

Tata Steel Technical Standard

S1481001 NDT percentages for metal piping

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Information and changes

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1. GENERAL

1.1. Definitions

MANUFACTURER:	DUTCH: FABRIKANT
KDT:	Quality Service Engineering Department of TATA STEEL IJMUIDEN
WELDING STANDARD:	S1450401 "Execution and inspection of welding work"
ASSEMBLY WELD:	Weld at final location during assembly; also called field weld
NDT:	Non-destructive testing
PED:	PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU
SITE:	TATA STEEL IJMUIDEN
STRENGTH TEST:	Strength test or pressure test with liquid or gas
FABRICATOR:	DUTCH: VERVAARDIGER
WAGS:	Works Arising Gases: Blast Furnace Gas, Oxygas and Coke Gas (production gases)
WATER HYDRAULICS:	Closed water hydraulic system that transfers forces through pressurized water (Fluid Power)
WBDA:	WET BESLUIT DRUKAPPARATUUR (Dutch law deciding pressure equipment)

1.2. Purpose

In this document, the NDT percentages to be used for welding of piping systems are prescribed and justified. Basically, the selected design code is used to determine the NDT percentages for new construction piping and pipelines. An increased percentage compared to the design code is used for some media.

1.3. Regulations

Many piping systems on the SITE must be manufactured in accordance with the European Directive 2014/68/EU also known as the Pressure Equipment Directive and the resulting Dutch legislation: the WBDA.

In order to achieve "presumption of conformity with the PED", pressure equipment on the SITE is basically designed according to a European harmonized code. For metal industrial piping systems, one of the following design codes applies:

- DIN 2413III Seamless steel tubes for oil and water hydraulic systems, calcul. rules
- EN13480 Metal Industrial Piping Systems
- EN15001 Gas installation pipes (flammable gases) with operating pressures greater than 0.5 barg for industrial and non-industrial gas installations
- RToD Dutch design rules for pressure vessels (discontinued in 2002)

1.4. Safety and reliability - increased SITE requirements

Safety and reliability records have shown that for a limited number of more critical systems the scope and extent of NDT-% in accordance with the design code does not yield the required confidence level. These systems are mentioned in this document with an increased percentage of NDT compared to the design code.

2. Principles, limitations and considerations

2.1. General principles for the NDT percentages

The following requirements were used as the basis for prescribing the NDT percentages. It is essential that these are met:

1. The piping system is subjected to a strength test as stated in the design code (for instance as in EN13480 / EN15001 / RTtoD / TATA hydraulic directive R1420102).
2. The pipe sections to be welded are in good condition at the location of the weld to be made.
3. The NDT percentage is batch related (1 batch = 1 welder * 1 welding method * number of welds), so also the contractor and his method of welding execution has an influence on the actual NDT percentage. This is in accordance with the design codes.

Deviating situations:

- a. If no volumetric NDT is possible (for example for fillet welds), a surface examination shall be carried out as replacement. The percentages of surface examination are then equal to the amount of volumetric examination set in this standard.
- b. If a strength test is not possible, the "Golden Weld" procedure shall be followed, as stipulated in KDT-FORM-045, using motivation form KDT-FORM-019.

NOTE: Practically this means a documented approval procedure via KDT, 100% volumetric NDT and 100% surface examination of the weld (s)!

Explicitly excluded is / are:

- Building-related natural gas pipelines laid under NEN 1078 / NEN 8078

This standard has been drawn up by PTC's HPM and KDT departments.

2.2. Possibly aggravating factors

A client can and may assess that a specific situation needs more confidence, for example, for the following situations:

- The pipe is in a confined space
- The pipe is in a poorly ventilated area
- The pipe is in an enclosed space
- As in the case of a tie-in, there is doubt about the good quality of the existing pipeline
- In case of a business critical part, for example the cold wind pipes and the hot wind pipes

It is up to the client to consider whether a higher percentage is desired for a particular room, with the prerequisite that this increased percentage is not at the expense of the percentage NDT of the pipeline parts outside this area.

If areas have been designated by the client for which an increased percentage compared to this standard is requested (whether or not up to 100% NDT), this shall be recorded in writing with the CONTRACTOR (preferably as a separate paragraph in the formal Scope Of Works quotation package).

3. NDT percentages for metal piping systems

3.1. Starting point NDT percentages and the exceptions

This standard is in addition to version 7.0 or higher of the WELDING STANDARD and shall only be used in combination with this WELDING STANDARD, however, the NDT percentages given in this standard are leading.

Where a higher NDT percentage is prescribed in an application specification for the manufacturing and / or delivery of a pressure-bearing pipe section, the highest percentage is the requirement.

The applicable design codes are specified in TATA standard S1475001 "General regulations for determining the design code and design / operating conditions of new or to be changed / repaired piping systems".

The following media, without being complete, can be examined according to the design code:

- except for pipes that fall under the PED category 'Sound Engineering Practice'
- except for special situations where additional NDT is prescribed
 - Natural gas
 - Argon
 - Nitrogen
 - Air
 - Condensate (all, including from blast furnace gas, coke gas, oxygas)
 - All liquids (including hazardous liquids), except (water) hydraulics
 - Steam pipes

Exceptions - piping systems with an increased NDT percentage:

- Pipes that are classified by the PED in category 'Sound Engineering Practise' or that do not fall into one of the PED categories (paragraph 3.2)
- Oxygen (paragraph 3.3)
- Hydrogen (paragraph 3.4)
- Hot blast and cold blast piping (paragraph 3.5)
- Production gas pipes with a design pressure greater than 0.5 barg (e.g. cokes gas) (paragraph 3.6)
- Production gas pipes (e.g. cokes gas, blast furnace gas and oxygas) with a design pressure less than or equal to 0.5 barg (paragraph 3.6)
- Hydraulic lines (oil and water hydraulics) (paragraph 3.7)

3.2. Exception - NDT percentages for 'Sound Engineering Practise' or not covered by PED

Pipes that fall under Article 4.3 ('Sound Engineering Practise') of the PED or that do not fall into one of the PED categories:

- a. in case of design code EN15001, shall be examined in accordance with that design code (the EN15001 prescribes a minimum of 10% volumetric NDT).
- b. no minimum NDT percentage prescribed for:
 - i. Pipelines for non-hazardous media (PED fluid group 2) with a design pressure less than or equal to 0.5 barg
 - ii. Media falling within fluid group 2A (see TATA DIRECTIVE R1300401) with a maximum operating pressure of 3,5 barg and max diameter DN150
- c. for all other situations:

% NDT in other situations		
- in combination with a strength test		
- meet the welding quality requirements of the SITE		
PED category	Shop weld	Assembly weld
Art. 4.3 *1	5%	5%

*1 Sound Engineering Practice

3.3. Exception - NDT percentages for OXYGEN piping systems

A minimum NDT percentage applies for oxygen according to this section.

NDT percentage in accordance with the design code, but **volumetric NDT** supplemented to

% NDT for OXYGEN, if		
- in combination with a strength test		
- meet the welding quality requirements of the SITE		
PED category	Shop weld	Assembly weld
Art. 4.3 *1 / I	50%	50%
II / III	50%	100%

*1 Sound Engineering Practice

3.4. Exception - NDT percentages for HYDROGEN piping systems

A minimum NDT percentage applies for hydrogen according to this section.

NDT percentage in accordance with the design code, but **volumetric NDT** supplemented to

% NDT for HYDROGEN, if		
- in combination with a strength test		
- meet the technical quality requirements of the SITE		
PED category	Shop weld	Assembly weld
Art. 4.3 *1 / I	50%	50%
II / III	50%	100%

*1 Sound Engineering Practice

3.5. Exception - NDT percentages for Hot Wind and Cold Wind pipes

A minimum NDT percentage applies to Hot Wind and Cold Wind pipes according to this section.

