 N
sekte 16032 mm²
druk 45.89 Mpa
459 bar

trekken & drukken 75000 kg
per cilinder 735750 N
sekte 31425 mm²
druk 23.41 Mpa
234 bar

vol

1 botsen 3g (GÖRLITZ)

vol

waterdrukproef 4.5 bar

vol



ANNEX 3

0011 8001 0115
Bernard Van Hoolstraat 50
B-2030 Leefdaal, België

Messnr.: 17.07.0064
Wegcode: 4545

Wegcode: 11046

Transp. n.
Inpakking:
Rev.:

Bruto: 6160 kg
6160
6160 kg



TECHNICAL DEPARTMENT OF TRANSPORTATION

Examination report of the CSC/ISO 1496-3 prototype tests

Characteristics of the prototype
Hoyer 119483
ADR/RID Tank container

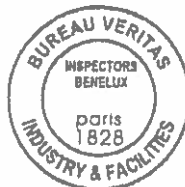
Tested at: Lier- Belgium – Van Hool NV
Görlitz – Germany – TÜV SÜD Rail GmbH

11/07/2017 to 13/07/2017
22/06/2017

Manufacturer : Van Hool NV
Container Type : TMI45-54/0
Kind of freight : Liquids
List of drawings : General drawing: 119483-006
ISO - type designation : LMK2
Maximum gross weight : 75000 kg
Tare : 6240 kg
Maximum payload : 68760 kg
Capacity : 53500 L

In attendance of	- Felix Bührdel	TÜV SÜD Rail GmbH
	- Luc Borstlap	Van Hool
	- Bart Zuidhoek	Bureau Veritas

Issued at Antwerp on the 14th of July 2017
The surveyor,



B. ZUIDHOEK



- I. Condition of tank container on arrival at test centre (Checking of dimensions: p. 3)
- II. Aim of the test: To ascertain the performance of the tank container according to the following conditions:
- Loads in kilograms
 - Forces in daN (1kg = 0,98daN)
 - Dimensions in mm
 - Pressure in Bars

TESTS

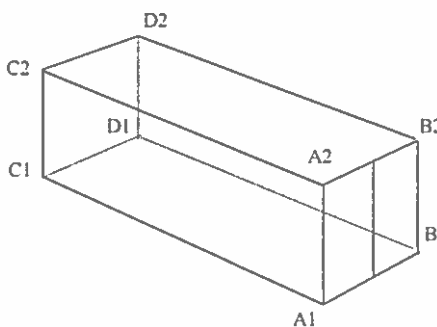
List of tests carried out	Order of tests	Comments	Page
- Dimensions check: Before test	1	Passed	3
After test	6	Passed	3
- Internal longitudinal restraint (dynamic)	2	Passed	4-5
- Stacking	3	Passed	6-7
- Lifting from the four top corner fittings	4	Passed	8
- Internal restraint test (longitudinal)	5	Passed	9

ANNEX

Annex 1	General drawing	119483-006
Annex 2	Test program	119483-proefprogramma

CHECK OF DIMENSIONS

Category		
Design dimensions		±
Length	13716	+0 -6
Width	2550	+0 -5
Height	2700	+0 -5



Temperature: Before: 20 °C After: 20 °C

Position	Ref	Diagonals		
		Before	After	±Δ
End wall	A2 → B1			
	A1 → B2			
Front wall	C2 → D1			
	C1 → D2			
Side walls	A2 → C1			
	A1 → C2			
	B2 → D1			
	B1 → D2			
Floor	A1 → D1			
	B1 → C1			
Roof	A2 → D2			
	B2 → C2			

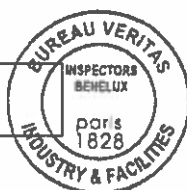
Position	Ref	Length		
		Before	After	±Δ
End wall	A1 → A2	2700	2700	0
	B1 → B2	2700	2700	0
	A1 → B1			
	A2 → B2			
Front wall	C1 → C2			
	D1 → D2			
	C1 → D1			
	C2 → D2			
Side walls	A1 → C1	13716	13716	0
	A2 → C2			
	B1 → D1	13716	13716	0
	B2 → D2			

- Dimensions to be taken at start and finish of the test program.
- Diagonal dimensions are not possible to measure.
- In particular cases, some dimensions may not be checked
- Add a complementary sheet to specify checks of temperature which might be applied.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

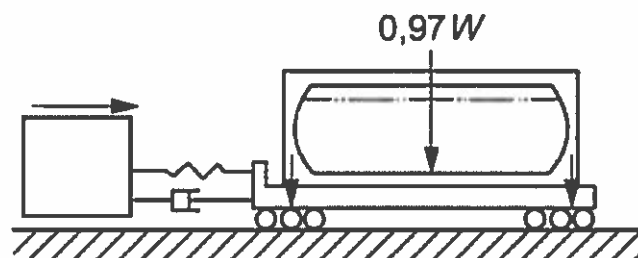


DYNAMIC RESTRAINT TEST (IMPACT TEST)

The test mass of the container shall be as close as possible to R. Measure and record the as-tested payload. The container under test shall be placed on the test platform as close as possible to the impacting end, with the container end considered to be more vulnerable to impact damage facing the point of impact. All four bottom corners of the container shall be locked in position by means of corner fittings restraining movement in all directions.

Create an impact such that for a single impact the as tested SRS at both corner fittings equals or exceeds the minimum SRS curve* at all frequencies within the range 3Hz to 100 Hz.

