



TRANSNET PIPELINES

General Welding Specification

Specification : PL 804/A

February 2014

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1. SCOPE

This is a general welding specification for production welding, manifold modifications and any other welding on Transnet Pipelines' related equipment.

This specification must be read in conjunction with the statement of work for a project.

2. CODES AND STANDARDS

- ASME B31.4 - Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols.
- API Standard 1104 - Welding of pipelines and related facilities.
- API Standard 5L - Specification for Line Pipe.

3. GENERAL

All welding, Welding Procedure Specifications, Welding Procedure Qualifications, control of, and usage of welding consumables, welder qualifications, the repair of, or removal of weldment defects shall conform in all respects to the requirements of ASME B31.4 and API Std 1104, latest editions, supplemented by the requirements of this specification. The requirements of this specification shall govern where conflict exists.

- 3.2 The Contractor shall provide and install all temporary connections required to properly earth the pipe or pipeline to prevent hazardous conditions from electrical sources. In no case shall the pipe earths be welded to the pipe.
- 3.3 The Contractor shall collect and properly dispose of all partially used or damaged welding electrodes.
- 3.4 Electrode stub-ends shall not be thrown in the pipe trench, or in the construction zone.
- 3.5 The Contractor shall furnish all labour, equipment, tools, supplies and approved electrodes required to perform this work.
- 3.6 The Engineer may at any time require the electrodes to be submitted for test and only those strictly conforming both in respect of specification and location of manufacture to an approved sample may at any time be utilised on the Contract Works.
- 3.7 All welding shall be to the approval of the Engineer. Any welding not to his or her approval will be rejected and work shall cease until the Engineer permits work to recommence.
- 3.8 The Contractor shall mark each and every weld on the pipeline with an identifying number. Such marking shall be to the approval of the Engineer and shall be preserved and remain legible up to the time that the section has been completely passed by the Engineer in respect of radiography and repairs.
- 3.9 The minimum length of any one piece of pipe to be installed in the mainline shall be 1,5 metres. All short pieces of pipe 1,5 metres or more length shall be carried forward to the

bending operation and welded intermittently into sections of the pipeline with the same wall thickness where reasonably practicable.

- 3.10 All surplus pipes shall be delivered to a pre-determined site and stock piled within two weeks of the welding having passed the area in question.
- 3.11 Pipe transitions shall be in accordance with ASME B31.4.

4. PROCEDURES

- 4.1 Before any production welding is commenced, the Contractor shall establish, document and obtain approval from the Engineer for the welding and welding repair procedures to be used.

The Contractor shall submit detailed welding procedure specifications in writing, complete with all technical information, and other data with the tender documents. Written procedures shall be furnished for each combination of essential variables proposed by the Contractor to be used in production welding and weld repairing. Essential and non-essential variables are defined in clause 2.4 of API 1104. In addition, welding electrodes, brand names and the manufacturer shall be approved by the Engineer.

The Contractor shall be responsible for demonstrating at his own cost by trials and subsequent tests that the Procedures are capable of producing timeously a completely satisfactory pipeline installation. If, following such trials and tests the results are not regarded by the Engineer as wholly satisfactory, the Contractor shall be responsible for modifying his detailed procedure specification and qualifications in order to achieve the necessary improvements.

The modifications shall be subjected to similar trials and tests at the Contractor's cost and, when approved, shall be adopted throughout the Contract without any additional charges being made to Transnet Pipelines by the Contractor.

No welding of the pipeline will be permitted until the Engineer certifies that the procedures have been approved.

- 4.2 All test specimen's radiographs and other test records shall be permanently marked and cross-referenced for identification and correlation with the welding procedures. On completion of demonstration and testing the Contractor shall submit a copy of all radiographs and other test records to the Engineer as well as all test specimens. All such materials and records shall be retained by Transnet Pipelines for the duration of the work and will become the property of Transnet Pipelines at the completion of the project.
- 4.3 In order to prevent cracking, the second or hot pass bead is to be made immediately following completion of welding and cleaning of the root or stringer bead, and in no case shall the time between two successive passes exceed five (5) minutes. All welds shall be completed in one continuous operation and shall not be left partially completed.

