BRL-K756/03
Date 2017-04-01

Evaluation guideline

for the Kiwa product certificate for Single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³

Trust
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Amendment to BRL K756/03

Date of amendment 17 augustus 2020
Technology code OGC-07: Steel tanks and second containments
Validated by Board of Experts Tank, Tank installations and Appendages dated. 27 November 2020

Validity
This amendment sheet pertains to BRL-K756/03 “Single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³” dated 01-04-2017.
Re-issue of quality declarations based on this Evaluation Guideline is not necessary.

Validation
This amendment sheet has been validated by Kiwa per 01-02-2021.

Preface
This amendment sheet has been drawn up because the tightness of hand wheeled locked manhole covers is not always proved to be tight at a pressure test at 30 kPa. This specifically concerns the manhole in the top of the tank.

4.6 Manholes

…

Manhole in the upper tank end
The manhole in the upper tank end must be tight at a test pressure of 30 kPa. The manhole shall be easily accessible for an internal inspection. The manhole cover is mounted with a bolt – nut connection. As a deviation the manhole in the upper tank end can be a closed with hand wheeled locked manhole cover. In the case a hand wheeled locked manhole cover is used, a risk inventory and evaluation must be set up and validated.

Text to change in:

Manhole in the upper tank end
The manhole in the upper tank end must be tight at a test pressure of 30 kPa. The manhole shall be easily accessible for an internal inspection. The manhole cover is mounted with a bolt – nut connection. As a deviation the manhole in the upper tank end can be closed a with hand wheeled locked manhole cover. Based on specifications of the hand wheeled locked manhole cover and/or calculations, it must be proved that this cover can withstand the minimum test pressure. In the case a hand wheeled locked manhole cover is used, a risk inventory and evaluation must be set up and validated.

Remark: In order to maintain the readability of the Evaluation Guideline, this amendment sheet contains a table with references to the changed articles and texts. See table below.

The table below indicates to which articles texts the changes apply. To maintain the readability of the Evaluation Guideline the changes are made directly in the text. Extra text and new text is highlighted. Lapsed text is strikethrough.

Date	Par.	Description	Remark
01-02-2021	4.6	Tekst change	None

255/130104

Preface

This Evaluation Guideline (BRL) has been accepted by the Kiwa Board of Experts Tanks, Tank installations and Appendages (TTA), in which all relevant parties in the field of tanks are represented. The Board of Experts also supervises the certification activities and where necessary requires the Evaluation Guideline to be revised. All references to Board of Experts in this Evaluation Guideline pertain to the above-mentioned Board of Experts.

This Evaluation Guideline will be used by Kiwa in conjunction with the Kiwa Regulations for Certification.

This Evaluation Guideline has been prepared by Criteria Committee 36 (CC36). The criteria committee are constituted as follows:

Person	**Represents**	**Working at**
M. van Ballegooijen	Certification body	Kiwa Nederland B.V.
B. Broekhuizen	Supplier tanks and appendages	Van der Ziel Milieutechniek
T. Cramer	Supplier tanks and tank installations	Berg-O-Tool
B. van Dalen (chairman)	Certification body	Kiwa Nederland B.V.
P. Dekker	Association of Tank installation companies	Mokobouw
J. Jacobi	Supplier tank installations	Jacobi Tanks
M. Houtzager	Supplier tanks	Altermij de Gouwe
D. van der Meer	Supplier tanks and appendages	TAB de Blesse
J. Peters (secretary)	Certification body	Kiwa Nederland B.V.
J. Riepe	Supplier tanks	GPI
E. Sterken	Supplier tanks	A. Leering
H. Tolsma	Supplier tanks, tank installations and appendages	Tolsma Tankbouw

The points listed below are the reason for revision of the BRL-K756/02:

- The previous version was not in line with the specific customer requirements for this type of tanks.
- Amendment sheets are incorporated in the text.

This evaluation guideline is prepared by Kiwa.

REMARK: THIS IS AN ENGLISH TRANSLATION OF THE DUTCH VERSION OF THIS EVALUATION GUIDELINE. IN CASE OF A DISPUTE, THE DUTCH VERSION SHALL BE BINDING.

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Bindend verklaring
Deze beoordelingsrichtlijn is door Kiwa bindend verklaard per 01-04-2017.

253/160324

Contents

1 Introduction

1.1 General

The requirements included in this Evaluation Guideline shall be used by Kiwa when processing an application and maintaining a product certificate for single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³.
These tanks are mostly used for storage of environmental harmful liquids, as well as combustible and dangerous liquids. Tanks in accordance with this guideline contribute to realise a negligible risk at environmental pollution and risks due to unusual occurrences, or will at least limited its consequences for the surroundings.

This evaluation guideline replaces BRL-K756/02 dated 10 December 2010 and amendment sheets dated 1 August 2014 and 1 September 2015.
The quality declarations issued and based at BRL-K756/02 will lose their validity on 1 October 2017, 6 months after validation of this evaluation guideline.

When performing the certification activities in relation to this evaluation guideline, Kiwa shall use the requirements stipulated in NEN-EN-ISO/IEC 17065.

1.2 Scope

The products are intended for storage of liquids, mostly environmental harmful liquids, as well as combustible and dangerous liquids.

The scope includes:
- Stationary aboveground, pressure less (atmospheric) storage;
- Vertical cylindrical positioned with supports;
- Maximum capacity 150.000 litres;
- Dimensions, diameter and height, of the tank is restricted by functionality, requirements set in the design code, and maximum capacity of 150.000 litres;
- Single or double walled;
- A design temperature suitable for the stored liquid.

The scope does not cover:
- Tanks with a design pressure greater than 0,5 bar(g);
- Tanks with a bottom in direct contact with the foundation;
- Process tanks;
- Underground storage;
- Tanks with compartments;
- Cryogenic applications;
- Transportable tanks.

Spill containers and appendages (overfill prevention devices, leak detection systems, contents gauges etc.) are not part of this evaluation guideline.

Tanks according to this evaluation guideline are in line with the requirements for tank installations as specified in BRL SIKB 7800 / BRL-K903. The tank installation (tank, pipes, protection devices, etc.) installed in accordance with the requirements of BRL SIKB 7800 / BRL-K903 will result in a negligible environmental risk.

1.3 Acceptance of test reports provided by the supplier

If the supplier provides reports from test institutions or laboratories to prove that the products meet the requirements of this Evaluation Guideline, the supplier shall prove that these reports have been drawn up by an institution that complies with the applicable accreditation standards, namely:

- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN-ISO/IEC 17021-1 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons;
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 for certification bodies certifying products.

This requirement is fulfilled when a certificate of accreditation can be shown, issued either by the Board of Accreditation (RvA) or by one of the institutions with which an agreement of mutual acceptance has been concluded by the RvA.
The accreditation shall refer to the examinations as required in this Evaluation Guideline. When no certificate of accreditation can be shown, Kiwa shall verify whether the requirements of the accreditation standard are fulfilled.

1.4 Quality declaration

1.4.1 Product certificate

The quality declaration to be issued is described as a Kiwa product certificate.
A model of the certificate to be issued has been included for information as annex I of this evaluation guideline.

1.4.2 Declaration of conformity tank

The declaration to be issued by the certified tank supplier is described as a declaration of conformity tank.
A model declaration of conformity has been included for information as annex II of this evaluation guideline.

2 Terminology

2.1 Definitions

In this Evaluation Guideline, the following definitions apply:

- **Board of Experts:** Board of Experts “Tanks, Tank installations and Appendages”.
- **Declaration of conformity tank**: A document in which the tank supplier / tank manufacturer declares that the tank has been constructed in accordance with the regulations as laid down in this evaluation guideline.
- **Evaluation guideline (BRL)**: The agreements made by the Board of Experts on the subject of certification.
- **Initial assessment**: The initial assessment that all the requirements of this Evaluation Guideline are met.
- **IQC-scheme:** A description of the quality inspections carried out by the tank supplier / tank manufacurer, as part of his quality system.
- **Maximum capacity**: Maximum volume of the content of the tank. The maximum capacity is always more than the nominal volume.
- **Maximum filling**: The maximum filling level of the tank, stated as a percentage of the nominal volume. Based on regulations or set in a risk inventory and evaluation.
- **Nominal volume**: This value is used in the calculation of the tank. The nominal volume is the volume of the cylindrical part of the tank up to the roof – cylinder weld.
- **Product certificate**: A document, in which the certification body declares that a product may on delivery be deemed to comply with the product specification recorded in the product certificate.
- **Product requirements**: Requirements made specific by means of measures or figures, focussing on (identifiable) characteristics of products and containing a limiting value to be achieved, which can be calculated or measured in an unequivocal manner.
- **Supplier**: The party responsible for ensuring that products and processes continuously meet the requirements on which the certification is based.
- **Surveillance assessment**: The assessment that is carried out after the certificate has been granted in order to ascertain that the certified products or processes continue to meet the requirements stipulated in this evaluation guideline.

2.2 Product requirements and test methods

Product requirements and test methods to be met are set in:

Number	Title
AD 2000-Merkblatt	Merkblätter (Arbeitsgemeinschaft Druckbehälter - Working Group for Pressure Vessels
ASME-VIII	American Society of Mechanical Engineers – Boiler and pressure vessel code - VIII – Pressure vessels
BRL-K758	Evaluation guideline for the Kiwa product certificate for Coating suitability of metal products to be coated
BRL-K779	Evaluation guideline for the Kiwa product certificate for Internal coating of steel tanks for flammable liquids
BRL-K790	Evaluation guideline for the Kiwa product certificate for Application of coating systems on steel pipes or steel storage tanks for liquids
BRL-K903	Evaluation guideline for the Kiwa process certificate for Tank Installations (REIT)

Number	Title
BRL-K910	Evaluation guideline for the Kiwa product certificate for Leak detection systems intended for the storage and / or transport of liquid / gaseous products
BRL SIKB 7800	(former Kiwa BRL-K903) Evaluation guideline Tank installations (design, installation, modification, (re)classification, inspection and repair)
DIN 28011	Gewölbte Böden - Klöpperform
DIN 28013	Gewölbte Böden - Korbbogenform
ISO 7-1	Pipe treads where pressure-tight joints are made on the treads – part 1: Dimensions, tolerances and designation
ISO 7005-1	Pipe flanges - Part 1: Steel flanges for industrial and general service piping systems
NEN-EN 288-1	Specification and approval of welding procedures for metallic materials - Part 1: General rules for fusion welding
NEN-EN 288-2	Specification and approval of welding procedures for metallic materials - Part 2: Welding procedure specification for arc welding
NEN-EN 288-3	Specification and approval of welding procedures for metallic materials - Part 3: Welding procedure tests for the arc welding of steels
NEN-EN 1092-1	Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, PN designated - Part 1: Steel flanges
NEN-EN 10025-1	Hot rolled products of structural steels – Part 1: General technical delivery conditions
NEN-EN 10025-2	Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels
NEN-EN 10025-3	Hot rolled products of structural steels – Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
NEN-EN 10025-4	Hot rolled products of structural steels – Part 4: Technical delivery conditions for thermo mechanical rolled weldable fine grain structural steels
NEN-EN 10025-5	Hot rolled products of structural steels – Part 5: Technical delivery conditions for structural steels with improved atmospheric corrosion resistance
NEN-EN 10025-6	Hot rolled products of structural steels – Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition
NEN-EN 10028-1	Stainless steels – Part 1: List of stainless steels
NEN-EN 10028-2	Flat products made of steels for pressure purposes.– Part 2: Non-alloy and alloy steels with specified elevated temperature properties
NEN-EN 10028-3	Flat products made of steels for pressure purpose – Part 3: Weldable fine grain steels, normalized
NEN-EN 10028-4	Flat products made of steels for pressure purposes – Part 4: Nickel alloy steels with specified low temperature properties
NEN-EN 10028-5	Flat products made of steels for pressure purposes – Part 5: Weldable fine grain steels, thermo mechanically rolled
NEN-EN 10028-6	Flat products made of steels for pressure purposes – Part 6: Weldable fine grain steels, quenched and tempered
NEN-EN 10028-7	Flat products made of steels for pressure purposes – Part 7: Stainless steels
NEN-EN 10088-1	Stainless steels - Part 1: List of stainless steels
NEN-EN 10088-2	Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes
NEN-EN 10088-3	Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes
NEN-EN 10204	Metallic products - Types of inspection documents
NEN-EN 10241	Steel threaded pipe fittings
NEN-EN 10242	Threaded pipe fittings in malleable cast iron