* SRS curve according to ISO 1496-3 Amendment 1-2006 Figure D.1





DYNAMIC RESTRAINT TEST (IMPACT TEST)

R =	75000 kg
Theoretical load R-T =	68760 kg
Actual load (filled with water) =	59740 kg

Nr.	Speed of wagon	Change of diagonal length A-side (mm)	Change of diagonal length B-side (mm)	Curve above required SRS* curve
1	4,5 km/h	0	0	No
2	10,6 km/h	0	0	No
3	12,2 km/h	0	0	No
4	12,7 km/h	0	0	Yes
		Total change of length	Total change of length	
		0	0	

* SRS curve according to ISO 1496-3 Amendment 1-2006

Comments: - For complete TÜV SUD rail report see; Project 717514860
 Document 717514860_Test_report_A
 Dated 30/06/2017

No leakage or permanent deformations or abnormality which will render it unsuitable for use where found.
 The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

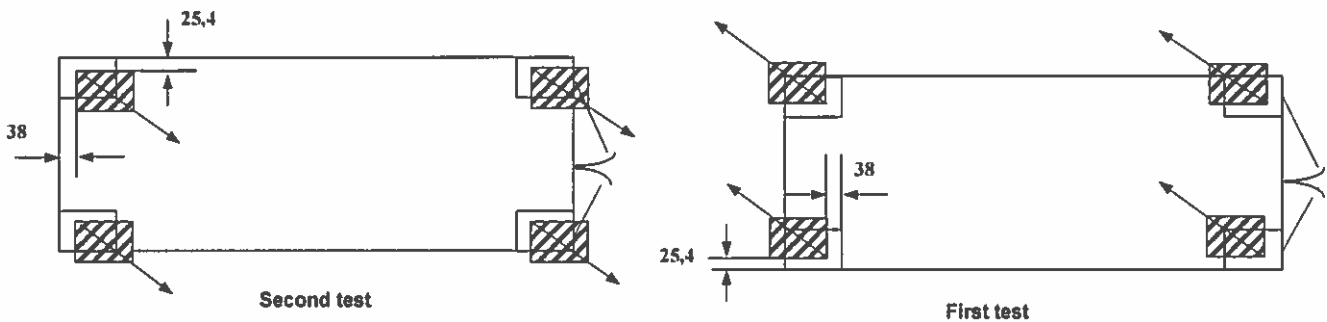
Satisfactory



STACKING TEST (1/2)

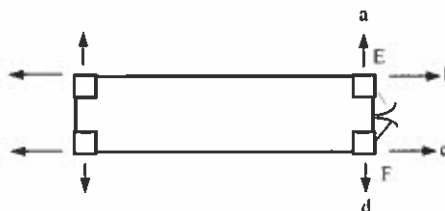
Test method :

The tank container will be placed on 4 level pads and subjected to vertical forces to all 4 corner fitting simultaneously, or to each pair of end fittings, at the appropriate level specified in table 2 of ISO 1496-3:1995(E). Each corner fitting or equivalent fitting shall be offset in the same direction by 25,4 mm laterally and 38 mm longitudinally. In the case of containers with identical ends, only one end needs to be tested.



STACKING TEST (2/2)

Note: Measurements will be taken at the centre of and at half the height of corner structures



Test load	Transverse corner structures deflections				Longitudinal corner structure deflections	
	a	b	c	d	E	F

1st test:



Before test					2700	2700
During test					2699	2698
After test					2700	2700

2nd test:



Before test					2700	2700
During test					2699	2698
After test					2700	2700
Total deformation					0	0

Comments: - Frame tested at stacking weight of 375000 kg
- Visual inspection of the integrity performed of the tank container.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

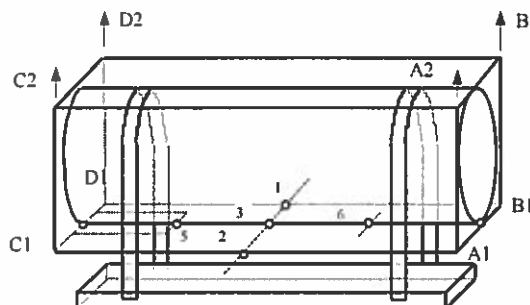
LIFTING TEST FROM TOP CORNER FITTINGS (1/2)

Test method :

The tank container under test is loaded to 2R, and is lifted by all four top corners in such a way that no significant acceleration or deceleration forces are applied.

The tank container shall be suspended for not less than 5 minutes and then lowered to the ground.

	2R = 150000 kg
Tare	6240 kg
Filled with water	53500 kg
Extra Load (belt)	90260 kg



Lifting from top corner fittings (2/2)

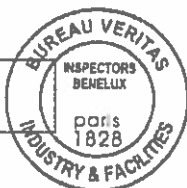
	1	2	A1 - C1	B1 - D1
Empty				
Deflections measured before lifting (on pads)				
Deflections measured during lifting (At least 5 min)				
Deflections measured after lifting (on pads)				
Permanent deformation (Container unloaded)				

Comments: Visual inspection of the integrity performed on the tank container.

No leakage or permanent deformations or abnormality which will render it unsuitable for use where found.
 The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

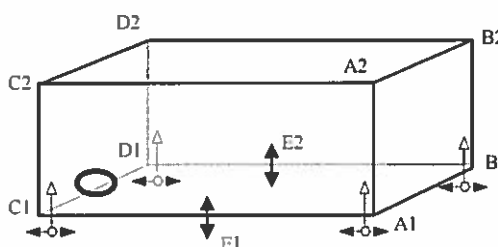


RESTRAINT TEST (STATIC RESTRAINT)

Test method

The tank container, loaded with a uniformity distributed load to a total weight of R, shall be secured to rigid anchor points by the bottom securing points, at one end. A load equal to 2 x R (daN) shall be applied longitudinally to the tank container, through the bottom securing points, at the other end, first in compression, and then in tension. These forces will be held for at least 5 minutes.

	R = 75000 kg
Tare	6240 kg
Filled with water	53500 kg
Extra Load (plates)	15500 kg



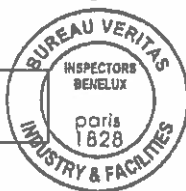
		Before test	During test	After test	Deformation
Compression	A1 → C1	13716	13711	13716	0
	B1 → D1	13716	13712	13716	0
	E1				
	E2				
Tension	A1 → C1	13716	13723	13716	0
	B1 → D1	13716	13723	13716	0
	E1				
	E2				

Comments: -

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

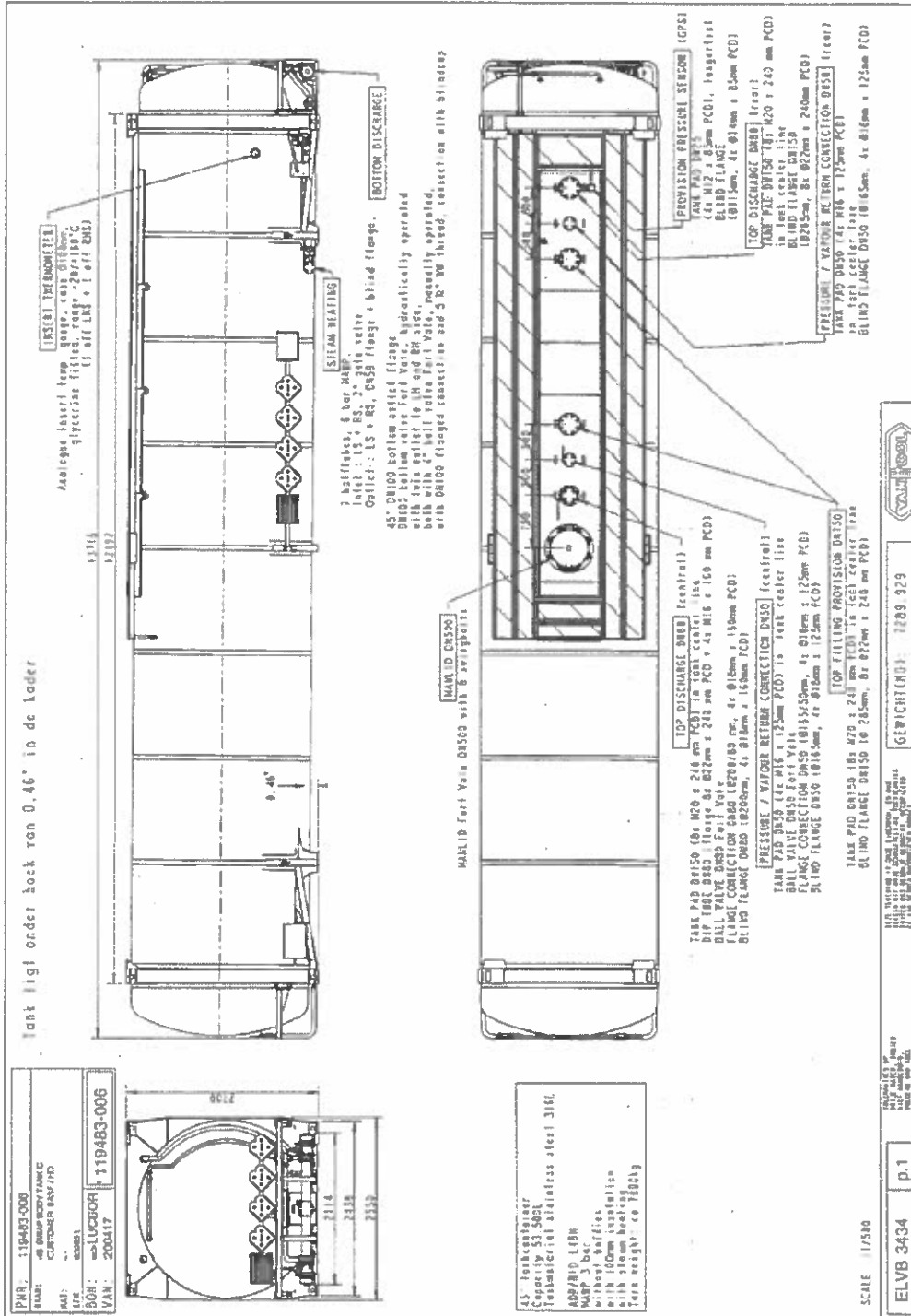
Satisfactory



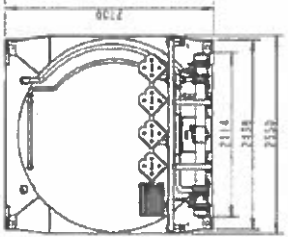


BUREAU
VERITAS

ANNEX 1



PRJ:	119483-000
OBJ:	48-BWAP-BODY/TANK
ART:	CUSTOMER PART / PD
REF:	820001
BOH:	LUCBOR
VAN:	200417
	119483-006



45° Reinforcement
Capacity: 51,502t
Nonferrous stainless steel 316L
ABS/EPD LINER
With 6 bar/100psi
with 100mm insulation
with steam heating
Tera energy: co 78801g