- 4.4 The welding of all field joints is to be executed by electric shielded arc welding.
- 4.5 Where ends of pipe which are damaged cannot satisfactorily be welded, the damaged pipe shall be cut and rebevelled.

Field bevels shall be made by machine tool or machine oxygen cutting and shall be cut on the same angle as the original pipe supplied by the manufacturer. Unless the pipe is damaged prior to the Contractor drawing it from the storage sites and a certificate to this effect is obtained from the Engineer, the cost of field welding, cutting and bevelling as necessary, shall be borne by the Contractor. Similarly, laminations, split ends and other defects shall be cropped, repaired or removed from the line as directed by the Engineer at the Contractor's cost unless written acknowledgement of such defects was obtained when drawing the pipe from the storage site.

- 4.6 A copy of the written qualified procedure shall be kept on file in the Contractor's site office and shall be made available at all reasonable times upon request for inspection or review by the Engineer.

5. WELDER QUALIFICATIONS

- 5.1 The formal qualification of welders shall be in accordance with API 1104. Welders shall only be allowed to make production welds or portions of welds for which they have qualified.
- 5.2 The pipe ends will be bevelled to an angle of thirty degrees (30°) $+5^\circ$, -0° in accordance with API Std 5L.
- 5.3 Prior to commencing work, all shielded metal arc welders who are to be used on the work shall pass a welder qualification test on manual welds in the presence of the Engineer. Welder qualifications shall be made on fixed pipe sloped at 30 degrees from horizontal. The results of the tests may be determined by both destructive and non-destructive methods.
- 5.4 The demonstrations and tests described in API Std 1104 shall be successfully carried out by each welder at the Contractor's cost and a certificate signed by the Engineer and a passport size photograph shall be issued by the Contractor for each welder before he is permitted to work on the pipeline.

Failure at the first such demonstration and test shall mean that double the number of test pieces must be successfully accomplished by the welder at the Contractor's cost before obtaining approval for pipeline work. Failure to qualify at the second test will debar the welder from participation in welding work on this Contract.

- 5.5 All welds shall be marked with plastic paint markers (metal stamps are prohibited) on the top quarter of pipe by each welder according to the mark assigned to the welders by the Contractor. Each welder of root beads shall mark his symbol at the beginning of the upper half of the section he has welded. All other welders shall place their symbol at an appropriate place below the root bead welder's symbol.
- 5.6 Welders who produce unsatisfactory production welds shall be requalified or removed entirely from the job.

6. PRODUCTION WELDING

- 6.1 Skids or supports of sufficient number and length shall be supplied and used by the Contractor to support the pipe at a height required for efficient welding.
- 6.2 Each piece of pipe shall be swabbed internally with a leather or canvas belt disc of the proper diameter, or cleaned to the satisfaction of the Engineer, to remove all dirt, loose scale or other foreign matter before being placed in alignment for welding. Care shall be taken by the Contractor that no dirt, welding rods or other foreign matter gets into and is left in the pipe during construction.
- 6.3 All bevels shall be buffed by machine wire brushing to a bright finish just prior to welding.
- 6.4 The internal and external surfaces of each pipe end shall be machine buffed a minimum length of 20mm from the welding edge to remove all rust, scale, dirt or other foreign materials before placing in alignment for welding. Grinding shall not be used for this purpose.
- 6.5 Field cut bevels shall be cut with a bevelling machine approved by the Engineer. The root face shall be at right angles to the pipe axis. Flame cut bevels will require mechanical facing. No mitred joints shall be allowed. The Engineer may carry out dye penetrant or ultrasonic examination of field cut bevels. Bevelled ends shall be free from all laminar and crack type defects.
- 6.6 Pipe shall be lined up in such a manner as to prevent damage thereto. The longitudinal seam shall be lined up in the top third of the completed pipeline and shall be staggered in successive pipes by no less than twenty degrees (20°) on alternate sides of the top centre of the pipeline. The pipe shall be welded so that this seam shall remain in the top third of the pipe during coating and lowering operations.
- 6.7 The open ends of completed sections of the pipeline shall be securely closed at the end of each day's work or upon completion of the section and shall not be re-opened until work is resumed.
- 6.8 Any obstruction remaining in the pipeline after completion of the line shall be removed and then re-welded and re-wrapped. This, together with all consequential work, shall be done at the Contractor's expense.
- 6.9 The root opening shall be between 1,6mm and 3,2mm. The alignment of the abutting pipe ends shall be such as to minimise the offset there may be between pipe surfaces due to manufacturing tolerance and wall thickness change. Such offset shall not exceed 1,6mm.
- 6.10 Internal line-up clamps shall be used wherever possible. Under exclusive circumstances such tie-ins where it is impractical to use internal clamps will the Engineer approve the use of external line-up clamps.
- 6.11 The line-up clamps shall not be released until the root bead is 100% completed. When an external line-up clamp is used, the root bead shall be made in equally spaced lengths around the circumference with a maximum cumulative length of no less than 60% of the

