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Learning Resources for the course:

Steel Structure Inspector Course for PED INSPECTOR

This document covers only:

Competence unit no. CU-4 DOCUMENTATION

Table of Contents

Introduction.....	2
Objective.....	3
A. Teacher Guideline.....	3
B. Students Guideline.....	4
C. Learning resources.....	6
D. Students tasks.....	7
E. Evaluation.....	8
F. Appendix.....	8

Introduction

The course consists of a number of CU's. A CU is the smallest element in the education system that specifies Learning Outcomes, Skills and Competence. A CU can be delivered individually or it can be delivered in combinations with other CUs in order to cover a defined range of knowledge and competence.

The course will clarify the inspector's role in manufacturing where it begins well before welding starts, continues during the welding operation, involves action after welding is completed, and is finalized only when the results are properly reported.

The course will be work-based and follows the manufacturing process from the order is received until the welded product is ready for delivery. The inspector is responsible for producing documents that ensure traceability of the components and related manufacturing action throughout this process.

The activities in this course are work-based and follows a product from initial order and as it is being produced in the factory until it is ready for delivery. The manufacturing process has been divided in logical steps whereby the learning activity and learning content and tasks, are distributed according the status of the manufacturing process.

Activities in the course will be both planning activities as well as practical tasks to be carried out in the workshop together with the company mentor, or in a laboratory at the VET school.

The learning material will be distributed through the LMS (Learning Management System) system provided for this course.

The topic of this CU is Documentation. The end result will be a specification and routines for being able to deliver a Production, Inspection and Test Plan, IPT, resulting in a Fabrication Record Book, FRB that can be delivered together with the product as a part of the documentation to the client when the product is ready for delivery.

The students have to submit all tasks, both practical and theoretical, given through the different course CUs. All CUs have practical tasks for the students. The course requires that the student has access to a workshop where products are manufactured. The products in the workshop will be used during the practical training sessions in this course.

A document tagged with copyright, has a copyright statement in the document itself. The teacher has to read the statement before using the resource. If only a copyright statement is given, the contact the source for the information in order to clarify the meaning

Objective

This CU has been created to define a document structure and give an overview over the company's documents related to creation, review, approval, publication, distribution, training and archiving to new or amended QMS documents.

Control of documents is important to ensure that correct, up to date information and instructions are available to enable to operate safely, efficiently and in compliance with applicable requirements.

The scope of this work is to define how documents are created, identified, managed, controlled and published within a Management System .

A. Teacher Guideline.

The topic for CU 4 is Documentation.

This CU shall focus on documentation and traceability. The understanding of why traceability is important and why documentation is necessary should be stressed.

It is recommended that you take the life span of the product into consideration here. Example, if it turns out after 5 years that a certain weld where the ex. TIG (141) first run in a welded joint starts to crack, then this will occur in similar welds throughout the product. The important question from a maintenance and security point of view is; where are these welds. We assume that the experienced students have similar examples from their own companies.

Try to get these examples on the table and discuss consequences of failures.

That will motivate the students to see the importance of this CU.

As an example a procedure for Identification and Traceability has been uploaded as a resource.

The students may also have such examples which can be used for discussion

Discussions for student group or individual work :

*Verify the need for documentation related to inspection of welding seams and welding procedures.

*Specify which documents you will use through the inspection process and what content the documents shall have.

*Write a procedure for inspection activities before, during and after welding that ensures traceability of the activities.

*Give examples of other relevant documents.

*Create Template for Procedure/checklist for the tasks

* Specify and establish routines for being able to deliver a Production, Inspection and Test Plan, IPT

B. Students Guideline

CU 4 covers the topic documentation.

The topics will cover how to create a system for identification and traceability and documentation of the work and inspection that has been done, or will be done, on the product.

In addition you should develop and deliver a Production, Inspection and Test Plan, IPT, resulting in a Fabrication Record Book,

The importance of the thematic will be seen in a lifelong perspective for the product.

You should reflect over for example: The consequences of a defect in a welded joint and see what happens if the same conditions are available in other joints and where these are situated in the product.

If you have examples from your own company, this could be used as a background for discussion in the class.

Time schedule for CU 4: 4 hours (2 hours studying and 2 hours zoom meeting)

C. Learning resources

Support resources from selected from the Internet.

Title	Producer	Reference	Language	No of pages	Copy-right
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Learning resources developed in the project.

Title	Producer	Language	No of pages	Copyright
Control Summary	QMS	English	2	No
Weld Summary	QMS	English	2	No
QA-4.2-1 Identification and traceability	QMS	English	1	No
Visual Inspection Report	ISIM	English	1	No
List of approved WPS-WPQR	ISIM	English	1	No
List of approved Welders	ISIM	English	1	No
Welding and Inspection Quality Plan	ISIM	English	1	No
Field Form				

Video resources created for this CU

Video content for the CU:

Title	Producer	Time	Reference	Language	Format	Copy-right
Visual Inspection Procedures	Welding Inspection	8.51	ISIM	English	MP4	No

D. Students tasks

Delivery from the students :

Verify the need for documentation related to inspection of welding seams and welding procedures.

*Specify which documents you will use through the inspection process and what content the documents shall have.

*Write a procedure for inspection activities before, during and after welding that ensures traceability of the activities.

*Which personnel shall be responsible for signing the documents?

*Give examples of other relevant documents.

*Create Template for Procedure/checklist for the tasks

*Shall control reports be written?

* Shall control reports be written for all control items whatever the result is?