ANNEX 2

<u>HOYER 119483</u>		<u>SO 7571</u>	<u>containertestbank</u>		
tarra	6000 kg		<u>grote cylinders</u>		
inhoud	53500 L		grote diameter	200.03 mm	
max. gross	75000 kg		kleine diameter	140.00 mm	
			grote sekte	31425 mm ²	
			kleine sekte	16032 mm ²	
			slaglengte	160 mm	
			<u>kleine horizontale cylinders portaal</u>		
			grote diameter	130.8 mm	
			kleine diameter	99.9 mm	
			grote sekte	13439 mm ²	
			kleine sekte	5601 mm ²	
			slaglengte	360 mm	water balast
2	stacking per cilinder	375000 kg 168750 kg 1655438 N			leeg
	sekte druk	31425 mm ² 52.68 Mpa 527 bar			
3	heffen boven per cilinder (4x)	150000 kg 37500 kg 367875 N			vol + spanbanden over tank aan bank
	sekte druk	16032 mm ² 22.95 Mpa 229 bar			
4	trekken & drukken per cilinder	75000 kg 735750 N	trekken & drukken per cilinder	75000 kg 735750 N	vol + 15500 kg
	sekte druk	16032 mm ² 45.89 Mpa 459 bar	sekte druk	31425 mm ² 23.41 Mpa 234 bar	
1	botsen 3g (GÖRLITZ)				vol
	waterdrukproef 4.5 bar				vol
LBL	21.04.'17				



TECHNICAL DEPARTMENT OF TRANSPORTATION

Examination report of the CSC/ISO 1496-3 prototype tests

Characteristics of the prototype
BASF 117992
ADR – RID L4BH

Tested at: Lier– Belgium – Van Hool NV
Görlitz – Germany – TÜV SÜD Rail GmbH From 06/05/2015 To 13/05/2015

Manufacturer : Van Hool NV
Container Type : TMIS45-63/0
Kind of freight : Liquids
List of drawings : General drawing : 117992-006 (26/02/2015)
Frame drawing : 117992-1040 (26/02/2015)
ISO – type/size code : LNK2
Maximum gross weight : 75000 kg
Tare : Bare : 7420 kg
Insulated and equipped : / kg
Maximum payload : / kg
Capacity : 63000 L

In attendance of	- Daniel Zingelmann	TÜV SÜD Rail GmbH
	- Luc Borstlap	Van Hool
	- Koen De Gruyter	Bureau Veritas

Issued at Antwerp on the 4th of June 2015
The surveyor,




De Gruyter Koen



- I. Condition of tank container on arrival at test centre (Checking of dimensions: p. 3)
- II. Aim of the test: To ascertain the performance of the tank container according to the following conditions:
- Loads in kilograms
 - Forces in daN (1kg = 0,98daN)
 - Dimensions in mm
 - Pressure in Bar

TESTS

List of tests carried out	Order of tests	Comments	Page
- Dimensions check: Before test	1	Passed	3
After test	9	Passed	3
- Restraint test (static restraint)	4	Passed	6
- Transverse racking test	6	Passed	7
- Stacking	7	Passed	4-5
- Lifting from the four top corner fittings	5	Passed	9
- Internal lateral restraint	3	Passed	8
- Internal longitudinal restraint (dynamic)	2	Passed	10-11
- Hydraulic pressure test	8	Passed	12

ANNEX

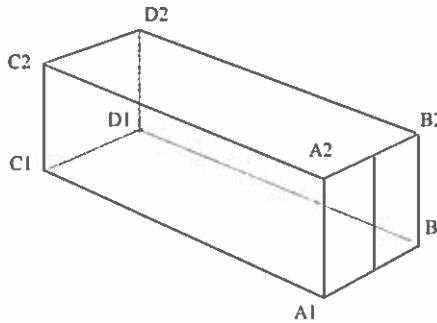
Annex 1	General drawing	117992-006 (26/02/2015)
Annex 2	Frame drawing	117992-1040 (26/02/2015)
Annex 3	Force calculation	BASF 117992 – SO7455



**BUREAU
VERITAS**

CHECK OF DIMENSIONS

Category		
Design dimensions		±
Length	13716	+0 -6
Width	2550	+0 -5
Height	2895	+0 -5



Temperature: Before: 15 °C After: 15 °C

Position	Ref	Diagonals		
		Before	After	±Δ
End wall	A2 → B1			
	A1 → B2			
Front wall	C2 → D1			
	C1 → D2			
Side walls	A2 → C1			
	A1 → C2			
	B2 → D1			
	B1 → D2			
Floor	A1 → D1			
	B1 → C1			
Roof	A2 → D2			
	B2 → C2			

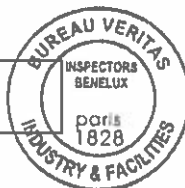
Position	Ref	Length		
		Before	After	±Δ
End wall	A1 → A2	2895	2895	0
	B1 → B2	2895	2895	0
	A1 → B1	2550	2550	0
	A2 → B2			
Front wall	C1 → C2	2895	2895	0
	D1 → D2	2895	2895	0
	C1 → D1	2550	2550	0
	C2 → D2			
Side walls	A1 → C1	13716	13716	0
	A2 → C2			
	B1 → D1	13716	13716	0
	B2 → D2			

- Dimensions to be taken at start and finish of the test program.
- All diagonals are taken from specified points at corner fittings.
- In particular cases, some dimensions may not be checked
- Add a complementary sheet to specify checks of temperature which might be applied.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