pipe circumference before the clamp is released. It is prohibited to effect alignment by heating, cold springing or hammering the pipe ends.

- 6.12 Where transition pieces are required the Contractor shall cut internal tapers of 5 degrees using an internal tapering machine or by some other approved method. Internal taper shall not be flame cut. To assure quality radiography, the Contractor shall inform the Engineer of the transition weld location and number, stake value, pipe diameter and wall thickness.
- 6.13 Pipe ends shall be rebevelled if any bevels or root faces contain dents, grooves or notches exceeding 1.6mm (0.063 inches). Cracks or laminations are not allowed.
- 6.14 The Contractor shall ensure that arcing does not occur between the ground leads of the welding machines and the pipe or fittings. Magnetic ground clamps are recommended. Striking the arc on the pipe or fittings at any point other than the welding groove shall not be permitted.
- 6.15 Arc burns on the pipe shall be removed from the pipeline by cutting out a cylinder of pipe containing the arc burns.
- 6.16 In the case of high winds, cold, rainy or stormy weather the Contractor shall provide protection for the welders at their work and shall protect the welds from sudden variations in temperature until they are cool.
- 6.17 Welding shall not be performed when, in the opinion of the Engineer, the weather is unsuitable for welding operations.
- 6.18 Movement of the pipe during welding of the root bead shall be prohibited. The hot pass shall be made as soon as possible after completion of the root bead pass and in no case shall the time between the two passes exceed five (5) minutes. All welds shall be completed in one continuous operation and shall not be left partially completed.
- 6.19 When complete lengths of pipe are to be cut the pipe identification shall be transferred to each side of the cut.

7. DISPOSITION OF SHORT PIECES

The Contractor shall not allow pipe to accumulate and shall move all short pieces of pipe 1,5 metres or more in length.

8. WELDING ELECTRODES

Suggested type of manual arc welding electrodes to be used for all aspects of mainline and manifold pipe welding applications, are as follows:

8.1 Application: Cold Work

"Cold work" is the terminology used when referring to welding on empty pipe (e.g. laying of new pipe, manufacture of manifolds, etc.).

ELECTRODE TO BE USED:

Classification : E7010G
Specification : AWS A5.5 / ASTM. SFA 5.5
Type : "Lincoln Shield-Arc Hyp"

Size

- 2,50 mm for pipes 2 - 4 inch in size
- 3,25 mm
- 4,00 mm
- 5,00 mm

8.2 **Application: Hot Work**

"Hot work" is the terminology used when referring to welding on a pipe containing product under flow conditions (e.g. stopple fittings, "Weld + Ends", etc.)

ELECTRODE TO BE USED

Classification : E7018
Specification : AWS A5.1 / SABS 455 E435 B26 GJ
Type : "Rockweld Basac - Low Hydrogen" or equivalent.

Classification : E 8018 (For welding API 5L X60 and X65)

Size

- 3.15 mm
- 3,25 mm
- 4,00 mm
- 5,00 mm

AS WITNESSES

1. _____

CONTRACTOR

2. _____

DATE: _____

AS WITNESSES

1. _____

TRANSNET PIPELINES

2. _____

DATE: _____