"Let op, bij wijzigingen ook de NL-versie evenredig wijzigen"
Voor de Nederlandse versie zie : KDT-FORM-045 Uitleg Gouden Las (NL}

1 Scope

This appendix deals with the application of gold welds in the use phase, ie during repairs, alterations or constructive alterations, on the Tata Steel IJmuiden site. This is an addition to the general Tata Steel Technical standard S1 45 04 01 "Execution and inspection of welding", latest revision and means that in terms of qualification, certification, welding documentation and NDT all requirements stated in the welding standard must be met and followed when making of a Golden Weld.

2 Introduction

The "Golden Weld" is based on the (Dutch) PRDA section 2.5 chapter 10. If a weld on pressure equipment cannot be subjected to a pressure test (hydrostatic or pneumatic), while the design code of the pressure equipment does require this, it is referred to as a "golden weld". In such a case, the steps shall be followed, as described in this appendix-procedure

3 Preconditions for applying a "Golden Weld"

The aim should always be to perform a hydrostatic pressure test after welding. However, it is permissible not to perform the hydrostatic pressure test if it is harmful or impracticable. Some typical examples:

- For overhead lines, the weight becomes too high for the span, there is a risk of sagging and bending.
- The presence of residual water is unacceptable for the process and / or due to the presence of many branches at the bottom, which cannot be sufficiently drained and dried.
- The pipeline cannot be blocked and tested in practical test lengths.
- Due to environmental restrictions due to large quantities of contaminated water.

If a hydrostatic test cannot be performed, the **first alternative** is a gas-filled test (usually with air or nitrogen), as stated in the applicable design code. However, this is not a "standard" alternative. For safety reasons, a separate action plan will have to be drawn up. If a gas pressure test is also not a realistic option, the "Golden Weld" standard will have to be followed as the last option. The fit-up and the weld itself shall meet the five (5) following conditions:

1. The weld must be made as a blunt seam and fully welded;
2. The weld must be a pipe-to-pipe connection, a pipe bend, pipe T-piece or pipe-reducing or the like is not allowed.
3. The pipe sections must be arranged stress-free in relation to each other;
4. The weld must be laid in at least 2 layers;
5. The weld must be easily accessible for the welding method and NDT techniques to be used. A point of attention during the design / recording of the work is the location of the connection.

4 Preperation

4.1 Documentation

The following documentation shall be send in advance to KDT, or DTD for equipment / pipes subject to inspection, for approval:

1. KDT-FORM-019 **"Golden Weld Motivation"**, to be completed by the system administrator of the work unit / client / owner as completely as possible, if necessary, occasionally with the help of the contractor. This shall clearly state what the technical and/or financial issues shall be if a (hydrostatic or gas) pressure test should be carried out.
2. **P&ID of the system,** clearly marked with the location of the golden weld.
3. **Construction drawing** on which the location of the golden weld is indicated, and possibly photos.
4. **Inspection and Test Plan (ITP)**. The required certificates and documents shall at least comply with the welding standard S1 45 04 01. Depending on the circumstances, additional requirements may be set. These shall be recorded in the ITP.

4.2 Execution

Performing NDT prior to welding: If the "Golden Weld" connects to an old(er) pipe, it is recommended to pre-inspect with UT the old pipe on inclusions & laminations and examine for sufficient residual wall thickness. If there are inclusions, or the wall thickness has decreased, another location for the Golden Weld can be chosen.

5 Execution fit-up and welding

Bonding should preferably be done with bullets. Bonding with bridge is allowed for welding in pipes with a wall thickness less than or equal to 4 mm, if bonding with bullets is not possible. In all cases, sutures SHALL NOT be included in the welds, they SHALL be removed beforehand.

The bullets shall be of a weldable steel grade and of the same material group as the base material. Only make tack welds on the weld edge preparation. Size of the bullet should be proportional to the size of the weld edge.

If the installation is under DTD approval, the DTD shall approve the fit-up of the gold weld(s), prior welding.

Welding according to pre-approved LMB/WPS by welder with valid certificate.

6 Inspection and NDT after welding

Inspection and NDT shall be carried out according to table 1, whereby the design code of the system and the requirements stated therein regarding NDT execution and acceptance are leading.
If the weld seam / seams are heat-treated after welding, the NDT shall be executed after the heat treatment.
If the combination of base material - welding process is susceptible to cracking, such as hydrogen cracking, a minimum of 12 hours shall be allowed before the NDT may be carried out.

If one or more of the above conditions cannot be met, there must be:

- Another weld is designated as a Golden Weld, or
- In consultation with the DTD / KDT, another minimum equivalent inspection plan shall be agreed.

7 Repair

During preparation, it shall be established how to deal with any welding rejection. Options are:
1) Repair according to used WPS, or
2) Make a separate repair procedure.
I.e. depending on circumstances, defect type and defect location in the weld. The chosen option must always be assessed by the KDT welding expert and recorded in the ITP.

8 Tightness test

A leak-tightness test shall be carried out before paint, coating and / or insulation is applied, with the installation filled with the medium and at working pressure. The leak tightness test shall be conducted by the designated inspector[1)]. Only after the leak-tightness test is acceptable, the paint, coating and / or insulation may be applied.
If the medium is pumped at elevated temperature, the leak tightness test with medium is not always possible.
If the medium is pumped under reduced pressure, the leak-tightness test is only possible with ultrasonic listening equipment.
If a leak tightness test is not possible or is canceled, this will always be stated in the ITP / QIP.

9 Documentation

All documentation shall be unambiguous and consistently traceable to the gold seal in question. At a minimum, the following shall be found on all documents (as a supplement to the ITP and related documentation, as stated under Chapter 3):

1) Which installation is involved?
2) Characteristic of the installation: As known to the Working Unit, and if applicable; as known to the DTD (DR / K / L /
V number). All DR / K / L / V numbers shall be specified separately for a collective report.
3) Weld number or location of the golden weld indicated on ISO and / or LISL.
4) Date on which the golden weld was made.

10 Inspection and NDT Requirements for “Golden Welds”

Table 1 for Inspection and NDT requirements for Golden Weld

Welding category of the *piping system* where the Golden Weld comes in: (Welding standard S1 45 05 01 Annex B.)	**1**	**2**	**3**
Form "Golden Weld Motivation", to be completed by client / WE, possibly. completed by contractor, then submit to designated inspector [1)]	Yes	Yes	Yes
Welding edge investigation of crack-sensitive material, or "old" material (magnetic, or if not possible, penetrant)	Yes	Yes	No
Fit-up acceptance by designated inspector **[1)]**	Yes	Yes	No
Visual inspection after welding by designated inspector **[1)]**	Yes	Yes	Yes
Volumetric examination: RT examination (X-ray or isotope) **[2) 3)]**	Yes	Yes[3)]	No
Volumetric examination: UT examination (with wall thickness> = 8 mm) **[3) 4)]**	Yes	[3)]	No
Surface examination (magnetic or penetrant) **[5)]**	Yes	Yes	Yes
Acceptance criteria according to design code:			
RToD: T0110, VT: T0112; RT: T0111; UT: T0117; MT/PT: T011?			
EN13445 (Pressure Vessels) → VT: EN5817 Class :	B	C	D
EN13480 / EN15001 (Leidingen) → VT: EN5817 Klasse :	B	C	D
Final test:			
Tightness test with product at working pressure (see par. 7)	Yes	Yes	Yes

Remarks:
1): Designated inspector is for installations subject to inspection: DTD inspector, for installations not subject to inspection: Tata Steel inspector.
2): X-ray examination is always the first choice, if this is not applicable, an isotope may be used. If an isotope and a single wall thickness <14 mm (or <7 mm with double wall irradiation!) Are used, additional NDT requirements apply and the KDT-FORM-032 “Se75 wall thin wall motivation test” form must be completed.
3): With pipes / pressure systems, which fall as a whole in Welding category 2 (Golden Weld itself is always welding category 1!) And with wall thickness> = 8 mm, one may choose between RT or UT angle sensor examination for the volumetric examination, which is the most practical is.
RT is mandatory for wall thickness <8 mm (for all welding categories), because UT is practically not possible.
4): US Corner test can always be used. ToFD and / or Phased array are not described in the design codes, therefore applying ToFD and / or Phased array always requires the prior approval of the DTD / AKI.
5): Magnetic testing for all ferritic steels, penetrant for all non-magnetizable steels, metals & alloys.