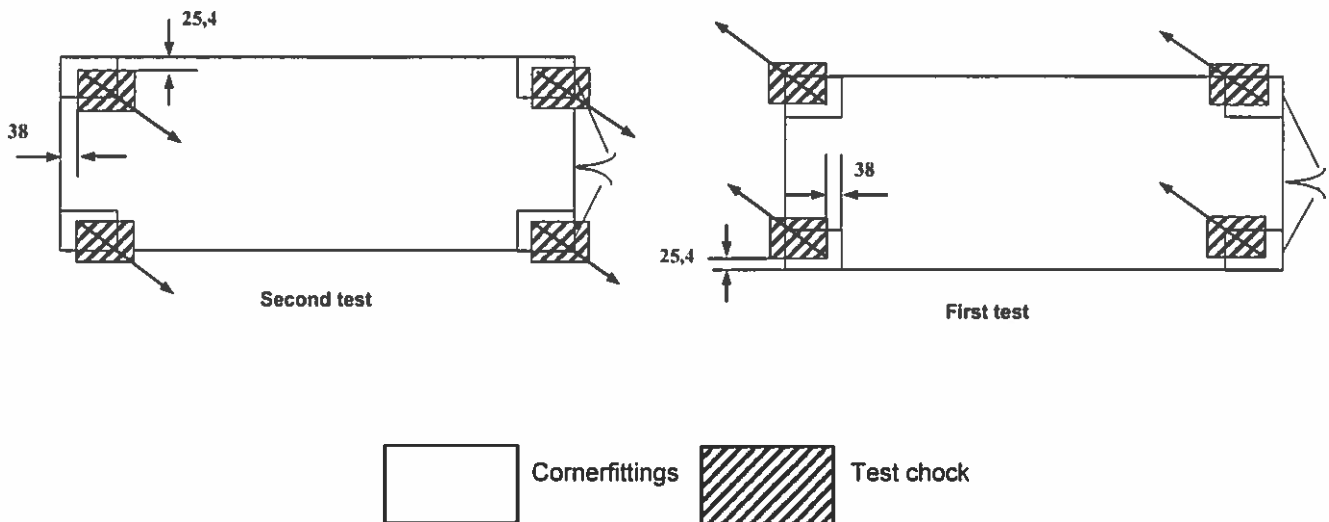
Satisfactory



STACKING TEST (1/2)

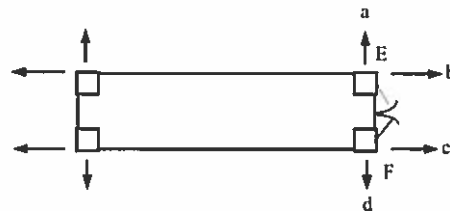
Test method :

The tank container will be placed on 4 level pads and subjected to vertical forces to all 4 corner fittings simultaneously, or to each pair of end fittings, at the appropriate level specified in table 2 of ISO 1496-3:1995(E). Each corner fitting or equivalent fitting shall be offset in the same direction by 25,4 mm laterally and 38 mm longitudinally. In the case of containers with identical ends, only one end needs to be tested.



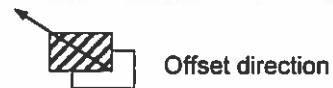
STACKING TEST (2/2)

Note: Measurements will be taken at the centre of and at half the height of corner structures



Test load	Transverse corner structures deflections				Longitudinal corner structure deflections	
	a	b	c	d	E	F

1st test:



Before test					2895	2895
During test					2893	2894
After test					2895	2895

2nd test:



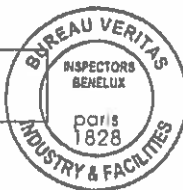
Before test					2895	2895
During test					2892	2993
After test					2894	2894
Total deformation					1	1

Comments: - Frame tested at stacking weight of 300.000 kg
 - Visual inspection of the integrity of the tank container performed.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

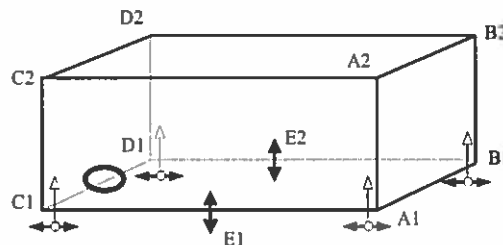


RESTRAINT TEST (STATIC RESTRAINT)

Test method

The tank container, loaded with a uniformity distributed load to a total weight of R, shall be secured to rigid anchor points by the bottom securing points, at one end. A load equal to 2 x R (daN) shall be applied longitudinally to the tank container, through the bottom securing points, at the other end, first in compression, and then in tension. These forces will be held for at least 5 minutes.

R = 75000 kg
 2R = 150000 kg



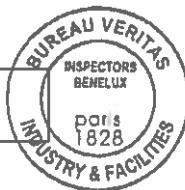
		Before test	During test	After test	Deformation
Compression	A1 → C1	12192	12182	12191	1
	B1 → D1	12189	12179	12189	0
	E1				
	E2				
Tension	A1 → C1	12191	12204	12192	1
	B1 → D1	12189	12200	12189	0
	E1				
	E2				

Comments: - Visual inspection of the integrity of the tank container performed.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

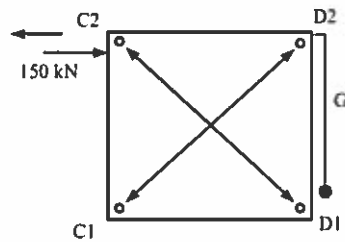
Satisfactory





**BUREAU
VERITAS**

TRANSVERSE RACKING TEST



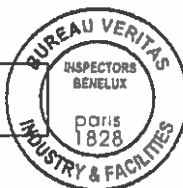
Force (kN)	
	G
Pusing	
0	52
150	56
0	52
Pulling	
0	52
150	49
After test	
0	52

Comments: - Only one end is tested due to identical end of the frame.
- Measurement of diagonals not possible do to swap body. Measurements performed with plumb instead.

No permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory

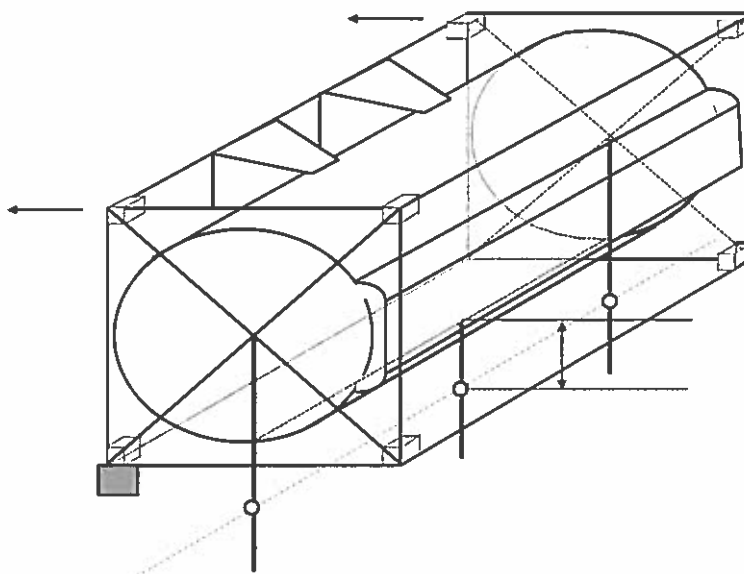


LATERAL INERTIA TEST

Test method:

The tank container under test shall be loaded to R. The tank container shall be positioned with its transverse axis vertical. It shall be held in this position by supports at the lower side of the base structure of the tank container acting through the bottom corner fittings in such a manner as to provide vertical and lateral securements. At the upper side of the base structure of the tank container, anchor devices acting through the bottom corner fittings shall be provided to give lateral restraint only. No securement shall be fixed to the top corner fittings. The tank container shall be held in this position for not less than 5 minutes.

	R = 75000 kg
Tare	7420 kg
Load (Water)	63000 kg
Extra Load (Metal plates)	4580 kg



Comments: Visual inspection of the integrity performed on the tank container.

- No leakage or permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied.

Result:

Satisfactory



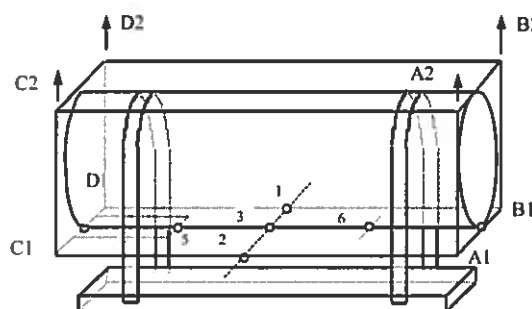
LIFTING TEST FROM TOP CORNER FITTINGS

Test method :

The tank container under test is loaded to 2R, and is lifted by all four top corners in such a way that no significant acceleration or deceleration forces are applied.

The tank container shall be suspended for not less than 5 minutes and then lowered to the ground.

	2R = 150000 kg
Tare	7420 kg
Load (Water)	63000 kg
Extra Load (Belt with steel I-profiles)	79580 kg



Lifting from top corner fittings

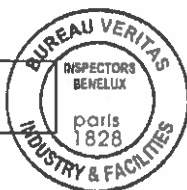
	1	2	A1 – C1	B1 – D1
Empty				
Deflections measured before lifting (on pads)				
Deflections measured during lifting (At least 5 min)				
Deflections measured after lifting (on pads)				
Permanent deformation (Container unloaded)				

Comments: Visual inspection of the integrity performed on the tank container.

- No leakage or permanent deformations or abnormality which will render it unsuitable for use where found. The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory



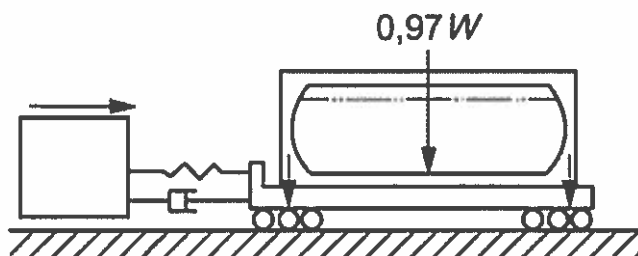
DYNAMIC RESTRAINT TEST (IMPACT TEST)

The container under test shall be filled with a quantity of water or any other non-pressurized product to approximately 97% volumetric capacity, ensuring that it is not pressurized during the test. However, if for reasons of overload it is not possible to fill to 97% of the capacity, then the test mass of the container (tare and product) shall be as close as possible to R. Measure and record the as-tested payload.

The container under test shall be placed on the test platform as close as possible to the impacting end, with the container end considered to be more vulnerable to impact damage facing the point of impact. All four bottom corners of the container shall be locked in position by means of corner fittings restraining movement in all directions.

Create an impact such that for a single impact the as tested SRS at both corner fittings equals or exceeds the minimum SRS curve* at all frequencies within the range 3Hz to 100 Hz.

* SRS curve according to ISO 1496-3 Amendment 1-2006 Figure D.1





DYNAMIC RESTRAINT TEST (IMPACT TEST)

R =	75000 kg
Theoretical load R-T =	67580 kg
Actual load =	40230 kg (97% Water)

Nr.	Speed of wagon	Change of diagonal length A-side	Change of diagonal length B-side	Left hand side Acceleration / SRS* curve	Right hand side Acceleration / SRS* curve
1	5,6 km/h	0	0	1,1G	1,1G
2	10,2 km/h	1	0	2,2G	2,1G
3	11,8 km/h	1	0	4,7G	4,5G
4	12,0 km/h	0	0	5,0G	4,6G
5	12,7 km/h	0	0	(Defect on accelerometer)	5,6G
6	12,4 km/h	0	0	5,4G / SRS Curve obtained	5,2G / SRS curve obtained
		Total change of length	Total change of length		
		2	0		

* SRS curve according to ISO 1496-3 Amendment 1-2006

Comments:

- Do to correction factor an actual acceleration of 4,7G at both sides must be obtained to certify tank container with R = 75000kg for 3G.
- In test number 6 the actual acceleration force of 4,7G was obtained.
- In test number 6 the minimum SRS curve was obtained.
- Temporary partition in the tank containers is made.
- For complete TÜV SUD rail report see; Project 717510549
 Document 15_717510549_Report_A
 Dated 11/05/2015

No leakage or permanent deformations or abnormality which will render it unsuitable for use where found.
 The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

Satisfactory





HYDRAULIC PRESSURE TEST

Test method :

The tank shall be hydraulically tested.