NDT percentage in accordance with the design code, but **volumetric NDT** supplemented to

% NDT for Hot and Cold Wind pipes, if applicable		
- in combination with a strength test		
- meet the welding quality requirements of the SITE		
Nom. Diam.	Shop weld	Assembly weld
All diameters	100%	100%

3.6. Exception - NDT percentages for production gas pipelines

For the production gas (WAGS) pipes, a minimum NDT percentage applies according to this section.

NDT percentage in accordance with the design code, but **volumetric NDT** supplemented according the tables below.

IMPORTANT:

If volumetric examination is not possible, such as with fillet welds, the percentage of surface examination shall be the same percentage as specified for the volumetric examination.

The following table applies to production gas pipes that fall under the PED (design pressure > 0.5 barg):

% NDT at GH, GO and GK > 0.5 barg, if		
- in combination with a strength test		
- meet the welding quality requirements of the SITE		
PED category	Shop weld	Assembly weld
Art. 4.3 ^{*1} / I / II	10%	10%
III	50%	100%

^{*1} Sound Engineering Practice

The following table applies to production gas pipes with a design pressure ≤ 0.5 barg that, because of the low pressures, do not fall under the PED, but are subject to the rules of a BRZO facility:

% NDT at GH, GO and GK ≤ 0.5 barg, if		
- in combination with a pressure test according to S1474001		
- meet the welding quality requirements of the SITE		
Nom. Diam.	Shop weld	Assembly weld
<DN400 ^{*1}	10%	10%
≥ DN400 ^{*1}	50%	100%

^{*1} The limit of DN400 follows from the table of 'production gas pipes that fall under PED' at a pressure of 0.51 barg.

3.7. Exception - NDT percentages for hydraulic lines

For hydraulic lines, a minimum NDT percentage applies according to this section. Hydraulics (pipes) here refers to both oil and water hydraulics (pipes).

NDT percentage in accordance with the design code, but **volumetric NDT** supplemented to

a. In case a strength test takes place:

% NDT for hydraulic lines		
<ul style="list-style-type: none"> - in combination with a strength test - meet the welding quality requirements of the SITE 		
Design pressure	Shop weld	Assembly weld
<40 barg	10%	10%
≥ 40 barg	10%	25%

b. In case no strength test takes place and the pipeline falls in Article 4.3 ^{*1} of the PED:

% NDT for hydraulic lines, falling in Art. 4.3 ^{*1} of the PED		
<ul style="list-style-type: none"> - without strength test - meet the welding quality requirements of the SITE 		
Design pressure	Shop weld	Assembly weld
All pressures	100%	100%

^{*1} Sound Engineering Practice

NOTE:

The table under (b) implies a standard in case the pipework falls under Art. 4.3 of the PED and no strength test is performed. The Golden Weld procedure therefore does not apply to (b).

4. REFERENCES

In this Tata Steel Standard reference is made to:

Law / EU regulations:

- PED (Pressure Equipment Directive)
- WBDA (Pressure Equipment(Commodities Act) Law)

Design Codes:

- NEN EN 13480: 2017
- NEN EN 15001: 2009
- RToD
- EN1993
- DIN 2413III: 2011

TSIJ Standard / Guideline:

- S 1450401 Execution and inspection of welding work
- S 1475 001 General rules for determining design code and design / operating conditions of new or change / repair piping systems
- S 1474001 General requirements for testing of piping systems
- R 1300401 Handleiding besluit drukapparatuur (*only in Dutch language*)
- R 1420102 Hydraulic guideline for suppliers, assembly companies, administrators and users. Part 2 Design guidelines

5. REVISIONS

Version 0:

First version of the determination of the NDT percentages to be used for welds of metal industrial piping systems.