Number	Title
NEN-EN 12285-2	Workshop fabricated steel tanks - Part 2: Horizontal cylindrical single skin and double skin tanks for the aboveground storage of flammable and non-flammable water polluting liquids
NEN-EN 13160-1	Leak detection systems – Part 1: General principles
NEN-EN 13160-2	Leak detection systems – Part 2: Pressure and vacuum systems
NEN-EN 13160-3	Leak detection systems – Part 3: Liquid systems for tanks
NEN-EN 13445-1	Unfired pressure vessels - Part 1: General
NEN-EN 13445-2	Unfired pressure vessels - Part 2: Materials
NEN-EN 13445-3	Unfired pressure vessels - Part 3: Design
NEN-EN 13445-4	Unfired pressure vessels - Part 4: Fabrication
NEN-EN 13445-5	Unfired pressure vessels - Part 5: Inspection and testing
NEN-EN 13445-6	Unfired pressure vessels - Part 6: Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron
NEN-EN-ISO 2409	Paints and varnishes - Cross-cut test
NEN-EN-ISO 3452-1	Non-destructive testing - Penetrant testing - Part 1: General principles
NEN-EN-ISO 4624	Paints and varnishes - Pull-off test for adhesion
NEN-EN-ISO 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections
NEN-EN-ISO 6520-1	Welding and allied processes - Classification of geometric imperfections in metallic materials - Part 1: Fusion welding
NEN-EN-ISO 8501-1	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
NEN-EN-ISO 9001	Quality management systems - Requirements
NEN-EN-ISO 9606-1	Qualification testing of welders - Fusion welding - Part 1: Steels
NEN-EN-ISO 10675-1	Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys
NEN-EN-ISO 12944-1	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 1: General introduction
NEN-EN-ISO 12944-2	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 2: Classification of environments
NEN-EN-ISO 12944-3	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 3: Design considerations
NEN-EN-ISO 12944-4	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 4: Types of surface and surface preparation
NEN-EN-ISO 12944-5	Paints and varnishes - Corrosion protection of steel structures by protective paint systems Part 5: Protective paint systems
NEN-EN-ISO 14732	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials
NEN-EN-ISO 15607	Specification and qualification of welding procedures for metallic materials - General rules
NEN-EN-ISO 15609-1	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials
NEN-EN-ISO 15609-2	Specification and qualification of welding procedures for metallic materials - General rules
NEN-EN-ISO 15609-3	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials
NEN-EN-ISO 15609-4	Specification and qualification of welding procedures for metallic materials - General rules
NEN-EN-ISO 15614-1	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials
NEN-EN-ISO 17636-1	Non-destructive testing of welds - Radiographic testing - Part 1: X- and gamma-ray techniques with film
PBV P107776	Report “Guideline tank installations for liquids and vapours, underground and aboveground”

Number	Title
RTOD	Dutch Rules for Pressure Vessels

See paragraph 9.1 for an overview of other normative guidelines and publications.

3 Procedure for granting a product certificate

3.1 Initial assessment

The initial assessment to be performed is based on the (product or process) requirements as contained in this evaluation guideline, including the test methods, and comprises the following:

- type testing to determine whether the products comply with the product and/or functional requirements;
- production process assessment;
- assessment of the activities for check on non-stationary storage and dispensing installations;
- assessment of the quality system and the IQC-scheme;
- assessment on the presence and functioning of the remaining procedures.

3.2 Granting the certificate

After finishing the initial investigation, the results are presented to the Decision maker (see paragraph 8.2) deciding on granting the certificate. This person evaluates the results and decides whether the certificate can be granted or if additional data and/or tests are necessary.

4 Productrequirements and test methods

This chapter contains the requirements to be met by the design and production of single and double walled vertical steel tanks for aboveground storage of liquids up to 150 m³. This chapter also featured the test methods to determine the performance requirements.

4.1 Design; drawings and calculations

Besides the requirements set in this evaluation guideline, the design of the tank must be made in accordance with the design codes below:

- NEN-EN 13445.
- ASME-VIII.
- AD-2000.
- Dutch Rules for Pressure Vessels.

Other design codes may be used when agreed with the certification body.

The requirements in the evaluation guideline pertain above those in the design code. By using the design codes, the requirements in the evaluation guideline must be respected. Only one design code must be used. Only when a specific part can't be designed by the chosen design code, an another design code can be used, when agreed with the certification institute.

Before the start of the tank design, the next information is necessary:

- Customer requirements, nominal volume, dimensions, single walled/double walled, location and position, number and location of connections;
- Product information, CAS-no., specific weight of the liquid (density), combustible/not combustible, viscosity, corrosive behaviour of the liquid;
- Local conditions at the place of installation, inside/outside, wind or snow load, atmospheric corrosion conditions, earthquake risk, risk of overflooding;
- Maximum internal pressure due to static liquid load;
- How the tank will be transported to the place of installation;
- Others, as internal coating or liners, isolation or tracing.

Based on the information above, the tank supplier / tank manufacturer shall be determine the next:

- Drawing of the tank;
- The design code to use;
- Methods of calculation for tank and supports, taken into account the information of the liquid to store and the local conditions;
- Material of tank (steel grade) and gaskets to choose based on chemical resistance to the stored product;
- Corrosion allowance and tolerances to dimensions and wall thicknesses after forming;
- Design temperature;
- Requirements to be met for welded connections;
- Motivated choice of external coating;
- Possible need for an internal coating and how this coating is chosen. The chemical resistance to the stored product must be documented.

4.2 Notification of production

Before the start of the production the tank supplier / tank manufacturer shall validate a drawing and calculation. At least five days before the start of the production the tank supplier / tank manufacturer shall inform the certification body with the information below:

- Drawing / tank number;

- Nominal volume (litre);
- Material;
- Design code;
- Diameter (mm);
- Cylindrical height (mm);
- Type of supports;
- Single walled / double walled;
- Product (CAS-no.);
- Specific weight of the product (kg/l);
- Design temperature (°C).

Remark: The certification body will provide in a system for making a notification.
Based on the notification, the certification body will decide whether to plan or not to plan an inspection. A inspection can consists of:

- An check at the basic design information.
- An evaluation during production or a part of the tank production.
- A final inspection to determine the tank performance requirements.
- A combination of the above.

In the case of an inspection, the tank supplier / tank manufacturer is required to share the design criteria, calculations and drawings with the certification body. If the design evaluation is part of the inspection, the certification body will communicate with the tank supplier / tank manufacturer within 5 working days. An evaluation or final inspection to determine the tank performance requirements will be planned in association with the tank supplier / tank manufacturer.

4.3 Requirements for the inner tank

This paragraph contains the requirements for the inner tank of an steel vertical aboveground tank in accordance with this evaluation guideline. The requirements are part of the technical specification of the certified product, mentioned on the declaration of conformity tank.

4.3.1 Dimensions

Volume

Maximum volume is 150.000 litre. The tank supplier / tank manufacturer will give information about the nominal volume of the inner tank (= nominal volume of the tank) with an tolerance of -0% / +5%.
The nominal volume of the inner tank is an calculation of the tank lower end and the cylindrical part of the tank (shell).

Diameter

There are no specific limits for the tank diameter (d1), other than a functional design. The diameter must in accordance with the specific rules of the applicable design code.

Height

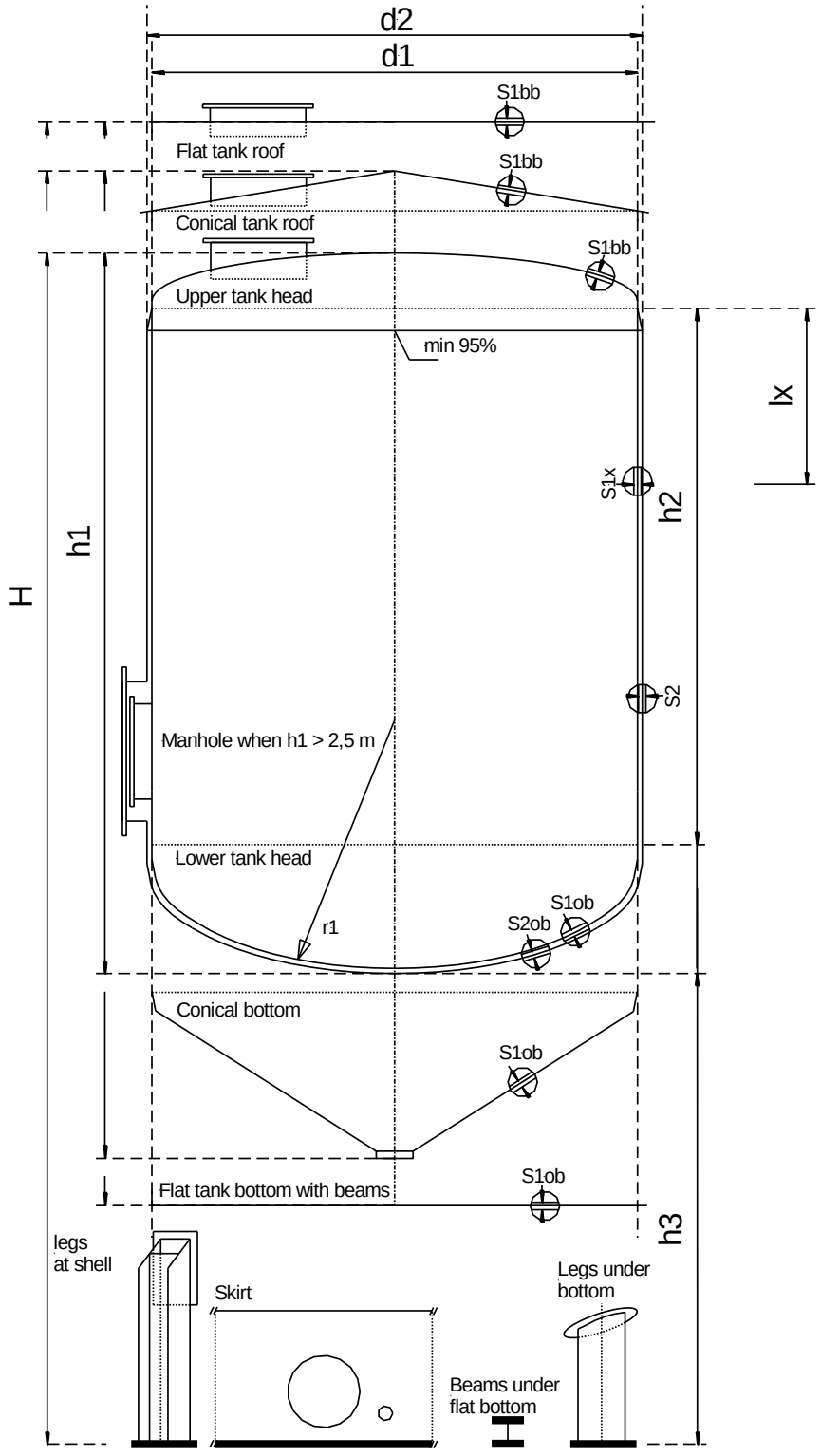
There are no specific limits for the height (h1) of the tank, other than a functional design. The height must in accordance with the specific rules of the applicable design code.

Relation between diameter and height

There are no specific limits for the relation between the tank diameter (d1) and height of the tank, other than a functional design. The relation between diameter and height must be in accordance with the specific rules of the applicable design code. The relation between the tank diameter (d1) and height of the tank can be limited by the maximum tank volume of tanks in accordance with this guideline (150.000 litre).

Wall thickness

The minimum wall thickness of tank parts must be given in mm, rounded to 2 significant figures for thicknesses up to 10 mm and rounded to 3 significant figures for thicknesses equal to or above 10,0 mm.



Drawing 4.3.1: Vertical tank
(Drawing is indicative, elsewhere in this evaluation guideline the possibilities and specific requirements are explained).

d1	=	External diameter of inner tank
d2	=	External diameter of outer tank
H	=	Total height of tank (including supports)
h1	=	Height of inner tank including lower and upper tank end (but without support)
h2	=	Cylindrical height of the tank (excluding lower and upper tank end)
h3	=	Height lowest part of tank to floor (min. 150 mm)
lx	=	Distance measured from highest weld of the tank (weld shell – tank upper part)
s1bb	=	Wall thickness inner tank upper end (head, dished end, cone roof or flat roof)
s1ob	=	Wall thickness inner tank lower end (head, dished end, conical end or flat bottom)
s1x	=	Wall thickness of the shell (inner tank) al location “x”
s2ob	=	Wall thickness of lower dished end (when an dished end is used)
s2	=	Wall thickness of outer tank (including other tank end is used)
r1	=	Crown radius inner dished end

4.3.2 Lower tank end

The lower tank end must be a tori spherical head, semi elliptical head, conical or flat with profiled support.

- Tori spherical head: see DIN 28011.
- Semi elliptical head: see DIN 28013.

Alternatively for tori spherical and semi elliptical heads a conical or flat lower tank end can be used. The flat lower tank end must have a profiled support. Calculations must prove effectiveness of the alternative lower tank ends.

Wall thickness of lower tank end

The wall thickness of the lower tank end (s1ob) is in accordance with the chosen design code.

The next aspects are important to determine the wall thickness of the lower tank end:

- Type of lower tank end (tori spherical head, semi elliptical head, conical with or without knuckle or flat lower tank end with profile support);
- Material used for lower tank end;
- Working temperature of the tank;
- Liquid heights;
- Total load (specific weight of the liquid, weight of the tank and external loads);
- Corrosion allowance;
- Wind load;
- Effect of openings in the head in relation with their position and dimension of nozzle and connections;
- Type and location of supports in accordance with the design code.

When a lower wall thickness is calculated for the lower tank end, a minimum wall thickness (s1ob) of 3 mm is still applicable.

Remark: In the case the design code is given a higher wall thickness, this wall thickness prevail to the wall thickness given above.

Minimum wall thickness after forming of the lower tank end

The lower tank end after forming must be in accordance with the minimum wall thickness as set in this evaluation guideline.

Welds in lower tank end

Welds in the lower tank end must be in accordance with the requirements for welding set in this evaluation guideline. If tank ends are purchased with welds made by companies not working under the quality system for welding adopted by the tank

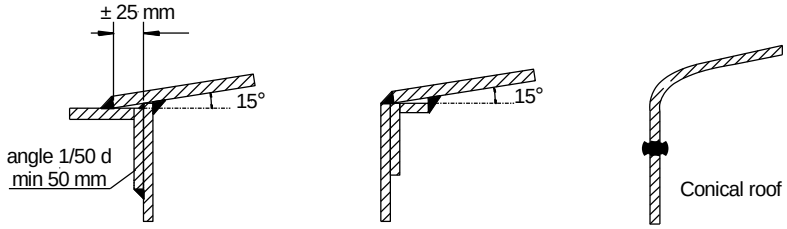
supplier / tank manufacturer, a dye penetrant inspection must be done. This dye penetrant inspection must be in accordance with the requirements for dye penetrant inspection at paragraph 4.12.3 of this evaluation guideline.

4.3.3 Upper tank end

The upper tank end or tank roof can be constructed as mentioned below;

- Tori spherical head: see DIN 28011.
- Semi elliptical head: see DIN 28013.
- Dished end in accordance with EN 12285-2.
- Conical roof.
- Flat roof.

Options for a conical tank roof shown in drawing below.



Drawing 4.3.3: Examples of conical tank roof constructions

Requirements for conical tank roofs

The top angle of a conical tank roof is 150°. Deviate is possible, but must be agreed with the certification body. If a knuckle is used, the radius of this knuckle is between 25 and 75 mm. This knuckle radius is made in such a way that is can be welded to the tank shell with a butt weld.

Wall thickness of upper tank end or tank roof

The wall thickness of the upper tank end or tank roof (s1bb) must be able to withstand a test pressure of 30 kPa. This aspect must be part of the design.

If the design code not provide in a wall thickness for the upper tank end or tank roof, the wall thickness of the upper tank end or tank roof must be equal to the minimum wall thickness of the nearby tank shell.

The outcome must be round up to the first commercial plate thickness.

Access for walking on the top of the tank, balconies and snow load must be taken into account.

When a lower wall thickness is calculated for the upper tank end or tank roof, a minimum wall thickness (s1bb) of 3 mm is still applicable.

Minimum wall thickness after forming of the tank upper end

The tank upper end or tank roof after forming must be in accordance with the minimum wall thickness as set in this evaluation guideline.

Welds in upper tank end or tank roof

Welds in the upper tank end must be in accordance with the requirements for welding set in this evaluation guideline. If tank ends are purchased with welds made by companies not working under the quality system for welding adopted by the tank supplier / tank manufacturer, a dye penetrant inspection must be done. This dye penetrant inspection must be in accordance with the requirements for dye penetrant inspection at paragraph 4.12.3 of this evaluation guideline.

4.3.4 Tank shell (inner tank)

The tank shell must be cylindrical. Vertical welds in the shell inner tank or connected parts shall be offset.

Wall thickness inner tank

The wall thickness of the tank shell (inner tank) (s1) is in accordance with the design code chosen. The outcome must be round up.

When a lower wall thickness is calculated for the tank shell (inner tank), a minimum wall thickness (s1x) of 3 mm is still applicable.
Remark: In the case the design code is given a higher wall thickness, this wall thickness prevail to the wall thickness given above.

The tank shell after forming must be in accordance with the minimum wall thickness as set in this evaluation guideline.

The maximum allowable deviation of the wall thickness must part of the calculation. The tolerances of the purchase plate material must be taken into account.

4.4 Requirements double walled tank

A tank in accordance with this evaluation guideline can be double walled. In this paragraph the product requirements are set for double walled tanks in accordance with this evaluation guideline. If the tank is double walled, the requirement for the inner tank still remain. The requirements are part of the technical specification of the certified product, mentioned on the declaration of conformity tank.

4.4.1 General requirements for double walled tanks

In the case of a leakage, the outer tank must be able to withstand the total liquid height.
Remark: This is based on the principal that in the case of a calamity the double wall is meant as a second containment. In this case the outer tank may deform but doesn't need to be of the same strength as the inner tank.

The outer tank shall cover at least 95 % of the nominal volume of the inner tank

A sufficient amount of leak detection medium must be able to flow freely at places where the outer tank constructively is connected to the inner tank.

Wall thickness of the outer tank

The minimum wall thickness of the outer tank (s2) and the outer lower tank end (S2ob) is 3 mm. The total wall thickness cannot be a product of the wall thickness of the inner and outer tank.
Remark: The outer tank is primarily designed to create a interstitial space for leak detection. Second purpose of the outer tank is the temporary storage of liquid from the inner tank in the case of a leakage. The construction of the outer tank is not meant to be as a storage tank on the longer term. For that reason it may deform. The outer tank can be calculated with a safety factor of 1,5 above the allowable stress.

Requirements for connections in the outer tank

Between the circumferential weld of the inner tank and outer tank a minimum offset distance in longitudinal direction of 20 mm is required.
Between the longitudinal weld of the inner tank and outer tank a minimum offset distance in circumferential direction of 20 mm is required.
When plates of the outer tank are welded with overlap, the required minimal overlap is 5 mm. When the outer tank is welded with overlap, the longitudinal weld must be offset.
Plates of the outer tank may be butt welded.
Remark: A butt welded outer tank can give a better aesthetic impression of the tank.

4.4.2 Interstitial space for leak detection, leak detection connections and leakdetection system

The space between the inner and outer tank will be mentioned as interstitial space.

General points of interest:

- Only tanks with an internal height less than 3,5 meter, and a volume less than 10.000 litre, can be equipped with a liquid leak detection system.
- An alternative double walled manhole can only be used in combination with a vacuum leak detection system in accordance with BRL-K910.

4.4.2.1 Interstitial space

The next requirements pertain to the interstitial space:

- Between the hole inner and outer tank a interstitial space must be present.
- The interstitial space is one, non separated space (compartments are not allowed).
- The interstitial space is compatible for the leak detection system to be used.
- The leak detection medium is suitable to detect leakages at the location of the supports connected to the tank. A special construction is needed. This could be a not fully welded compensation plate or a compensation plate with holes.

4.4.2.2 Leak detection connections

The next requirements are applicable for leak detection connections:

- There shall be at least two sockets at the interstitial space for the leak detection system. The location of sockets must be in order with the recommendations of the certified tank installer and/or supplier of the leak detection system. One of the leak detection sockets shall be located at the highest point of the interstitial space.
- The type of leak detection connections is in accordance with the requirements and installation instruction of the supplier of the leak detection system.
- Leak detection sockets are located in such a way that it will not affect the installation of other pipes.
- When a liquid leak detection system is used, the tank must be equipped with a closed 1” (DN25) connection. This connection is for testing and maintenance, and shall be located at the lowest point of the tank.
  Remark: The connection for testing and maintenance of the leak detection liquid cannot be combined with the two mandatory leak detection connections.

4.4.2.3 Leak detection system

There are two possible leak detection systems.

- Leak detection systems in accordance with BRL-K910;
- Liquid leak detection systems.

Which leak detection system to install, is to be decide by the certified tank installer in accordance with BRL SIKB 7800 / BRL-K903. Requirements regarding leak detection systems in these evaluation guidelines should take in account.
Remark: Tanks in accordance with this evaluation guideline will often be used at chemical and industrial sites. A proper working of the leak detection system is needed. For that reason it is advised to use more accurate BRL-K910 leak detection systems.

For leak detection systems in accordance with the BRL-K910 the next points of interest are applicable:

- When air is used as leak detection medium, the air must be dried. If the air is not dried, moisture and oxygen will enter the interstitial space, which can cause corrosion.
- The kinematic viscosity of the stored liquid may not be more than 5 * 10-3 m²/s when a vacuum leak detection system is used.

- Leak detection for tanks, containing extremely highly flammable, highly flammable and flammable liquids must be in accordance with the ATEX directive.

For liquid leak detection systems the next points of interest are applicable:

- When a liquid leak detection system is used, the tank must be equipped with a closed 1" (DN25) connection. This connection is for testing and maintenance, and shall located at the lowest point of the tank
  Remark: The connection for testing and maintenance of the leak detection liquid cannot be combined with the two mandatory leak detection connections.
- A liquid leak detection system must be able to functioning efficient at an ambient temperature of -20°C to +60°C.
- The leak detection liquid may not be corrosive to the tank material. It must have an expected lifetime of at least 15 years, without losing its properties for leak detection.
- The leak detection liquid may not cause an unexpected reaction with the stored liquid.
- The leak detection liquid must fulfil the requirements of NEN-EN 13160-3.
- To avoid crystallization, glycol based leak detection liquids may not be used in combination with galvanized parts.
- Liquid leak detection system must be provided with an acoustic or visible alarm.
  Note: The liquid level in a leak detection pot can be seen as a visible alarm.

4.5 Height bottom tank - floor

The minimum height bottom tank – floor (h3) is 150 mm.
Remark: This height is necessary for inspection of the lower tank end.

There is no maximum the for bottom tank – floor height. This height influences the strength of the supports. For that reason the height of the supports must be taken into account at the calculation of the supports.

4.6 Manholes

Each tank in accordance with this guideline shall be provided with a manhole in the upper tank end. Tanks with an internal height of more than 2,5 meter must be provided with a manhole in the tank shell.

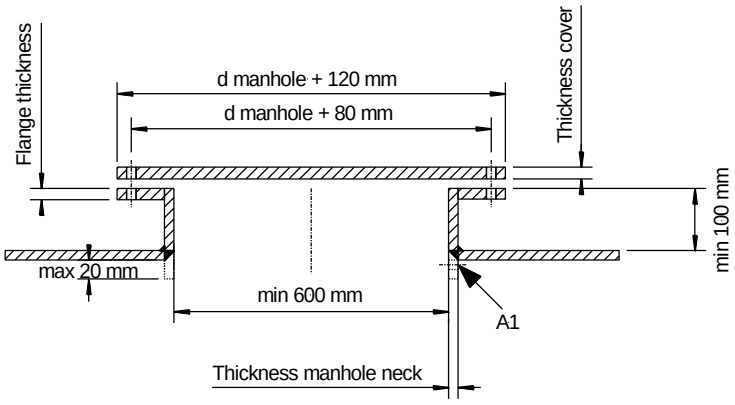
The internal diameter of a manhole shall be at least 600 mm.

Manhole in the upper tank end

The manhole in the upper tank end must be tight at a test pressure of 30 kPa. The manhole shall be easily accessible for an internal inspection. The manhole cover is mounted with a bolt – nut connection. As a deviation the manhole in the upper tank end can be closed with hand wheeled locked manhole cover. Based on specifications of the hand wheeled locked manhole cover and/or calculations, it must be proved that this cover can withstand the minimum test pressure. In the case a hand wheeled locked manhole cover is used, a risk inventory and evaluation must be set up and validated.

General dimensions of manholes

Only set-trough manholes are allowed in the inner tank. See drawing 4.6.1 for the implementation of a set-trough manhole.



Drawing 4.6.1: Set-trough manhole (drawing is indicative)

Manhole components must be in accordance with the minimum requirements set in table 4.6.1. Deviate from this table is possible. In that case a calculation based on NEN-EN 1092 flange is mandatory. When deviate with a NEN-EN 1092 flange all manhole and flange components must be accordingly.

Inner diameter manhole (mm)	Thickness manhole neck (mm)	Bolt hole diameter	Thread size	Number	Flange thickness and cover thickness
600	6	18	M16	32	16
700	7			36	18
800	7			44	20
1000	7			48	20

Mentioned wall thicknesses after forming.

Table 4.6.1: General dimensions of manholes and components

If a hand wheeled locked manhole cover is used (only allowed in the upper tank end), the wall thicknesses for manhole neck, flange- and cover thickness of table 4.6.1 or calculated wall thicknesses still pertain.

Manholes in tanks with an internal height of more than 2,5 meter

A manhole in a tank with an internal height of more than 2,5 meter is necessary for a safe manual entry of the tank. This second manhole does also have an internal diameter of 600 mm, and is located at the lowest position possible in the tank shell. The manhole in the shell is placed in such a way that it is easily accessible.
Only at emphatic request of the user of the tank, it is allowed to deviate from a second manhole in the tank shell. The points listed below must be taken into account:

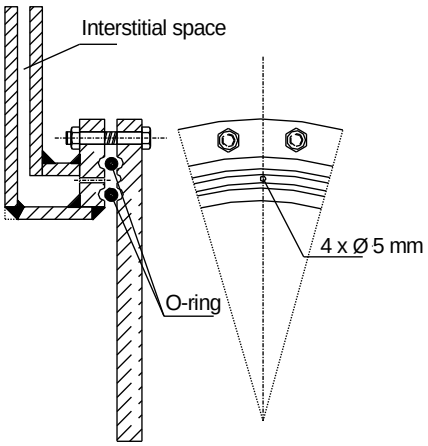
- The user of the tank is informed about the fact that a manual entry of the tank is in contradiction with the health and safety regulations.
  Remark: Tanks filled with dangerous liquids can only entered with safety measures.
- If a manhole in the shell is not provided, the weakness of a manhole opening must be calculated for future installation of a manhole. The location of the manhole to install in the future must be present on the tank drawing. Future manholes may only be installed by certified tank manufacturers.

In general the second manhole in the tank shell must be in accordance with the requirements in table 4.6.1 or a NEN-EN 1092 specified flange is used. This second manhole must withstand the liquid height. The wall thickness of the manhole neck and manhole flange must be calculated with the selected design code.

The manhole in the shell must be tight at the expected pressure caused by the liquid height. To withstand the pressure caused by the liquid height, deviate from this evaluation guideline is possible for the manhole in the shell. Deviate from the internal diameter of the manhole is not allowed. The cover of the second manhole in the shell must be provided with a “davit” or a hinge.

Second manhole in a double walled tank
A double walled tank with an internal height of more than 2,5 meter must also be provided with a second manhole.
This must be a double manhole. The diameter of the manhole in the outer tank must have a diameter of 200 mm bigger than the manhole in the inner tank.

As an alternative for a double manhole as describes above, a manhole as shown in drawing 4.6.2 can be used. This alternative manhole is sealed with a double O-ring. Between the two O-rings, a recess connected with the interstitial space is made. The connection between the recess and interstitial space is made with at least 4 holes with a diameter of 5 mm. One of the holes is located at the lowest point of the circle. This alternative double walled manhole can only be used in combination with a BRL-K910 leak detection system.



Drawing 4.6.2: Alternative double walled manhole (drawing is indicative)

In general the alternative second manhole in the tank shell must be in accordance with the requirements in table 4.6.1 or a NEN-EN 1092 specified flange is used. This alternative second manhole must withstand the liquid height. The wall thickness of the manhole neck and manhole flange must be calculated with the selected design code. As far as welding is concerned, the construction of the alternative manhole must be practically and made in such a way that assembly and disassembly of bolts and nuts is easily possible. The construction of the alternative manhole must be suitable for a proper coating application.

Manhole covers, gaskets and O-rings must be such way that they can provide a sufficient seal for the above mentioned pressures.
Note: The tank will be pressure tested during the installation of the tank. Sealing the manhole cover must be possible without extreme high torque of the bolts.

Manholes in combination with an internal coating
If the tank will be provided with an internal coating, a set-trough of the manhole neck is not allowed. See BRL-K758 for requirements regarding coating suitability.

Set-trough of the manhole

The maximum set-trough of the manhole in tanks without an internal coating is 20 mm. Manholes where the neck extends to more than 20 mm inside the tank shall be provided with a hole of at least 10 mm at the highest point in order to guarantee the free movement of vapours. See detail A1 in drawing 4.6.1.

Flange faces and covers
The flange faces and sealing surfaces of covers openings shall be sufficiently flat after the manufacture of the tank. During assembly, the flange faces and sealing surfaces must fit well together when the flange bolts are normally tightened.
Note: The tank will be pressure tested during the installation of the tank. Sealing the manhole cover must be possible without extreme high torque of the bolts.

Gaskets and O-rings
The combination of manhole covers and gaskets or O-rings achieve a sufficient sealing for the applicable pressures.
Note: The tank and tank connections will be pressure tested during the installation of the tank. Sealing the manhole cover must be possible without extreme high torque of the bolts.

Gaskets and O-rings shall be free of asbestos, of one-piece and without inserts and fully resistant to the stored liquid. The resistance to the stored liquid must be demonstrated and documented by the tank supplier / tank manufacturer.

4.7 Lifting lugs

The tanks shall be provided with at least 2 lifting lugs.
The number and plate thickness of the lifting lugs shall be designed to enable the hoisting of an empty tank without causing unacceptable mechanical stress or permanent deformations to the tank.
Lifting lugs are preferably connected to the inner tank.

The minimum diameter of the hole in lifting lug is 60 mm.
Lifting lugs are located in such a way that it will not affect the installation works.

Additionally to the lifting lugs mentioned above, provisions for placing the tank in up-right position and horizontal transport must be made. These provisions are located at a functional place at the tank.

4.8 Supports

The supports of the tank must be in accordance with the chosen design code.

Remark: In this case the use of design codes trough each other is not allowed. If a design code, for example, only provide in a tank skirt, the tank cannot be placed on legs. If so, the complete tank must be designed with a design code which provide in a support with legs.

The aspects below must be taken into account for calculation of supports:
- Material of supports.
- Material of the tank at the connection of legs to the tank shell.
- Material of the tank lower end at the connection of the legs, tank skirt or beams to the tank bottom.
- Working temperature of the tank.
- Liquid heights.
- Total load (specific weight of the liquid, weight of the tank and external loads).
- Corrosion allowance.
- Wind load.
- Earth quakes.
- Height of the supports (height tank lower end - floor).

- Snow load.
- Type of anchoring.
- Type support (3 or 4 legs under tank bottom / at tank shell, tank skirt, use of brackets).

Wind load
For outside installation the tank, wind load must be taken into account. The tank supplier / tank manufacturer shall be able to submit a calculation. This calculation must be documented. The wind load must be in accordance with the national (Dutch) annex of NEN-EN 1991-1-4 (Eurocode 1).

The points below must be observed:
- Tensile forces must fully be absorbed, when fastened to the floor;
- The extra compressive force at the legs at the “leeward side” as a result of wind load;
- The compressive force at the floor must divided in such a way that the surface pressure doesn’t exceed.

Remark: The installation company is during the installation responsible for the surface and must assign to the tank supplier / tank manufacturer which base is needed.

Earthquake load
If the tank needs to be installed in an area with a potential risk at earthquakes. An additional calculation must be submitted by the manufacturer. This calculation must be documented. The earthquake load in must be in accordance with the national (Dutch) annex of NEN-EN 1998-1 (Eurocode 8).

Snow load
For outside installation the tank, snow load must be taken into account. The manufacturer shall be able to submit a calculation. This calculation must be documented. The snow load in must be in accordance with the national (Dutch) annex of NEN-EN 1991-1-3 (Eurocode 1).

Additional requirements for tank skirt
For inspection and ventilation purposed, the tank skirt must be provided with 2 openings in opposite sides.
One opening must be suitable for inspection. One inspection opening must have an internal diameter of at least 300 mm. If the area behind the tank skirt must be assessable for inspection and maintenance, the dimension are equal to those of an manhole. The manhole diameter is at least 600 mm.
Remark 1: A opening with a diameter of 300 mm is enough for a visual inspection without entry. It is not recommended to choose for an inspection opening with a diameter of 400 mm, as this opening would possibly be used as an opening for entry. In accordance with the health and safety regulations, an opening with a diameter of 400 mm is unsuitable for an internal manual inspection.
Remark 2: A tank with a connection at the bottom part, must always be provided with an opening for entering the tank skirt. In this case a manhole with a diameter of 600 mm is mandatory.

A second opening must have a diameter of at least 80 mm. This second opening is necessary for ventilation. It is not allowed to use this second opening for pipe penetration.

Supports of double walled tanks
Supports of double walled tanks can be fixated to the inner or outer tank.

If supports are fixated to the outer tank, a calculation must prove the sufficient distribution of forces in the outer tank.

When supports are fixated to the inner tank, special provision must be made at the compensation plates. The compensation plates must be a part of the leak detection interstitial space. This can be solved by 2 holes with a minimum diameter of 4 mm, connecting the space behind the compensation plate with the interstitial space.

4.9 Connections

There are no restrictions on the number of connections to the tank. More important are the user requirements. How many and the position of connections must be specified by the BRL SIKB 7800 / BRL-K903 certified installer.

Normally all connections are positioned at the top at the tank. With a motivated reason it is allowed to deviate with connections below the highest liquid level.

The tank is generally provided with the following connections:

- Filling connection;
- Outlet / suction pipe;
- Vent / aeration connection;
- Fluid level indication pipe.
  Remark: With a fluid level indication pipe is meant an internal pipe that ends at the lowest point of the tank and is intended for determining the liquid level in the tank. Water can collect at the lowest point in the tank if the density of the stored liquid is less than water. Tanks without an internal coating and where water can collect at the lowest point are sensitive to corrosion. This water can be detected and removed through this fluid level indication pipe.

Optional connections are possible for fluid level measurement equipment, overfill prevention, temperature and pressure transmitters, other equipment and internals.

4.9.1 Filling connection

- Connection of the filling line is based on user requirements and suitable for an overfill prevention device.
- To avoid pressure surges in the filling line, materials used for filling connections must be suitable for PN16.
- To prevent static electricity during filling, tanks for flammable, highly flammable and extremely flammable liquids are provided with an inner pipe. The end of the inner pipe installed shall have a distance of at least ¼ of the pipe diameter from the bottom of the tank.
- The internal filling pipe of tanks for flammable, highly flammable and extremely flammable liquids are provided with an inner pipe which is ending at a 20 mm lower level than the end of the outlet / suction pipe.
- The end of the internal filling line may be provided with a disk to distribute the liquid stream.
- Based on the product properties and location of the outlet of the filling, the tank wall may be provided with an extra plate for protection.

4.9.2 Outlet / suction pipe

- Openings in the internal pipe of the outlet / suction pipe are not allowed. A suction pipe must be tested at leak tightness.
- To avoid pressure surges in the outlet / suction pipe, materials used for filling connections must be suitable for PN16.
- If the outlet / suction pipe is positioned below the highest liquid level a valve or protection against draining is necessary.

4.9.3 Vent / aeration pipe

- Minimum diameter of the vent pipe is 1½” (DN40), or half the diameter of the filling line if the filling line is bigger than 3” (DN80).
- The vent / aeration line is positioned at the highest possible point of the tank.

4.9.4 Fluid level indication pipe

- Tanks where water can collect at the lowest point, and tanks which must be periodically checked at the presence of water must be provided with a fluid level indication pipe. This pipe is accessible from the top of the tank and is ending at the lowest point of the tank. Having a fluid level indication pipe and an outlet at the lowest point of the tank is not possible.
- The internal fluid level indication pipe of tanks for flammable, highly flammable and extremely flammable liquids are provided with an inner pipe which is ending at a 20 mm lower level than the end of the outlet / suction pipe.
- Gauging by hand must be possible at tanks with liquid fuels.
- The internal pipe of the fluid level indication shall have a 3 mm diameter hole as high as possible and close to the tank wall.
- An extra plate at the tank wall below the fluid level indication pipe is not allowed, as this can influence the yearly monitoring at the presence of water in the tank.

4.9.5 Connections below the highest liquid level

Connections below the highest liquid level are only allowed if provided with a flange connection.

Explanation connections below the highest liquid level: Tanks in accordance with BRL-K756 are mostly used as storage tanks at chemical and industrial sites, where connections below the highest liquid level could be necessary. This doesn't change the environmental risks of connections below the highest liquid level. For that reason it is not recommended to use connections below the highest liquid level, as this could lead to uncontrolled (partial) emptying of the tank content after operational mistakes. Small unobserved leakages in connected pipes or accessories could lead to continuously spill of product to the environment. For this reason deviate with connections below the highest liquid level is only allowed with a motivated reason. For installations at chemical and industrial sites, risk inventory and evaluation is very common and often required. A risk inventory and evaluation must be set up by a BRL SIKB 7800 / BRL-K903 certified installer, in accordance with report P107776 "Guideline tank installations for liquids and vapours, underground and aboveground", based on the process scheme for risk inventory as described in BRL SIKB 7800.

4.9.6 Connections below the highest liquid level at double walled tanks

In principal, penetration of the interstitial space of a double walled tank with a connection is not allowed. As a connection trough the interstitial space is single walled, it could affect the designation "double walled tank". Connections below the highest liquid level in double walled tank is only allowed with a motivated reason. A connection below the highest liquid level in a double walled tank should preferably be double walled, in such a way that the double wall of the connection / pipe is connected with the interstitial space of the tank.

All general requirements for a connection below the highest liquid level are applicable.

4.9.7 Requimement at the construction of the connections

- Connections are welded from both sides.
- Connections are located in such a way that it will not affect the installation or installation works.
- The minimum distance from connection to the edge of the tank is 200 mm. Welded connections may not deform during the welding process.
  Remark: Deforming could lead to problems during the installation phase (un-tightness of treads during pressure tests).
- Flanges must be flat, even after welding (distortion may occur).
- Flanges must be sealed with gaskets. The gasket material shall be free of asbestos, of one-piece and fully resistant to the stored liquid. When supplied by the tank supplier / tank manufacturer, the resistance to the stored liquid must be

demonstrated and documented.

- To avoid distortion and leakages, pipes where threads are made by cutting, must have a sufficient rest wall thickness after cutting.
- The distance of pipe work fitted to the connections, is determined by the biggest diameter of the two connections. This distance (“a”), must be in accordance with NEN-EN 10242 Table 17 "Long sweep bends". This minimum distance is necessary for having enough space to fit the pipework in accordance with BRL SIKB 7800 / BRL-K903.
- The following standards apply to the connections on the tank:
  - Sealing pipe thread in accordance with ISO 7-1.
  - Threaded steel pipes and sockets in accordance with NEN-EN 10241.
  - Seamless steel sockets in accordance with NEN-EN 10242.
  - Flanges, not being the filling and suction line, in accordance with ISO 7005-1 or NEN-EN 1092 (both PN10).

4.9.8 Internals

Internals as heat exchangers, stirrers, pipes etc. are allowed, providing that the tank is still in accordance with this guideline (strenght, temperature range, corrosion, visibility during inspection, accessibility etc.) and as long as other standards are respected.
If due to an internal the tank couldn’t be inspected in a proper way, the lifetime will be reduced to the first re-classification (normally after 15 years).
Heating coils could be possibly subject to the PED regulations. PED approval is not part of this evaluation guideline. A PED declaration falls under the responsibility of the tank manufacturer.

4.10 Material

The steel to be used is considered to be ductile enough. A steel is considered as sufficiently ductile to satisfy if, in a tensile test carried out by a standard procedure, its elongation after rupture is not less than 14% and its notch impact value measured on an ISO V test-piece is no less than 27 J, at a temperature not greater than 20 °C, but not higher than the lowest scheduled operating temperature.
Material grade: Structural steel (S), steel for pressure vessels (P) or high-alloy steel (austenitic stainless steel, duplex etc.).

The material of the tank, the manhole, and the construction of the manhole, shall be resistant to the stored liquid. This must be documented by the tank manufacturer.
Remark: Therefore the evaluation of liquid-material-combination in accordance with Annex B of NEN-EN 12285-1 can be used.

All other externally welded construction parts (not in contact with the liquid), for example supports, must be made of steel suitable for the application.

Basically the material comply with the requirements below. Hereby is also the application of the material mentioned.

- If structural steel is used for the tank, manhole, construction of the manhole and other welded parts, this steel shall at least comply with S235JR according to EN 10025-1 to 6.
- If steel for pressure vessels is used for the tank, manhole, construction of the manhole and other welded parts, this steel shall at least comply with P265 according to EN 10028-1 to 7.
- If high-alloy steel is used for the tank, manhole, construction of the manhole and other welded parts, this steel shall at least comply with 1.4307 (304L) according to EN 10088-1 to 3.

In the case the design code is referring to other material specifications, these specifications must be used for the calculation of the tank. The minimum EN-standard

material specifications are still applicable. The tank supplier / tank manufacturer must prove that the material is “equal” or “better”.
Remark: This could be applicable when ASME is chosen as design code.

An inspection document for the material of the tank, manhole and construction of the manhole must be present. The document is validated by the steel manufacturer’s authorized inspection representative, independent of the manufacturing department. This corresponds to an inspection certificate “type 3.1” of NEN-EN 10204.
Remark: Inspection documents based on a specific inspection “type 3.2” of NEN-EN 10204 or with a PMA (Particular Material Appraisal) can be also accepted for sheet material.

Material tank connections
The material of tank connections, shall be resistant to the stored liquid. To avoid galvanic corrosion the connections must not be able to form a galvanic element with the material of the tank. An inspection certificate “type 3.1” of NEN-EN 10204 is reasonably for the material used at the supplied tank connections.
Comment: PED is used as reference to interpret “reasonably”. In accordance with the PED a test certificate is not required for small connections.

4.11 Fabrication of the tank

During the fabrication of the tank, the following requirements pertaining to the processes used, qualification of personnel and the associated inspection shall apply.

4.11.1 Rolling of the shell

The allowed tolerance of the nominal diameter of the inner tank (d1) is ± 1,5%.
If in doubt, the roundness of the tank must be determined by two perpendicular measurements at the place of the suspected deviation.

4.11.2 Carbon steel contamination of high-alloy steel

Carbon steel contamination must be removed from tanks made of high-alloy steel.
If the surface of the sheet material has not been damaged or contaminated with carbon steel particles, then it is sufficient to pickle the weld seams only. After pickling and completely removing the oxide layer / impurities, the high-alloyed steel must be passivated.
If the machines and tools used for production are also used for the manufacture of carbon steel products, then the high-alloyed steel tank shall on completion be both pickled and passivated both internally and externally.
The procedure for pickling and passivating must be documented in a procedure.

4.11.3 Preparation of weld seams

The weld seam preparation shall be in accordance with the welding procedure specification.

4.11.4 Welding procedure specification and welding procedure qualification

The tank manufacturer shall demonstrably have approved welding procedures for all welds that are used for the production of the tanks in accordance of this evaluation guideline.

Welding procedure specification
The welding procedure specification must comply with:

- NEN-EN-ISO 15609-1 “Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding”;
- NEN-EN-ISO 15609-2 “Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 2: Gas welding”;

- NEN-EN-ISO 15609-3 “Specification and qualification of welding procedures for metallic materials - Welding procedures specification - Part 3: Electron beam welding”;
- NEN-EN-ISO 15609-4 “Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 4: Laser beam welding”.

Remark: Welding procedure specifications prior to 2004 do not meet the above requirements. NEN-EN-ISO 15609 has replaced NEN-EN 288. It is possible that NEN-EN 288 welding procedure specifications are rewritten in accordance with NEN-EN-ISO 15609, but this is only possible if all the relevant parameters of the original WPS are well documented. The tank manufacturer shall have to demonstrate this. In all other cases the welding procedure specification shall have to be rewritten and tested again.

The tank manufacturer must maintain a documented system in which the welding procedure specification can be traced to the welding procedure qualification.

Welding procedure qualification

The welding procedures must be qualified according to the following standards:
- NEN-EN-ISO 15607 "Specification and qualification of welding procedures for metallic materials - General rules";
- NEN-EN-ISO 15614-1 "Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys".

The welding procedure qualification shall be assessed by an independent body, selected by the tank manufacturer and accepted by the certification body.

4.11.5 Welder qualifications

The qualifications of welders and operators of welding machines shall meet:
- NEN-EN-ISO 9606-1 “Qualification testing of welders - Fusion welding - Part 1: Steels”;
- NEN-EN-ISO 14732 “Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials”.

The initial qualification of a welder or operator of welding machines shall be issued by an independent body, selected by the tank manufacturer and accepted by the certification body.
An extension of the welding qualification shall be issued by an independent body, selected by the manufacturer of the tank manufacturer and accepted by the certification body.

Every 6 months the tank manufacturer will document that the welder or operator of a welding machine is still working within the scope of the welding qualification (confirmation).

The tank manufacturer shall have a documented system in which welders’ qualifications are managed and maintained. The issue, the extension and the confirmation of the welder qualifications shall be documented.

4.12 Inspection of welding work

After completion, the welds shall be visually assessed.
The welds shall be exanimated by means of radiographic testing at 10% of all tanks produced in accordance with this guideline. Additionally dye penetrant testing could be applicable.

4.12.1 Visual inspection of welds

The welding shall be visually inspected per tank, including supporting construction and other welded parts.

For visual welding inspection the standards below are applicable:

- NEN-EN-ISO 6520-1 “Welding and allied processes - Classification of geometric imperfections in metallic materials - Part 1: Fusion welding”.
- NEN-EN-ISO 5817 “Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections”.

The weld shall at least meet the requirements of NEN-EN-ISO 5817 quality level C.

The visual welding inspection shall be carried out by a person who is demonstrably qualified for this work, for example VT level 1 or VT level 2 or equivalent. The visual welding inspection is not carried out by a person who was directly involved in the welding of the tank.
The visual welding inspection may also be carried out by an external inspection agency that has been selected by the tank manufacturer and accepted by the certification body.

A report of the visual welding inspection that is traceable to the tank under investigation shall be made available.

4.12.2 Radiographic testing

The welds of tanks in accordance with this evaluation guideline shall be randomly inspected by means of a radiographic testing.

The sample size of radiographic testing is 10% of all tanks produced in accordance with this evaluation guideline. This means that 1 out of 10 produced tanks in accordance with this evaluation guideline must be tested radiographically.
Remark: Radiographic inspection at tanks produced not in accordance with this evaluation guideline and inspections at sample plates are not count in the sample size.

For radiographic testing the standards below are applicable:

- NEN-EN-ISO 17636-1 “Non-destructive testing of welds - Radiographic testing - Part 1: X- and gamma-ray techniques with film”;
- NEN-EN-ISO 10675-1 “Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys”.

The radiographic testing shall be performed in accordance with NEN-EN-ISO 17636-1 Class B. A radiographic test on a tank consists of two X-rays. A film on which the longitudinal seam is photographed at the location of an intersection and a film on which the circumference seam is photographed at the location of an intersection.

The examined welds shall at least comply with NEN-EN-ISO 10675 Class 2 (corresponds to NEN-EN-ISO 5817 Level C).

The radiographic testing shall be carried out by a person who is demonstrably qualified for this work, for example RT level 1 or RT level 2 or equivalent. The assessment of a radiographic testing shall be performed by a person who is demonstrably qualified for this work, for example RT level 3 or IWE or equivalent. The assessment is not carried out by a person who was directly involved in the welding of the tank.

The radiographic testing may also be carried out by an external inspection agency that has been selected by the manufacturer of the tank and accepted by the certification body.

A report of the radiographic examination that is traceable to the tank under investigation shall be made available.

Radiographic examination during the initial assessment
During the initial assessment tank manufacturers must examinate the first 5 tanks radiographically as described above.

4.12.3 Dye penetrant testing

Where indicated in this evaluation guideline, purchased tank parts with welds, must be inspected by the means of dye penetrant inspection.

For dye penetrant testing the standard below is applicable:

- NEN-EN-ISO 3452-1 “Non-destructive testing - Penetrant testing - Part 1 General principles”.

The examined welds shall at least comply with NEN-EN-ISO 5817 Level C (average).

The dye penetrant testing shall be carried out by a person who is demonstrably qualified for this work, for example PT Level 1 or equivalent. The assessment of a dye penetrant testing shall be carried out by a person who is demonstrably qualified for this work, for example PT Level 2 or equivalent. The assessment shall not be carried out by a person who was directly involved in the welding of the tank.
If the supplier of the purchased part of the tank wants to take care of the dye penetrant inspection, the test must be done by an external inspection agency. This inspection agency must be accredited.

A report of the dye penetrant examination that is traceable to the tank part shall be made available.

4.12.4 Inspections and testing resulting in rejections (general)

All errors found shall be repaired. The repaired area shall be re-inspected and assessed. The principles of this assessment is equal to the assessment at the original imperfection. If defects found during radiographic testing, and run to the edge of the film, the adjacent areas must also be photographed. If errors are also found in these areas, 100% of the relevant weld must be photographed. Reports of re-inspection are not count in the sample size.
The tank manufacturer must set up a register of examinations with rejections. Investigation and corrective actions must be made by the tank manufacturer in the case of a high number of welding imperfections.

4.13 Testing

All tanks shall be pressure tested for leak tightness. For safety reasons, an pressure test with water is an alternative for pressure test with air. The interstitial space must be always tested with air.

4.13.1 Pressure test tank with air

The pressure test with air shall be performed before the application of an internal or external coating.

The tank test pressure is 30 kPa (0.3 bar) air. The test pressure is checked by means of a manometer, of which the accuracy is traceable to a calibration standard.

General testing sequence of the tank pressure test with air:

- Pressurize the tank.
- When the correct test pressure has been reached, the air supply (valve) on the tank shall be shut off and the compressed air supply shall be disconnected.

- Wait until the pressure has stabilized (due to temperature and setting of plates).
- After stabilization, the pressure must be maintained for at least 15 minutes. No inexplicable pressure drop may occur.
- In the meantime the connections, the manhole seals and all welds shall be checked for leak tightness using a water and soap solution.
- Leakages must be repaired and re-tested in the same way as described above.

Remark 1: No permanent deformation of the tank shall occur as a result of this test.
Remark 2: The tank including the manhole cover to be supplied shall be "airtight".

The tank is determined to be leak tight when there is no inexplicable loss of pressure during the test and when no leaks are visible when the tank is being tested with the water and soap solution.

The pressure test is not performed by the person who was directly involved in the production of the tank.

A registration or report of the pressure test, which can be traced back to the tested tank, shall be available.

4.13.2 Pressure test with water

For safety reasons, a pressure test with water can be done. The complete tank must be filled with water, with an extra overpressure of 2 kPa (20 mbar).

The pressure test with water shall be performed before the application of an internal or external coating.

The test pressure of 2 kPa (20 mbar) is checked by means of a manometer, of which the accuracy is traceable to a calibration standard.

General testing sequence of the pressure test with water:
- Fill the tank with water completely.
- Keep the water level for at least 1 hour.
- An air supply and manometer is mounted at one of the connections on top of the tank.
- Bring the tank at the required pressure.
- When the correct test pressure has been reached, the air supply (valve) shall be shut off.
- Connections, the manhole seals and all welds at the top of the tank shall be checked for leak tightness using a water and soap solution.
- The tank is checked at visible water leakage.
- Leakages must be repaired and re-tested in the same way as described above.

Remark 1: No permanent deformation of the tank shall occur as a result of this test.
Remark 2: The tank including the manhole cover to be supplied shall be "tight".

The tank is determined to be leak tight when there is no visual water leakage and inexplicable loss of pressure during the test and when no leaks are visible when the tank is visually inspected.

The pressure test is not performed by the person who was directly involved in the production of the tank.

A registration or report of the pressure test with water, which can be traced back to the tested tank, shall be available.

4.13.3 Pressure test double walled tank with air

Both tank and interstitial space must be "tight" at double walled tanks.

The pressure tests shall be performed before the application of an internal or external coating.

Test pressure for the tank is 30 kPa (0.3 bar) air.
Test pressure for the interstitial space is 40 kPa (0.4 bar).

The test pressure is checked by means of a manometer, of which the accuracy is traceable to a calibration standard.

The pressure test must be performed in an efficient way. For double walled tanks the pressure test procedure below must be followed. General testing sequence for a double walled tank:

- When the inner tank is ready, it is brought to an overpressure of 30 kPa and checked for leaks by means of a soap solution.
  Remark: Alternatively, the welds of the tank that will no longer be visible when the double wall has been installed can be tested by means of a dye penetrant examination.
- A record of this test, that is traceable to the tested tank, shall be made.
- After the entire tank (inside and outside tank) has been finished, the inside tank is brought to an overpressure of 30 kPa and the visible welds of these are tested using a water and soap solution.
- After pressurizing the inner tank, wait until the pressure has stabilized (due to temperature and settling of plates).
- After stabilization, the pressure must be maintained for at least 15 minutes. No inexplicable pressure drop may occur.
- With the pressure still on the inner tank, the interstitial space is pressurized to an overpressure of 40 kPa.
- The interstitial space must also be stabilized for at least 15 minutes. No inexplicable pressure drop may occur.
- All welds at the outside of the tank must be tested using a water and soap solution.
- If no leaks are found, the pressure is first removed from the interstitial space.
- Finally, the inner tank is then made pressure less.
- Leakages must be repaired and re-tested in the same way as described above.

Remark 1: No permanent deformation of the tank shall occur as a result of this test.
Remark 2: The tank including the manhole cover to be supplied shall be "airtight".

The tank and interstitial space is determined to be leak tight when there is no inexplicable loss of pressure and when no leaks are visible when the tank is being tested with the water and soap solution.

The pressure test is not performed by the person who was directly involved in the production of the tank.

A registration or report of the pressure test, which can be traced back to the tested tank, shall be available.

4.13.4 Test for leak tightness of welded suction pipes

A leak in a welded suction pipe shall result in the suction pump being unable to pump the stored fluid.
The connections of suction pipes in and on the tank shall be tight and sufficiently robust so that no leakage occurs due to deformation after the fitting of the pipework.

4.13.5 Pressure test manhole covers

Manhole covers can be tested separately. The tank manufacturer must set up an procedure for this test. This procedure must be approved by the certification body

before it is used. The pressure test must be performed with the same gasket as purchased to the client for the final installation.

4.14 External protection carbon steel tanks

The outside of a carbon steel tank in accordance with this evaluation guideline must be protected against corrosion. For this purpose, a durable paint system with a life expectancy of at least 5 years (= middle), suitable for the atmospheric corrosion category at the location of installation.

The applicable atmospheric corrosion category will be determined by the tank installer based on the conditions at the locations of installation.

Even without the determination of the tank installer the minimum requirements below are applicable:

- The minimum protection by the paint system of a carbon steel outdoor installed tank must be suitable for urban and industrial atmospheres, moderate sulphur dioxide pollution; coastal areas with low salinity. This means atmospheric corrosion category C3 in accordance with EN-ISO 12944.
- The minimum protection by the paint system of a carbon steel indoor installed tank must be suitable for unheated buildings where condensation can occur. This means atmospheric corrosion category C2 in accordance with EN-ISO 12944

Requirement for the application of the paint system.
Below the requirements for the application of the paint system.

- The paint system to use must be documented in the IQC-scheme (required moments for measuring and measurement equipment), including the documentation of the paint supplier. In this documentation the life expectancy is declared.
- The surface must be cleaned and blasted to minimum cleanness Sa 2½ in accordance with EN-ISO 8501-1.
- The roughness of the surface must be in accordance with the specification of th paint supplier. Registration of the measured roughness must be traceable to the tank.
- Manage the required conditions during the application of the paint (tank temperature, ambient temperature, relative humidity, dew point).
- Information regarding the highest and lowest dry film thickness and the minimum and maximum overcoating time.
- A procedure for aftercare (in the case repairs are necessary at a damaged tank). This procedure must give information of the initial paint system used, and recommendations for the repairment, including preparation of the surface and precautions).
- The adhesion of the paint system shall be tested by a cross cut test in accordance with EN-ISO 2409. A procedure for this test must be documented. The test frequency must be set in the IQC-scheme. Minimum required is class 2 in accordance with EN-ISO 2409.
  Remark: If a cross cut test can't be performed, in case of a DFT higher than 250 µm, a dolly test in accordance with EN-ISO 4624 must be done.
- The design of the tank may not influence the application of the paint system. All surfaces to paint must have easy access and sharp edges must be avoided.
- It is not allowed to use different paint systems through each other.

The external coating must be suitable for the use inside of the temperature range of the tank.

Optionally a tank in accordance with this evaluation guideline can be provided with an external paint system in accordance with BRL-K790 scope 6.

A external coating is not applicable for tanks made of stainless steel.

4.15 Internal protection

The inside of the tank can be provided with an internal coating. Tanks for the storage of liquid petroleum fuels shall be applied with an internal coating in accordance with BRL-K779 ”Internal coating of steel tanks for flammable liquids". If the used coating is certified in accordance with BRL-K779, it is proved that it is suitable. A internal coating must be applied in accordance with BRL-K790 “Application of coating systems to steel pipes or steel storage tanks for liquids”. When a company is certified in accordance with BRL-K790, it also fulfils to the requirement of this evaluation guideline.

The design of tanks to apply with an internal coating must be in accordance with the coating suitability of metal products to be coated. Requirements can be found in BRL-K758 “Coating suitability of metal products to be coated”.

In the case a BRL-K779 certified internal coating is not resistant for the liquid to be stored in the tank, an different coating can be used. In this case a BRL SIKB 7800 / BRL-K903 certified installer set up an risk Inventory and evaluation.

The internal coating must be suitable for the use inside of the temperature range of the tank.

4.16 Tank with isolation and/or external heating (tracing)

Optionally, a tank in accordance with this evaluation guideline can be provided with a thermal isolation or external heating (tracing). The requirements for external protection of carbon steel tanks still remain if the tank is provided with a thermal isolation or external heating (tracing). The external paint must be suitable for the temperatures.

4.17 Marking of the tank

All tanks in accordance with this evaluation guideline must be provided with a corrosion-resistant identification plate. The identification plate must be affixed to the manhole, manhole neck or on an underlying steel strip that is welded to the tank. A unique tank number must be present on the identification plate.
Marking with the certification mark is also described in chapter 5 of this evaluation guideline.

4.18 Identification plate

The information below shall be provided on the identification plate:

- Name of the certified tank supplier / tank manufacturer and/or his trade mark; *Remark: Optionally the name of the installer may be mentioned, if this installer is certified in accordance with BRL SIKB 7800 / BRL-K903.*
- Tank number;
- Year of manufacture (will not apply if the tank number provides this information);
- BRL-K756;
- Nominal volume of the tank;
- Design pressure (atmospheric) of the tank;
- Design temperature of the tank;
- The maximum specific weight of the liquid to be stored;
- Type of coating;
- Kiwa-mark.

4.19 Drawing; user instructions

The tank supplier must supply instructions for the use of the tank and draw the users' attention to those aspects that may endanger humans, animals and/or the environment. Also, aspects that may have a negative effect on the life expectancy, as well as all other aspects that the tank supplier deems worth mentioning shall be included in these instructions.

At least the following aspects shall be included in the instructions for use of the tank:

- Proposed use of the tank and the liquid to be stored in it.
- The materials used, tank material, gaskets and the (internal) pipework.
- Reference to the “as built” drawing.
- Reference to, and explanation of the tank declaration of conformity.
- Important information is to be recorded prior to the delivery of the tank in order to prevent misunderstandings (such as volume, single-walled or double walled construction, choose of material, gasket material, etc.).
- Information on the external corrosion protection provided on carbon steel tanks (atmospheric corrosion category, environmental conditions, life expectancy at the place of installation, etc.).
- Information on the internal corrosion protection (internal coatings or linings).
- Lifting instructions.
- Hoisting plan for put the tank in up-right position.
- Guidance for the user pertaining to the leak detection parts supplied by the tank supplier / tank manufacturer, such as volume of interstitial space, maximum allowed pressure, expansion of the interstitial space, size of the liquid reservoir, installation of it, periodically maintenance and who can carry out the maintenance (BRL SIKB 7800 / BRL-K903 certified installers).
- Warning regarding the maximum pressures allowable in the tank and the interstitial space. The interstitial space is not designed for high pressures. Pressures above 40 kPa (0.4 bar (g)) can lead to the implosion of the inner tank.
- Leak detection systems operated by air could cause corrosion in the interstitial space if the air is not dried.
- In the case a vacuum leak detection is used, the kinematic viscosity of the store liquid may not above $5 * 10^{-3}$ m²/s.
  Note: By vacuum leak detection it is not allowed that stored liquid or their vapour cause a failure of the system. This could happen if the liquid or vapour is in contact with the leak detector. It is also not allowed the liquid or vapour cause a pollution nearby the tank.
- Information and advice for use of internals, thermal isolation and tracings.

Drawings, tank data and declarations of conformities must be retained by the holder of the certificate for at least 10 years.

4.20 Transport, handling, after care

Upon delivery, the tank shall be internally brush clean.

All unused connections shall be closed prior to transport.

While awaiting delivery to the buyer, the tank supplier / tank manufacturer shall provide suitable storage locations or warehouse space to prevent damage or deterioration of the quality of the tank.

The tank supplier / tank manufacturer is responsible for loading and transporting the tank (or outsourcing it) from the production site to the place of destination and the unloading on site, unless otherwise contractually agreed with the buyer.

Remark: Only empty lifting of the tank. The maximum angle at hook is 60°. During lifting the interstitial space may be filled with leak detection liquid.

General / piping
If supplied with, the tank supplier / tank manufacturer shall clearly mark the fluid level indicator connection(s).

4.21 Installation

How an aboveground tank shall be installed is stipulated in BRL-K903 “Regulation on the Approval of Installers for the Tank Installation” (Regeling Erkenning Installateurs Tankinstallatie) / BRL SIKB 7800 “Tank installations” (Tankinstallaties) and PGS 30. The certified tank supplier must give information regarding the mandatory issuance of an installation certificate besides the declaration of conformity to prove that the tank installation is in accordance with local laws and regulations.

5 Marking

5.1 General

Each product shall be indelibly marked with the following marks and identification:

- manufacturers name and/or trade mark;
- date of production or -code (tank number);
- type description.

5.2 Certification mark

After entering into a certification agreement with Kiwa, the product shall be indelibly marked with the certification mark. See paragraph 4.17 and 4.18 of this evaluation guideline.

6 Quality system requirements

This chapter contains the requirements which shall be fulfilled by the tank supplier's / tank manufacturer's quality system.

6.1 Manager of the quality system

Within the tank supplier's / tank manufacturer's organisational structure an employee shall be responsible for managing the manufacturer's quality system.

6.2 Internal quality control / quality plan

As part of the quality system the tank supplier / tank manufacturer must implement an internal quality control scheme (IQC-scheme).

In this IQC-scheme the following shall be demonstrably recorded:

- which aspects are inspected by the manufacturer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

The IQC-scheme shall have an index, the version date and number and be validated by the person with the final responsibility within the organisation. This IQC-scheme shall be in the format as shown in the annex III. The schedule must be detailed in such a way that it provides the certification body with sufficient confidence that requirements will be continuously fulfilled.

At the time of the initial audit, the IQC-scheme shall have functioned for at least 1 month.

6.3 Procedures and working instructions

The tank supplier / tank manufacturer shall be able to submit the following:

- procedures for:
  - dealing with products with deviations;
  - corrective actions to be taken if non-conformities are found;
  - dealing with complaints concerning products and/or services delivered.
- the working instructions and inspection forms used.

<u>Products or services with deviations</u>

The tank supplier / tank manufacturer shall have a procedure covering products with deviations in order to prevent any deviations in the production process from influencing the quality of the final product.

<u>Corrective actions</u>

The tank supplier / tank manufacturer shall have a procedure for taking the necessary corrective actions in the case of non-conformities. The cause of the non-conformity shall be investigated, and feedback given to the relevant department.

<u>Complaints procedure</u>

The tank supplier / tank manufacturer shall have a procedure covering the handling of complaints concerning the product delivered. This procedure shall include at least the following points:

- A written procedure for handling complaints.
- A person responsible shall be assigned within the company for handling complaints.
- Complaints shall be registered.
- Feedback shall be given to the relevant department as a result of complaints.
- The corrective measures resulting from the complaints shall be recorded.

6.4 Registration / checklist

During production, the processes used and the inspections and tests carried out shall be recorded on a checklist.

6.5 Management of test and measuring equipment

The tank supplier / tank manufacturer shall determine which test and measuring equipment are required in order to demonstrate that the product meets the requirements of this evaluation guideline.

When necessary, and where indicated in this evaluation guideline, test and measuring equipment shall be calibrated at specified intervals.

The tank supplier / tank manufacturer shall assess the validity of the previous tests and measurements made if the calibration reveals that the testing or measurement equipment is not functioning properly.

The test and measuring equipment shall be provided with an identification with which the calibration status can be determined.

The tank supplier / tank manufacturer shall record the results of all calibrations.

The tank supplier / tank manufacturer shall have the necessary test and measuring equipment. These resources shall also be made available to the site assessor of the certification body. This includes amongst others the equipment for pressure testing, wall thickness measurements, lighting with the required light intensity for tank inspections, coating thickness meter etc.

6.6 Other requirements for the quality system

The tank supplier / tank manufacturer shall be able to submit the following:

- The organisation's organogram;
- Qualification requirements of the personnel concerned.

Quality system

If an organization has a quality system based on NEN-EN-ISO 9001, then where possible, reference can be made to procedures or instructions that form part of this quality system.

Changes

The certification body (Kiwa) shall be informed in the event of changes that may have consequences for the quality of the products (including design changes or changes in production) and processes. The certification body (Kiwa) then determines whether additional evaluation is required.

Work instruction and procedures

In addition, the following working instructions and/or essential forms, used during the manufacturing process, may be added to the IQC-scheme and / or documented quality system:

- A documented system for the welding procedures;
- A documented system for the management and maintenance of welder qualifications;
- A model report for the visual inspection of the welding work;
- A model (report) which confirms that the pressure test has been carried out;
- A production card that shows the present stage of production.

Documents / drawings

Tanks shall be produced on the basis of an approved and authorized design that is detailed in documents / drawings. The documents must be authorized by a qualified employee of the organisation.

Old documents / drawings must be removed.
Retention period of data must be set.

Tank declaration of conformity
The tank supplier / tank manufacturer shall, upon delivery of the tank, prepare a declaration of conformity and make this available to the purchaser. The certification body will provide instructions for the preparation of the declaration of conformity tank. At the validation date of this evaluation guideline the next instruction was available: “Handleiding voor de Kiwa portal voor het aanmelden van tank- en tankbakcertificaten – tankconformiteitsbewijzen conform BRL-K744, BRL-K747, BRL-K756, BRL-K792, BRL-K796, BRL-K797 en BRL-K798" (only in Dutch).

7 Summary of tests and inspections

Below a summary of the tests and inspections to be carried out by the certification body out in the event of certification:

- **Initial investigation:** tests in order to ascertain that all the requirements recorded in the evaluation guideline are met;
- **Inspection test:** tests carried out after the certificate has been granted in order to ascertain whether the certified products continue to meet the requirements recorded in the evaluation guideline;
- **Inspection of the quality system of the supplier:** monitoring compliance of the IQC-scheme and procedures.

7.1 Test matrix

Description of requirement	BRL article	Class	Investigation carried out for		
			Initial investigation	Inspection by certification body after certification	
				Inspection test	Frequency
Product requirements					
Design; drawings and calculations	4.1	2	Yes	Yes	1 x per year
Notification of production	4.2	2	Yes	Yes	Inspection based on notification of production
Requirements for the inner tank	4.3	2	Yes	Yes	1 x per year
Requirements double walled tank	4.4	2	Yes	Yes	1 x per year
Height bottom tank – floor	4.5	2	Yes	Yes	1 x per year
Manholes	4.6	2	Yes	Yes	1 x per year
Lifting lugs	4.7	2	Yes	Yes	1 x per year
Supports	4.8	2	Yes	Yes	1 x per year
Connections	4.9	2	Yes	Yes	1 x per year
Material	4.10	2	Yes	Yes	1 x per year
Fabrication of the tank	4.11	2	Yes	Yes	1 x per year
Rolling of the shell	4.11.1	2	Yes	Yes	1 x per year
Carbon steel contamination of high alloy steel	4.11.2	2	Yes	Yes	1 x per year
Preparation of weld seams	4.11.3	2	Yes	Yes	1 x per year
Welding procedure specification and welding procedure qualification	4.11.4	2	Yes	Yes	1 x per year
Welder qualifications	4.11.5	2	Yes	Yes	1 x per year
Inspection of welding work	4.12	2	Yes	Yes	1 x per year
Inspection of welding work; visual inspection of welds	4.12.1	2	Yes	Yes	1 x per year
Inspection of welding work; radiographic testing	4.12.2	2	Yes	Yes	1 x per year
Inspection of welding work; dye penetrant testing	4.12.3	2	Yes	Yes	1 x per year
Inspection of welding work; inspections and testing resulting in rejections (general)	4.12.4	2	Yes	Yes	1 x per year
Testing (*1)	4.13	1	Yes	Yes	1 x per year
External protection carbon steel tanks	4.14	2	Yes	Yes	1 x per year
Internal protection	4.15	2	Yes	Yes	1 x per year
Tank with isolation and/or external heating (tracing)	4.16	2	Yes	Yes	1 x per year
Marking of the tank	4.17	2	Yes	Yes	1 x per year
Identification plate	4.18	2	Yes	Yes	1 x per year
Transport, handling, after care	4.20	3	Yes	Yes	1 x per year

Installation	4.21	3	No	No	n/a
Quality management requirements					
Manager of the quality system	6.1	2	Yes	Yes	1 x per year
Internal quality control / quality plan	6.2	2	Yes	Yes	1 x per year
Procedures and work instructions	6.3	2	Yes	Yes	1 x per year
Registration / checklist	6.4	2	Yes	Yes	1 x per year
Management of test and measuring equipment	6.5	2	Yes	Yes	1 x per year
Other requirements for the quality system	6.6	2	Yes	Yes	1 x per year

(*1) These aspects must be performed by the supplier and witnessed by the site assessor during the inspection.

Note: Non-conformities may be found during the inspection visits. These non-conformities are classified according to the following classes:

1 = Critical: These non-conformities can result in dangerous or unsafe situations. The supplier shall, in consultation with the certification body, take the required corrective actions within two weeks. Exceeding this period shall result in a suspension of the certificate.

2 = Important: These non-conformities affect the quality of the product in the longer term. The supplier shall, in consultation with the certification body, take the required corrective actions within three months. Exceeding this period shall result in a suspension of the certificate.

3 = Less important: These non-conformities are less important but shall be corrected in the long term. This is checked by the certification body during the next inspection visit.

7.2 Inspection of the quality system

The quality system of the manufacturer will be checked by the certification body (Kiwa). The inspection consists of at least those aspects mentioned in the Kiwa Regulations for Certification.

8 Agreements on the implementation of certification

8.1 General

Beside the requirements included in this Evaluation Guideline, the general rules for certification as included in the Kiwa Regulation for Product certification shall also apply.

These rules are in particular:

- The general rules for conducting the initial investigation, in particular:
  - the way suppliers are to be informed about how an application is being handled;
  - how the investigation is conducted;
  - the decision to be taken as a result of the initial investigation.
- The general rules for conducting inspections and the aspects to be audited.
- The measures taken by the certification body in case of non-conformities.
- The measures taken by the certification body in case of improper use of Certificates, Certification Marks, Pictograms and Logos.
- Terms for termination of the certificate.
- The possibility to lodge and appeal against decisions or measures taken by the certification body.

8.2 Certification staff

The staff involved in the certification may be sub-divided into:

- Certification assessor (CAS): in charge of carrying out the initial investigation;
- (Application) Reviewer: in charge with the application for certification and review of reports form certification and site assessors;
- Site assessor (SAS): in charge of carrying out external inspections at certified companies works;
- Decision maker (DM): in charge of taking decisions in connection with initial investigations carried out, continuing the certification in connection with the inspections carried out and taking decisions on the need to take corrective actions.

8.2.1 Qualification requirements

The qualification requirements consist of:

- qualification requirements for personnel of a certification body which satisfies the requirements of EN ISO/IEC 17065, performing certification activities;
- qualification requirements for personnel of a certification body performing certification activities set by the Board of Experts for the subject matter of this Evaluation Guideline.

Education and experience of the concerning certification personnel shall be recorded.

	Certification assessor / (Application) Reviewer	**Site assessor**	**Decision maker**
Basic competence			
Knowledge of business processes and ability for professional evaluation	• Bachelor degree or similar work and reasoning level • 1 year of relevant working experience	• Vocational education at intermediate level or similar work and reasoning level • 1 year of relevant working experience	• Bachelor degree or similar work and reasoning level • 5 years of working experience with a minimum of 1-year experience with certification

	Certification assessor / (Application) Reviewer	Site assessor	Decision maker
Audit skills	• Training in audit skills • Minimum of 4 complete audits of which at least 1 has been carried out independently and witnessed for qualification	• Training in audit skills • Minimum of 4 complete audits of which at least 1 has been carried out independently and witnessed for qualification	Not applicable
Technical competence			
Knowledge of this BRL	• Detailed knowledge of this BRL and a minimum of 4 complete audits for this BRL or for related BRL's	• Detailed knowledge of this BRL and a minimum of 4 complete audits for this BRL or for related BRL's	Not applicable
Relevant knowledge of: • The technology related to the manufacturing of the products to be inspected, the performance of these processes and the provision of these services; • The manner in which the products are used, the processes are performed and the services are provided; • Any defect which may occur during the use of the product, any error in the execution of processes and any inadequacies in the provision of services.	• Relevant technical education at Bachelor degree or similar work and reasoning level; • Detailed knowledge of cluster related BRL's • Visual welding inspector VT-w Level 2 or equal.	• Relevant technical vocational education at intermediate level or similar work and reasoning level'; • Detailed knowledge of cluster related BRL's • Visual welding inspector VT-w Level 1 or equal.	Basic knowledge of test and inspection techniques.

8.2.2 Qualification

The qualification of the Certification staff shall be demonstrated by means of assessing the education and experience to the above-mentioned requirements. In case staff is to be qualified on the basis of other criteria, this shall be recorded.
The authority to qualify staff rests with the:

- Decision makers: qualification of certification assessors and site assessors;
- Management of the certification body: qualification of decision makers.

8.3 Report initial investigation

The certification body records the results of the initial investigation in a report.
This report shall comply with the following requirements:

- Completeness: the report provides a verdict pertaining to all requirements included in this Evaluation Guideline;
- Traceability: the findings on which the verdicts have been based shall be recorded and traceable;
- Basis for decision: the decision maker shall be able to base his or her decision on the findings included in the report.

8.4 Decision for granting the certificate

The decision for granting the certificate shall be made by a qualified decision maker who has not been involved in the initial investigation. The decision shall be recorded in a traceable manner.

8.5 Layout of quality declaration

The product certificate shall be in accordance with the model included in annex I.

8.6 Nature and frequency of third party audits

The certification body shall carry out surveillance audits on the supplier's site at regular intervals to check whether the supplier complies with his obligations. The Board of Experts decides on the frequency of these audits.

At the time this BRL was validated, the frequency been determined at a minimum of 1 audit per year. For every first to third tank per calendar year, an additional inspection as described in paragraph 4.2 of this evaluation guideline must be conducted. At every next 3 tanks above, 1 inspection must be conducted. A maximum of 5 tanks per calendar year are part of the sampling as described above.

The compulsory yearly audit shall cover at least:

- the suppliers IQC-scheme and the results obtained from inspections carried out by the supplier;
- the correct marking of the certified products;
- compliance with the required procedures;
- Welding qualifications.

An additional inspection (ad random) can contain a design verification, a design verification in combination with an audit during production and testing or a design verification with a document review.

The results of each audit shall be reported by Kiwa (certification body) in a traceable manner.

8.7 Report to the Board of Experts

The certification body shall report annually regarding the certification activities performed. This report shall include the following aspects:

- mutations in number of certificates issued (granted/withdrawn);
- number of inspections carried out in relation to the required frequency;
- the results of these inspections;
- the measures imposed in case of non-conformities;
- the complaints received concerning the certified products.

8.8 Non-conformities

When the certification requirements are not met, measures are taken by Kiwa (certification body) in accordance with the sanctions policy as detailed in the Kiwa regulation for product certification.

8.9 Interpretation of requirements

The Board of Experts may record the interpretation of requirements of this Evaluation Guideline in a separate interpretation document.

8.10 Specific rules set by the Board of Experts

No specific rules for the execution of the certification activities to follow by the certification body, have been laid down by the Board of Experts

9 List of referenced documents

9.1 Bibliography

Activiteitenbesluit	Activiteitenbesluit milieubeheer*
Activiteitenregeling	Activiteitenregeling milieubeheer**
PGS 30	Hazardous Substances Publication Series 30 “Liquid fuels in aboveground tank and delivery installations”
Report P107776	Guideline tank installations for liquids and their vapors, underground and aboveground Kiwa Regulation for product certification

*) Legal code of the Dutch government who has specified the requirements pertaining to various industries with regard to the environment in “Activiteitenbesluit”.
**) The requirements stipulated in “Activiteitenbesluit” are further clarified in the “Activiteitenregeling”.

I Model certificate

CERTIFICATE

Product certificate
KXXXXX/XX

Issued *yyyy-mm-dd*

Replaces

page *1 of 2*

STATEMENT BY KIWA

With this product certificate, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by

<Name supplier>

as specified in this product certificate and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa evaluation guideline BRL-K756/03 "Single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³" dated 01-04-2017.

Luc Leroy
Kiwa

Publication of this certificate is allowed.
Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid.

Kiwa Nederland B.V.
Sir Winston Churchilllaan 273
Postbus 70
2280 AB RIJSWIJK
Tel. 088 998 44 00
Fax 088 998 44 20
info@kiwa.nl
www.kiwa.nl

Supplier
<name supplier>
<address>
<postal code> <PLACE>
Tel.
Fax
www.
E-mail

Certification process consists of initial and regular assessment of:
- **quality system**
- **product**

Product certificate KXXXXX/XX

Technical specification

Vertical aboveground tanks conform evaluation guideline BRL-K756/03 “Single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³”.

Additional specification

If an internal coating is applied, the coating shall comply with the requirements from BRL-K779. Epoxy coatings according to BRL-K779 have to be applied by a company certified in accordance with BRL-K790.

Application and use

These tanks are intended for use in tank storage installations for liquids. Mostly for environmental harmful liquid, as well as combustible liquids.

Marking

The Kiwa®-mark products are marked with the word mark “KIWA”.

Place of the mark:

On the edge, neck of alle manholes and identification plate.

Compulsory specifications:

- name of the supplier or his trade mark;
- tank number;
- year of manufacture (will not apply if the tank number provides this information);
- BRL-K756;
- nominal volume of the tank;
- the design pressure (atmospheric) of the tank;
- the design temperature of the tank;
- maximum specific weight of the liquid to be stored in the tank;
- type of coating;
- Kiwa-mark.

Method of marking:

- indelibly;
- “Kiwa” or “KK”.

RECOMMENDATIONS FOR CUSTOMERS

Check at the time of delivery whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc.

If you should reject a product on the basis of the above, please contact:

- <Name supplier>

and, if necessary,

- Kiwa Nederland B.V.

Consult the supplier’s processing guidelines for proper storage and transport methods.

II Model declaration of conformity tank

Declaration of conformity tank

BRL-K756/03

Single- and double walled vertical cylindrical steel tanks for pressure less aboveground storage of liquids with a maximum capacity of 150 m³

Purchaser

.
. .

Supplier/Producer

Tank supplier B.V.
Street 1
1234 AB ANYWHERE
Tel: 0123-112200
Fax: 0123-112233
Email: info@tanksupplier.nl

Registration number
Kiwa registration number

Registration date
??-??-20??

Tank number:
Tank number Production

Tank data

Year of manufacture	
Nominal volume (l)	
Diameter (mm)	
Height (mm)	
Design temperature (°C)	
Max. specific weight (kg/l)	
Material	Steel/Stainless steel (For example: S235JR, P265, 1.4401)
Tank type	Single walled/Double walled
External coating	
Internal coating	

Details regarding the used coating system are mentioned at the inspection report coating if applicable.

Statement by Kiwa Nederland B.V.

Based on pre-certification tests as well as periodic inspections carried out by Kiwa, the tank referred to in this declaration of conformity can be considered to be in compliance with the Kiwa Evaluation Guideline BRL-K756/03.

Statement by supplier/manufacturer

The supplier / manufacturer declares that the fabrication and testing of this tank is in accordance with the Kiwa Evaluation Guideline BRL-K756/03.

General

Besides this declaration of conformity tank, an installation certificate must be issued to prove that the tank installation is in accordance with local laws and regulations (NL).

Recommendations for users

Check at the time of delivery whether:
- The tank serial number corresponds to the number at this declaration of conformity tank.
- The tank has sustained no visible damage during transport.

If you should reject a product on the basis of the above, please contact:
1. The supplier of the tank.
2. Kiwa Nederland B.V.

Kiwa Nederland B.V.

Sir Winston Churchill-laan 273
P.O. Box 70
2280 AB Rijswijk
Telephone: 088 998 44 00
Internet: www.kiwa.nl

Copies of this declaration of conformity are for: Local authorities (NL), owner/user, supplier, Kiwa Nederland B.V.

Validation date *??-??-20??* Registration number.....

III Model IQC-scheme, check list and Quality system

III.1 IQC-scheme

The supplier / tank manufacturer shall have an internal quality assurance scheme (IQC-scheme) implemented in his factory. This IQC-scheme is an overview of the internal and quality controls that the supplier / tank manufacturer performs during production. The IQC-scheme contains a schematic overview of all controls that relate to the production of tanks.

The IQC-scheme consists of the following components:

- Which inspections are carried out by the supplier / tank manufacturer.
- What is specifically inspected.
- Which test method is used.
- What is the inspection frequency.
- The method of registration regarding the inspection performed and the results obtained.

Example

B **Inspections during process**

No.	Description	Inspection aspects	Inspection method	Instruction no.	Inspection frequency	Inspection registration
1	Design	Calculation / drawing				
1.1		*Notification of production at Kiwa (5 working days before the start of production)*	*(Notification form BRL-K756 tank / e-mail)*	*(Procedure ….)*	*(Each design in accordance with Kiwa)*	*(Notification form BRL-K756 tank)*
1.2		*Release for production*	*(Validation of drawing / calculation)*	*(Procedure ….)*	*(Each design)*	*(Production form …).*
	…..					
2	Cutting of plates	Instruction / Drawing				
2.1		*Dimensions*	*(Inspection equipment)*	*(Procedure ….)*	*(Each plate)*	*(Checklist …).*
2.2		*Bottom circumference*	*(Inspection equipment)*	*(Procedure ….)*	*(Each plate)*	*(Checklist …).*
	…..					
3	Rolling of plates	Instruction / Drawing				
3.1		*Dimensions after rolling*	(Inspection equipment)	(Procedure ….)	(Each plate)	(Checklist …).
	…..					

The final IQC-scheme is a proprietary scheme. After all, each company has its own working practises and methods. It is therefore important that the IQC-scheme corresponds with the working practices and methods within the company, but at the same time is in conformance with the requirements of BRL-K756.

III.2 Checklist

A checklist contains a registration of all relevant production steps, checks and inspections. The checklist is traceable to the tank to be produced and is kept up to date during production by the employees of the tank supplier / tank manufacturer. The checklist also gives the production stage of the tank.

The term production card can also be used instead of checklist.

Example

tank supplier / tank manufacturer Order number:

Production number:		Client:		Drawing no.:	
Tank volume (litre):		Tank type:		Material tank:	
Total tank height (mm):		Cyl. length (mm):		Diameter tank (mm):	
Wall thickness tank shell:		Wall thickness bottoms:		Wall thickness outer tank:	
Dimensions inspection opening:		Dimensions manhole:			
Number of lifting lugs:		Diameter hole:			
Connections:	Filling line Vent Suction Fluid level indicator Extra connections				DN 80 DN

Check internal quality department

☐ Internal ☐ Kiwa	Status: Date:	Employee(s):	

Inner tank						
Circumferential dished end 1 (mm):		Plate length:		Length after rolling:		Check:
Circumferential dished end 2 (mm):						
Outer tank						
Circumferential dished end 2 (mm):		Plate length:		Length after rolling:		Check:
Circumferential dished end 2 (mm):						

Description		Accepted					
	Y	Y	Y	nvt	*Signature*	Name of employee	Remarks
1.0	Cutting of plate	☐	☐	☐			Charge:
2.0	Bending of plate material	☐	☐	☐			
3.0	Etc.	☐	☐	☐			
		☐	☐	☐			

III.3 Quality system

The supplier / tank manufacturer can also set up a documented quality system. If an organization has a quality system based on NEN-EN-ISO 9001, then where possible, reference can be made to procedures or instructions that form part of this quality system.

Kiwa can provide the tank supplier / tank manufacturer with an example of a quality system.