If the liquid/gas tank is provided with compartments, in addition to hydraulic testing, each compartment shall be tested with the adjacent compartments empty and at atmospheric pressure. The test pressure shall be measured at the top of the tank or compartment with the tank container in its normal position. The test pressure shall be maintained for as long as is necessary to enable a complete examination of the tank and its fittings to be made, but in any case for not less than 30 min. Relief devices, where fitted, shall be rendered inoperative or removed for the purpose of this test. The pressure at which the tank is tested shall be selected with regard to the intended use of the tank, in accordance with the regulations applied by the competent authority.

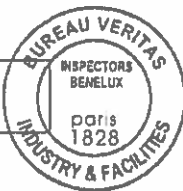
Test pressure	Duration	Test fluid	Temperature
6 bar	60 minutes	Water	15°C

Comments: Visual inspection of the integrity performed on the tank container.

- No leakage or permanent deformations or abnormality which will render it unsuitable for use where found.
The dimensional requirements affecting handling, securing and interchange where satisfied

Result:

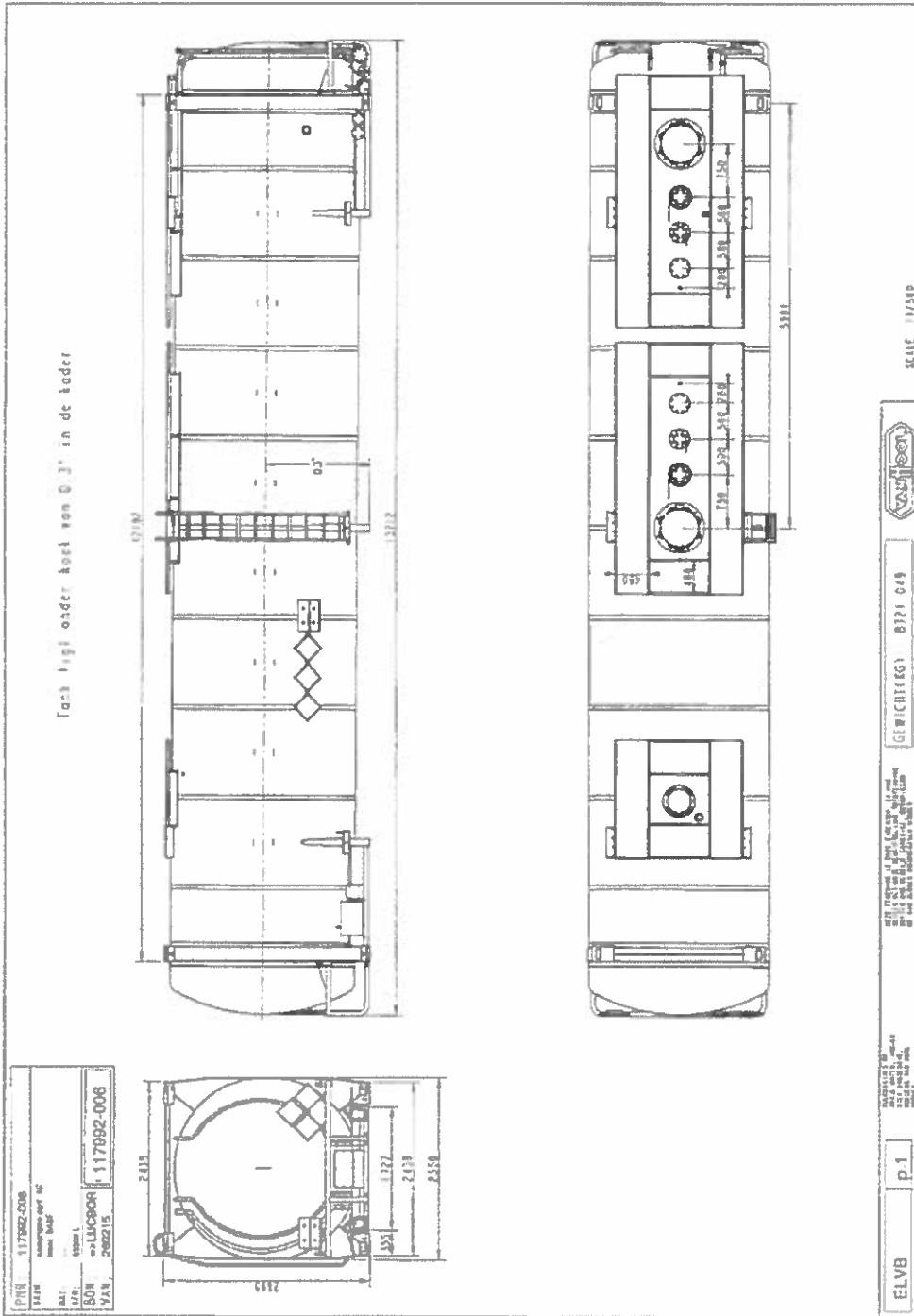
Satisfactory