* Shall control reports be written only when there are something to be reported?

* What is a trigger level for report ?

E. Evaluation

1. Did you find this module relevant ?

* Yes

* No

* I don't know

2. Was it time enough for going through the material ?

* Yes

* No

* I do not know

3. Was the resources relevant for this module ?

* Yes

* No

* I do not know

I. Assessment

Not implemented in CU4

F. Appendix.

Learning resources developed for this CU.

Insp plan: 147-235-41

Object: Oresundslink_HB

WPY

Order no: 55401820E

Det: 3500:Lower Cord North


Activity: Prefabrication

Prep by: JF

Page: 1 of 2

Rev:

Rev date:

Insp code
 V= Visual insp
 B= Presence
 S%= Random insp
 A= Insp all items
M1-9= Receiv insp
 MA= Dim insp
 F= Shape insp
Off= Non destruction test (U,R,M,P)Ultrasonic,Radiogr
 Magnetic part,Dye penetr
 U= Alignment, positioning
TÄ= Leak test
 TP= Pressure test
 VÄ= Heat treat insp
 R= Cleanliness insp
Y= Surf treat,coat insp
 K= Component insp
 MO= Assembly insp
 MI= Environmental test
P= Process insp
 Fu= Insp of function
 MA= Insp of marking
 HP= Holdpoint
EL= Insp electrical inst
 E= Insp electronics inst
 1= Insp of cablerunnings
 2= Insp of terminators
3= Insp of marking
4= Continuity test
5= Insp of connect.
REVIEW OF INSP DOCUMENTS
 KKR
 CUSTOMER
 /


PBS	Insp code	Insp no	Perf by	Req code	Specification	Drawing, valid document(s)	Description, method and scope of insp	Date/Sign	Report
41.0	MÄ V A	23541001	Ts	3A	P32 P1 P11	09-F.702A-423541 09-F.702A-4P3541	Lower Chord North Before fabr. Inspection of identification for all components (drawing no., position no. etc) Visual inspection with respect to finish of edges, grooves and surfaces. (ev.damages)	980320 JF	
41.1	V F A	23541002	Ts	2A	P32 P11	09-F.702A-423541	Lower Chord North General Inspection with respect to fitness of components (allignment, weld bevels etc)	980320 JF	
41.2	P S% 10	23541003	Ts	2B	P11 P4/5	09-F.702A-423541 WPS	Lower Chord North Production Inspection of welding parameters, ref. applicable WPS and drawings.	980320 JF	
41.2	F MÄ A	23541004	Ts	1A	KVS0567.11 P11	09-F.702A-423541	Lower Chord North Production Dimensional inspection during/after assembly/tack welding of chord. (P11). Fixtures to be used.	980320 JF	

Eks 1.

Insp plan: 147-235-41

Object: Oresundslink_HB

WPY

Order no: 55401820E

Det: 3500:Lower Cord North

Activity: Prefabrication

Prep by: JF

Page: 2 of 2

Rev: _____

Rev date: _____

Insp code
 V= Visual insp
 B= Presence
 S%= Random insp
 A= Insp all items
 M1-g= Receiv insp
 M= Dim insp
 F= Shape insp
 OFP= Non destruction test (U,R,M,P) Ultrasonic, Radiogr
 Magnetic part, Dye penetr
 U= Alignment, positioning
 TÅ= Leak test
 TP= Preasure test
 VÅ= Heat treat insp
 R= Cleanliness insp
 Y= Surf treat, coat insp
 K= Component insp
 MO= Assembly insp
 MI= Environmental test
 P= Process insp
 Fu= Insp of function
 MA= Insp of marking
 HP= Holdpoint
 EL= Insp electrical inst
 E= Insp electronics inst
 MA= Insp of cablerunnings
 HP= Holdpoint
 3= Insp of marking
 4= Continuity test
 5= Insp of connect
 1= Insp of terminators
 2= Insp of terminators

PBS	Insp code	Insp no	Perf by	Req code	Specification	Drawing, valid document(s)	Description, method and scope of insp	Date/Sign	Report
41.3	MÅ F A	23541005	Ts	1B	KVS0567.11 P11	09-F.702A-423541	Lower Chord North After fabr. Dimensional inspection. All reports to be stored at Qc dept.-KkrV.	980324 JF	351
41.3	OFFPMV OFFPROFPU	23541006	Ts	Qio 1A	P11 prENV1090 P29 P30 P31 P32	09-F.702A-4W3541	Lower Chord North After fabr. None Destructive Examination of welds. NB! Holdtime before NDE. All reports to be stored at Qc dept.-KkrV.	980324 D	

2/2

NOTES

In the weld Summary list, there are two columns named " Extra Report Available" 1, and " Extra Report Available" 2.

" Extra Report Available" 1 shows the Visual inspection, which is performed 100%.

" Extra Report Available" 2. Shows Lamination inspection, this is performed 100% when this is signed.

Explanation to abbreviation in the weldlog

Column : NDE gr.

Abbreviation

BMO	Weldclass B, Member zones, Other Welds. In accordance with prENv 1090-1: 1994
MF	Member zones, Fillet Welds
CF	Connection zones, Fillet Welds
MX	Member zones, Full penetrated welds. With requirements on Lamination inspection
CX	Connection zones, Full penetrated welds, With requirements on Lamination inspection
MOF	Member zones, Full penetrated welds
COF	Connection zones, Full penetrated welds
MOP	Member zones, Partly penetrated welds
COP	Connection zones, Partly penetrated welds.
MI	Member Zones, