



NET4GAS, s.r.o

COMPRESSOR STATION JIRKOV 73 BAR AND HSK

Welding Specification

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1 GENERAL

1.1 Scope of the Document

This specification covers the minimum requirements for field welding of piping systems. It applies to butt-welding, fillet welding and socket welding of pipes, valves, bends, flanges, branch outlet fittings and other fittings in carbon steel and low alloy steel for construction of piping systems in the stations relating to the Project

Definitions:

Term	Explanation
Project	Compressor Station Jirkov 73 bar
	Capacity Extension of BTS Hora Svaté Kateřiny
Employer	NET4GAS
Consultant	ILF Consulting Engineers
Supplier	Means responsible contractor regarding engineering, manufacturing and supplying of total scope as outlined within this specification
Others	Other Suppliers to the Project
Third Party	Independent experienced and approved expert/authorized institute

1.2 Abbreviations

Term	Explanation
EN	European standard
FCAW	Flux Cored Arc Welding with External Shielding
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
MT	Magnetic Particle Examination
NDT	Non-Destructive Testing

WPQR	Welding Procedure Qualification Record
pWPS	Preliminary Welding Procedure Specification
SMAW	Shielded Metal Arc Welding
WPS	Welding Procedure Specification

1.3 Codes and Standards

No.	Number	Title
1	ČSN EN 1594	Gas supply systems - Pipelines for maximum operating pressures over 16 bar – Functional requirements
2	CEN ISO/TR15608	Welding - Guidelines for a metallic material grouping system
3	ČSN EN ISO 14731	Welding coordination – Tasks and Responsibilities
4	ČSN EN 1708-1	Welding – Basic welded joint details in steel – Part 1: Pressurized components
5	ČSN EN 10204	Metallic products - Types of inspection documents
6	EN 12732	Gas supply systems - Welding steel pipe works - functional requirements
7	ČSN EN ISO 14732	Welding personnel – Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic
8	ČSN EN ISO 15609-1	Specification and qualification of welding procedures for metallic materials - welding procedure test
9	ČSN EN ISO 15614-1	Specification and qualification of welding procedures for metallic materials - welding procedure specification
10	ČSN EN ISO 17639	Destructive tests on welds in metallic materials - Macroscopic and microscopic examination of welds
11	ČSN EN ISO 3834	Quality requirements for fusion welding of metallic materials Part 1-Criteria for the selection of the appropriate level of quality requirements Part 2-Comprehensive quality requirements

		Part 5-Documents with which it is necessary to conform to claim conformity to the quality requirements of ISO 3834-2 ISO 3834-3 or ISO 3834-4
12	ČSN EN ISO 4136	Destructive tests on welds in metallic materials - Transverse tensile test
13	ČSN EN ISO 5173	Destructive tests on welds in metallic materials - Bend tests
14	ČSN EN ISO 5817	Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections
15	ČSN EN ISO 3183	Petroleum and natural gas industries – Steel pipe for pipeline transportation systems
16	ČSN EN ISO 6507	Metallic materials - Vickers hardness test
17	ČSN EN ISO 6892	Metallic materials - Tensile testing
18	ČSN EN ISO 9001	Quality management systems – Requirements
19	ČSN EN ISO 9015	Destructive tests on welds in metallic materials - Hardness testing
20	ČSN EN ISO 9016	Destructive tests on welds in metallic materials - Impact tests - Test specimen location, notch orientation and examination
21	ČSN EN ISO 9606-1	Qualification testing of welders - Fusion welding
22	ISO 148	Metallic materials - Charpy pendulum impact test
23	ČSN EN 50504	Validation of arc welding equipment specifies validation methods for arc welding equipment
24	SM_I05_02_01	Principles of Occupational Health and safety organization
25	TP_T01_01_01_03	Principles for the design, construction, reconstruction and repair of pipelines and connections for the HP pipelines up to 100 bar
26	TPG 702 04	Gas Mains and Service Pipelines of Steel for Maximum Operating Pressure up to 100 bar included

27	TPG 923 01	Certification of processes testing the professional level and working qualities in the field of gas installation
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1.4 Reference Documents

The following referenced documents shall apply and shall be read in conjunction with this document in the latest revision:

No.	Number	Title
1	C4G-JI73-ILF-GENER-STR-SPC-822	NDT Specification
2	C4G-JI73-ILF-GENER-STR-SPC-810	Ball Valves < DN 300 - Specification
3	C4G-JI73-ILF-GENER-STR-SPC-823	Piping Installation and Fabrication Specification
4	C4G-JI73-ILF-GENER-STR-SPC-808	Flanges \geq DN 300 (incl. connection and gasket material) - Specification
5	C4G-JI73-ILF-GENER-STR-SPC-805	Fittings (T-pieces, Reduction pieces, Caps) \geq DN 300 - Specification
6	C4G-JI73-ILF-GENER-STR-SPC-801	Ball Valves with Combined Sealing \geq DN 300 (incl. actuators) - Specification
7	C4G-JI73-ILF-GENER-STR-SPC-800	Pipes DN 300 - DN 1400 - Specification
8	C4G-JI73-ILF-GENER-STR-SPC-824	Piping Classes Specification
9	C4G-JI73-ILF-GENER-STR-SEZ-860	Welding matrix

2 TECHNICAL REQUIREMENTS

In general the requirements of TPG 702 04 chapter 7.5, TP_T01_01_01_03 and EN 12732 shall be fulfilled.

The selected welding technology must be based on the qualitative and geometric parameters of the pipes, fittings and other material formulated in the purchasing specifications referred to in Chapter 1.4.

Additionally the below stated requirements apply.

2.1 Qualification of Welding Procedure Specifications

2.1.1 General

In general the requirements of ČSN EN 12732 shall be fulfilled in addition to the requirements mention in this specification.

Written procedure, based on ČSN EN ISO 15609-1, listing the materials, detailed method and parameters to be employed during welding, shall be prepared.

All testing equipment and facilities shall be supplied and/or at least one accredited and experienced test laboratory has to be nominated to perform all necessary destructive and non-destructive testing as per requirements of this specification and other referenced standards and specifications.

The equipment and facilities shall be subject to approval by Employer.

Sufficient notice shall be given before commencement of any procedure qualification and related testing.

The use of pre-qualified procedures may be permitted upon approval by Employer.

2.1.2 Preliminary Welding Procedure Specification

Preliminary WPS` s shall be submitted for review and approval to Employer and third party at least two weeks prior to the beginning of the welding procedure qualifications.

The pWPS shall briefly contain the information as required in the relevant standards.

2.1.3 Essential Variables

Unless otherwise specified Essential Variables shall be as per the requirements of the applicable standards. If a change in the welding conditions will affect the notch-toughness properties of a weld than also the Supplementary Essential Variables for the relevant welding process.

For changes outside the range of the Essential and Supplementary Essential Variables a new WPS/WPQR shall be qualified in accordance with the applicable standards and this specification.

2.1.4 Grouping of Materials

The applicable welding standards allow a wide range of materials to be grouped for the qualification of welding procedures. This can be considered sufficient for most applications in piping construction.

However, taking the project specific parameters like operating pressure, stress levels, environmental hazards or hazards for population in case of piping failure etc. into consideration it is good engineering practice to qualify separate procedure for case where materials of considerable different strength, chemical properties, heat treatment conditions etc. shall be welded together.

2.1.5 Welding Procedure Qualification

Welding Procedure Qualification shall be in accordance with ČSN EN ISO 15614-1.

Demonstration of welding a joint (qualification weld) by using approved equipment and methods, utilizing the parameters outlined in the preliminary WPS to demonstrate that the given weld will have suitable mechanical properties and soundness. The qualification weld has to be subjected to non-destructive and destructive testing.

All WPQ's shall be performed in accordance to the previously approved pWPS's, which have to be stamped and signed as "APPROVED FOR QUALIFICATION".

The qualification test welds shall be performed simulating production welding and reflecting the specific conditions, like clamping, lifting and lowering etc.

All welding parameters and conditions influencing the essential variables shall be recorded using calibrated equipment. All welding for procedure qualification and for production shall be done using calibrated welding machines.

The quality of the qualification welds shall be determined by non-destructive testing (NDT) and destructive testing as per the applicable standards unless amended by this specification and the separate NDT specification.

2.1.6 Testing of Qualifications Welds

Preparation of test samples and testing shall be performed at an approved test laboratory.

2.1.6.1 *Non-Destructive Testing*

All Qualification Welds shall be subjected to NDT after the completion of welding. Where post-weld heat treatment is necessary, this shall be performed prior to NDT.

NDT shall consist of the following:

- Visual examination
- Radiographic testing and/or
- Ultrasonic testing and/or
- Magnetic Particle Inspection

as applicable to the joint design and the specific requirements.

NDT shall be carried out and evaluated according to NDT Specification C4G-JI73-ILF-GENER-STR-SPC-822.

2.1.6.2 *Destructive Testing*

After passing NDT, the test weld shall be subject to destructive testing.

For destructive testing as a minimum all Qualification Welds shall be subjected to Macro Examination, Hardness Test, Transverse Tensile Test, Bend Test and Charpy Test as described below, supplemented by further tests required in the applicable standards.

The following table states the required destructive testing.

Test	Transverse Tensile Test	Bend Test	Macro Examination	Hardness Test	Charpy Test
Reference Standard	ČSN EN ISO 6892-1 ČSN EN ISO 4136	ČSN EN ISO 5173	ČSN EN ISO 17639	ČSN EN ISO 6507-1 ČSN EN ISO 9015-1	ISO 148-1 ČSN EN ISO 9016
Number of Specimen	2	2 + 2 (cap and root)	1	1	2 + 2 (cap and root)

The test temperature shall be the minimum design temperature. The energy absorbed, on standard test pieces, must be equal or greater than the values given in the following table.

Dimension of test specimen	Average value	Single value
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10mm x 10mm	47 J	32 J
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2.1.7 Qualification of Repair Welding Procedures

All repair welding shall be performed in accordance with an approved repair welding WPS and shall be executed by qualified welders. The repair welding WPS is separate from the original welding procedure with the addition of the following:

- Method of defect removal
- NDT requirements to determine complete removal of defect

To qualify a repair welding procedure, a production weld shall be produced in accordance with the approved WPS and shall be non destructive tested after completion. If acceptable, a section within the allowable limits has to be removed and re-welded in accordance with the proposed repair procedure. Finally this repair weld has to pass all required tests described in the relevant sections of the applicable standards and this specification.

2.1.8 Re-Tests

If the mechanical tests fail for whatever reason, the contractor shall immediately investigate the causes of the failure, and take all necessary actions including but not limited to retest and/or re-evaluation of WPQR parameters.

If after re-testing as described below the qualification weld finally fails to meet the minimum requirements, a new WPS proposal shall be established and qualification welding and testing repeated.

If the test joint finally fails to meet the minimum requirements, a new WPS proposal shall be established and qualification welding and testing repeated.

2.1.9 Welding Procedure Qualification Records and Final Approval of WPS's

Document containing all information concerning the welding of the qualification joint (as run parameters, detailed methods and conditions) as well as the results of the subsequent tests, material certificates, calibration certificates etc.

During procedure qualification all the parameters used shall be recorded. After completion of the welding procedure qualification a qualification record shall be compiled, containing the following information:

- Revised WPS based on "as-run" parameters
- Printout or datasheets of the "as-run" parameters and welding details

- Printout or datasheet of the “as run” parameters and welding details
- Summary of the welding parameters including heat input calculation
- Certificates of base materials
- Certificates of filler materials and other welding consumables
- Calibration certificates of equipment
- Pre-heat treatment Records (as applicable)
- Visual inspection report
- Results of NDT
- Results of destructive testing

The final WPS, accompanied by the WPQR, shall be submitted for review and approval to third party. Based on satisfactory results the WPS will be stamped and signed as “APPROVED FOR CONSTRUCTION”.

2.2 Qualification of Welders

2.2.1 General

Supplier shall be certified according to ČSN EN ISO 3834-2.

Welders shall be qualified according to ČSN EN ISO 9606-1. The results of the qualification test shall be reported as per Appendix A of ČSN EN ISO 9606-1.

Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials shall comply with the standard ČSN EN ISO 14732.

The limits of welder qualification are the essential variables of the WPS. The use of pre-qualified welders, obtaining qualification, which is covering the range of the qualified WPS's, shall be subject to approval by Employer.

Qualification shall be valid for a period of six months unless otherwise stated in the applicable standards. This period may be extended by a further six months when it can be shown by NDT from production welding that the welder has produced satisfactory welds. Therefore a “Welder Performance Record” shall be maintained, showing the number of welds and NDT results for each welder and/or operator.

2.2.2 Welder Identification

A unique identification number shall be assigned to each welder and a welder identification card with the welder's name, photograph, identification number, and WPS's for which the qualification is valid shall be issued for each qualified welder.

Each welder shall have the card or a copy available at work location and shall produce the card to the welding inspector if asked for. Welders performing work without identification card shall be suspended from production welding until such time as the card can be produced and shown. In case a welder terminates his work, the identification number shall not be reassigned to another welder.

Before commencing work, Supplier shall present the Employer / Third Party with the list of welders intended for the works on site.

All non-destructive testing reports and weld maps shall reference the responsible welder's number. Weld maps shall also indicate the weld procedure(s) used.

2.2.3 Pre-Production Test

Each of the qualified welders shall pass a pre-production test before being admitted to production welding. This test has the purpose of demonstrating the skill of the welder in applying the qualified WPS.

During this pre-production testing, each workgroup of welders shall make a weld on a test pipe. The diameter of the test pipe will be proposed by the Supplier's welding engineer and approved by Employer's welding engineer in line with ČSN EN ISO 9606-1. A range of weld parameters may be covered with a single test pipe, as far as feasible and agreed with Employer's welding engineer. The test shall be performed on a test piece pursuant to the provisions of ČSN EN 288-9 with evaluation within the WPQR scope. The test must be carried out exactly according to the WPS while observing all technological parameters – preheating, clamp removal, lifting and lowering operations, compliance with work times. It is particularly necessary to observe the maximum permitted delay between welding of individual layers.

The pre-production welding shall be performed on-site. The Employer's supervisor / Third Party must agree with the Supplier on the place and date of the welder pre-production tests. The welders who have successfully performed the test welds for the WPS qualification may be qualified without further test at the judgement of the Employer's supervisor / Third Party.

If the Employer's supervisor / Third Party judges the negative outcome of the pre-production test was caused by special conditions or circumstances, the test can be repeated.

A welder cannot be given the chance of a retest if he has proven to be incapable or had insufficient training. This judgement depends only and exclusively on the Employer's supervisor / Third Party.

Welders and/or operators who welded the procedure qualification test welds, which have been satisfactory non-destructive and destructive tested, shall be deemed as being qualified welders.

2.3 Welding Processes

Applicable manual welding processes are shielded metal arc welding (SMAW), and gas tungsten arc welding (GTAW) or a combination of those. Other welding processes shall be subject to approval by Employer.

As automatic or semi-automatic welding processes submerged-arc welding (SAW), gas tungsten arc welding (GTAW), gas metal arc welding (GMAW) and flux cored arc welding with external shielding (FCAW) or a combination of those may be used in the piping pre-fabrication process Other welding processes shall be subject to approval by Employer.

Validation of arc welding equipment shall comply with ČSN EN 50504.

The following welding processes are not allowed:

- SMAW using cellulosic electrodes
- Any automatic or semi-automatic process using copper backing
- Oxygen – acetylene welding (311)

2.3.1 Applicable Processes

For the construction of the station pipings several different welding processes are considered appropriate. Depending on the pipe diameter to be welded, the following general rule of thumb should be applied.

Applicable Welding Process(es) depend on the welding pipes diameters is showed in the table below.

Nominal Diameter	Applicable Welding Process
< DN 50	TIG
≥ DN 50 and ≤ DN 400	TIG, MMA
> DN 400	TIG, MMA, MIG, MAG, FCAW

Contractor must use an appropriate welding and alignment method with respect to the real geometrical parameters of pipes and other material (tolerances of outside diameter, out-of-roundness, wall thickness, etc.).

Piping, fittings and valves to be joint welded during the construction of stations are specified in the Project documents. (Refer to chapter 1.4 of this Specification)

Welding of root pass using TIG shall be mandatory used where proper cleaning / sweeping out of slag and other impurities is impossible. Blowing with air is not considered as proper cleaning approach.

In the document Welding Matrix are showed the welding joints depend on the material grade, type of weld and diameter of pipe.

The Contractor must propose and use such a welding method/process which enables welding of pipes and other materials (i.e. fittings, valves, insulating joints, scraper traps, flanges, etc.) specifically supplied to the site in accordance with project specifications and all the tolerances must be considered. Deviations from the standards required by those project specifications cannot be claimed as an extra work.

2.3.2 Minimum distance between welds

The minimum requirements for the distance between two welds shall be:

- Two girth welds on pipeline: 1,5 x D
- Two girth welds on station piping: 0,5 x D, but at least 100mm
- Two various types of welds (i.e. fillet weld of pipe socket to the nearest girth weld: 10 x WT, but at least 100mm
- Exemption from the rules above may only be applied after written approval of Employer's responsible welding engineer.

2.4 Welding Consumables

Filler metal identification, trade name and batch certificates shall be kept and maintained during the entire welding operation. Filler metals should be used from Employer pre-qualified producers ESAB, Böhler or Lincoln. If supplier intends to use filler metal from other producers, these producers require prequalification from Employer first.

Usability of additional material shall be verified on a pre-production welding test. The test welds will be tested with destructive and non-destructive tests in the scope of WPQR according to ČSN EN ISO 15614-1.

All batches of welding consumables shall be ordered including Material Certification according to ČSN EN 10204 type 3.1.

The chemical composition of the deposited weld metal shall comply with the requirements of the applicable WPS.

All welding consumables shall be stored and handled in accordance with a written procedure and with the manufacturer's recommendations.

Any consumables that cannot be properly identified or are damaged or contaminated in any way shall be segregated and removed from the job site.

2.5 Production Welding

Each weld shall be finished during one work day unless otherwise approved by Employer.

In the table below is specified minimum welders which shall be provided welding joint on the pipe.

Nominal pipe diameter	Number of welders
< DN300	1 welder
DN 300 - DN800	2 welders
DN 900 – DN1000	3 welders
DN1200 - DN1400	4 welders

Submerged arc welding one wire electrode (Nr.121 acc. to ČSN EN ISO 4063) and Tubular cored metal arc welding with active gas shield (Nr.136 acc. to ČSN EN ISO 4063) could be used in the pre-fabrication process.

2.5.1 Re-marking of pipes

Contractor is responsible for the proper remarking of products with certification after cutting of certified pipes. This activity shall be provided by authorized Contractor inspector only. This authorisation shall be approved by Employer's inspection representative.

2.5.2 Identification of weld on site and prefabrication workshop

Each weld shall be marked with a unique identification number. This number shall also be used in welding and piping documentation and on isometric drawings to identify each weld.

The marking shall be clearly visible on the upper part of the pipe and applied with a weatherproof marker, at least 100 mm next to the edge of the pipe, in case of coated pipe at least 100mm next to the edge of the weld's coating (e.g. shrinkable sleeves).

Use of cold die stamp is not allowed.

All the welds must be numbered with the numbering system established by the Contractor and approved by Employer's representative.

Each weld must be marked preferably during welding or before the start of the first NDT at the latest.

The agreed mark of successful visual inspection of the weld shall be added to the weld mark as precondition to carry out the NDT inspection.

2.5.3 Pipe Receipt

All pipes shall be inspected immediately after receiving by Supplier inspector as per the requirements of applicable codes, standards and specifications.

Company shall be advised of all defective pipes that are designated for repair work prior to any repair being undertaken.

Pipe body repair by welding shall not be permitted.

2.5.4 Pipe Body Repair

A minimum length of cut out shall guarantee the complete removal of the defective area, plus 75 mm on either side of the defect. Preheat before cutting is not required when automatic beveling machines are used or the heat affected area will be removed by other mechanical methods.

If the ovality of the pipe end after pipe repair is within the requirements for ovality as per the line pipe specification, and acceptable alignment for welding can be demonstrated the pipe may be re-used.

2.5.5 Weld repair and removal of defect

General.

All not acceptable welds, must be repaired in accordance with the provisions of this specification, or be removed by cutting from the pipe.

Authorisation for Repair

Repairs of weld defects are allowed, after resolving / fulfilling all the hereunder mentioned restrictions / criteria:

- Approval of Employer
- The repair procedure is approved and qualified
- Maximum length of weld repair does not exceed 20% of the circumference
- The entire (group of) defect(s) is removed
- A repair of a repair weld is not allowed (no second repair at the same spot)
- The weld defect is not a crack
- Repair of the root is only allowed with basic coated or rutile basic electrodes or the GTAW process. In addition, repair welds shall be performed in upwards welding direction.

Minimum length of weld defect repair shall be 50mm plus 25 mm on the each site.

Qualification of a repair welding procedure- refer to chapter 2.1.7

If one or more of the above mentioned restrictions / criteria is not resolved / fulfilled, the weld shall be completely cut out, including 150 mm pipe material on both sides of the weld.

2.5.6 Pipe End Preparation and Inspection

If the supplied pipe shows any bevel damage or has been repaired the bevel ends of the cut pipe shall be prepared and inspected as stated below. This also applies to pipes, which have been cut to shorter length.

Pipes, valves and fittings to be supplied with bevel design in accordance with the specifications mentioned in chapter 1.4.

If necessary pipe ends shall be beveled by machining, grinding or machine thermal cutting.

Fusion faces and the surrounding surfaces within 25 mm of the joints shall be free from heavy scale, moisture, oil, or any other substance that may have a detrimental effect on the weld quality.

If a gas cutting machine is used, the edges shall be free of slag and the cut surface shall be machined or ground back removing the heat-affected area. After grinding the beveled edges shall be visually and MT examined to ensure no defects.

If the pipe is cut back more than 100 mm from the factory bevel, the pipe end shall also be ultrasonic tested in accordance with original mill standard to ensure that no laminations are present.

2.5.7 Weather Conditions

In case of wind, rain, snow, etc. welding operation must be suspended unless adequate protective measures are taken. Therefore, in case ambient conditions should cause condensation on the joints and especially in case the joints are wet, the edges shall be dried by heating with a torch on min. 100 mm at each side of the weld.

In case of wind, rain, low ambient temperature (lower than +10°C), welding operations shall not be carried out without having taken all necessary precautions. Necessary precautions shall be specified in the WPS and checked during welding.

Especially in case of rain, or wind (particularly in presence of sand) special shelters shall be erected to protect welders and joints.

2.5.8 Preheating and Interpass Temperature Control

Preheating, if necessary, shall be carried out with the provision required in the WPS, preferably using induction heaters or propane torches.

The temperature must be controlled as per ČSN EN ISO 13916. The necessary temperatures must be reached prior of starting to weld. It shall be measured 75mm from the weld preparation at one (minimum) in each quadrant.

If the welding is interrupted at the end of the welding piece, isolating blankets should be put on the weld to avoid a quick cooling of the weld.

Preheat and interpass temperature measurements are to be performed on the external pipe surface using calibrated digital thermometers or temperature measuring crayons.

The minimum preheating temperature for weld repair shall be as stated in the relevant WPS

The minimum preheating temperature for tie-in welds shall be as stated in the relevant WPS.

2.5.9 Equipment for Production Welding

The Contractor must supply all welding systems, equipment and appliances necessary for welding, cutting, shaping, pre-heating, demagnetization of pipes etc.

The equipment for aligning and lining up the pipes must not damage weld ends.

The Contractor must propose and use welding equipment which enables welding of pipes and other materials (i.e. fittings, valves, flanges, scraper traps etc.) specifically supplied to the site in accordance with the project specifications and all the tolerances must be considered. Deviations from standards required by project specifications cannot be claimed.

3 INSPECTION, TESTING AND CERTIFICATION

All project materials and welding work shall be inspected and tested in accordance with the requirements of the applicable design codes and as described in detail in this specification.

All welding work shall meet the acceptance criteria for non-destructive testing (NDT) as defined in the separate NDT specification.

All procedures for testing and inspection shall be subject to the approval of the Company prior to commencement of work.

Measuring and test equipment, as well as qualification of inspection and test personnel, shall be in accordance with the requirements of the applicable Codes and Standards.

The project material and the welding consumable shall be furnished with material test certificates 3.1 according to EN 10204.

4 DOCUMENTATION

On the site welding documentation must consist of at least, but not limited to, the following documentation:

- WPS's
- WPQR's
- List of qualified welders with their mark, copy of certification and range of permitted welding activity (proved by site pre-production test)
- Pipe book
- Daily and weekly weld testing summary, including total number of repairs and the number of repairs per welder.

The details of the required documentation to be provided therein shall be approved by the Employer's supervisor prior to start of welding work on site. All of the reports above shall be included in the field quality control plan.