BUREAU VERITAS

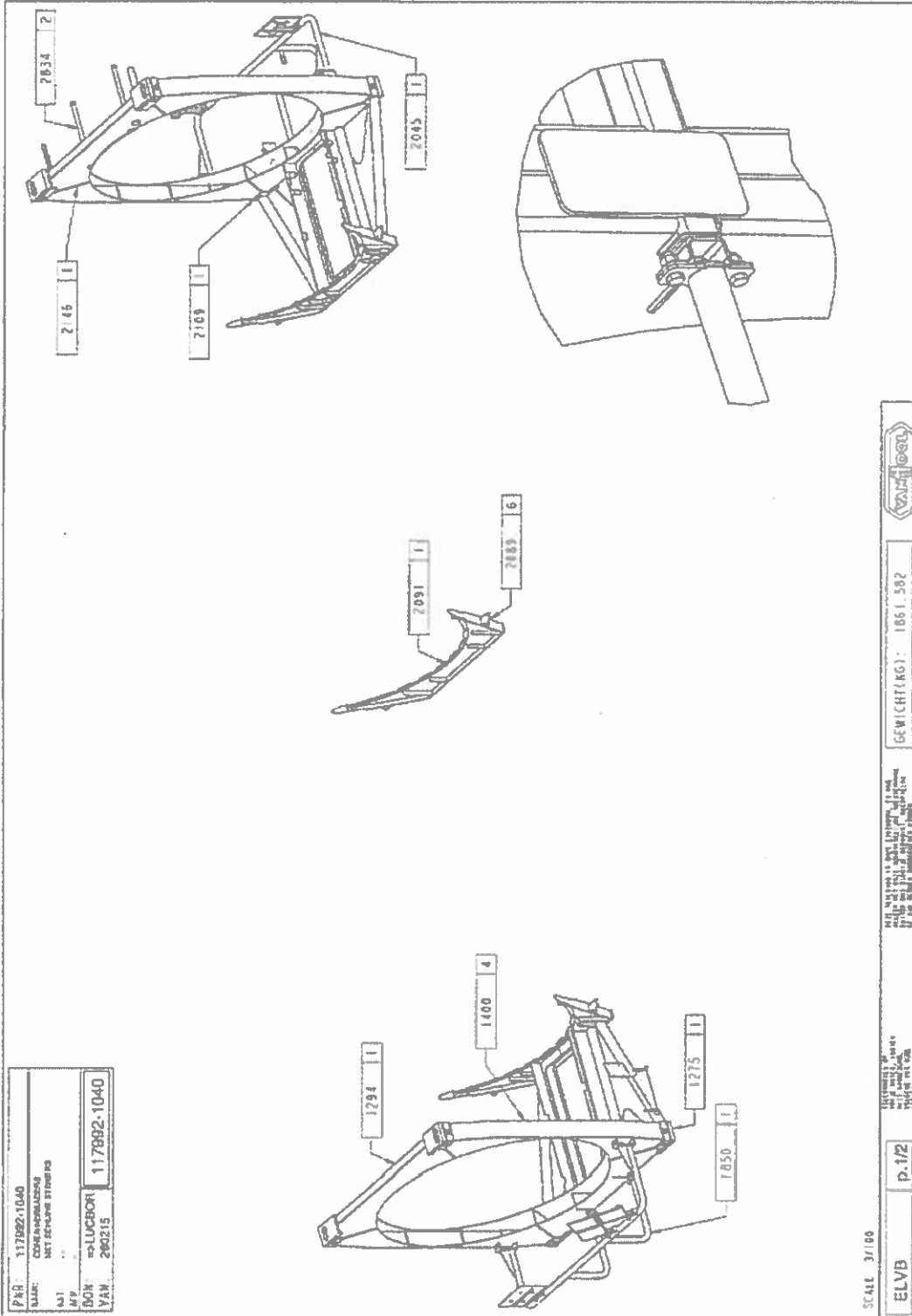
ANNEX 1





BUREAU
VERITAS

ANNEX 2





**BUREAU
VERITAS**

ANNEX 3

BASF : 117992

SO 7455

containertestbank

tara 7420 kg
inhoud 83000 kg
max. gross 75000 kg

grote cilinders
grote diameter 200.03 mm
kleine diameter 140.00 mm
grote sectie 31425 mm²
kleine sectie 18032 mm²
slaglengte 160 mm

kleine horizontale cilinders portaal

grote diameter 130.8 mm
kleine diameter 89.9 mm
grote sectie 13439 mm²
kleine sectie 5601 mm²
slaglengte 360 mm

water
balast

stacking 300000 kg
per cilinder 135000 kg
1324350 N
sectie 31425 mm²
druk 42.14 Mpa
421 bar

leeg

racking drukken 150000 N
sectie 13439 mm²
druk 11.18 Mpa
112 bar

racking trekken 150000 N
sectie 5601 mm²
druk 26.78 Mpa
268 bar

leeg

heffen boven 150000 kg
per cilinder (4x) 37500 kg
367875 N
sectie 18032 mm²
druk 22.95 Mpa
229 bar

vol
+
spanbanden over tank aan bank

trekken & drukken 75000 kg
per cilinder 735750 N
sectie 18032 mm²
druk 45.89 Mpa
459 bar

trekken & drukken 75000 kg
per cilinder 735750 N
sectie 31425 mm²
druk 23.41 Mpa
234 bar

vol

2 kantelen 90° 75000 kg
zadels R 1215 mm

vol
+ 4580 kg

waterdrukproef 5 bar

vol

1 botsen 3g (GÖRLITZ)

vol 06.05.'15

LBL 08.05.'15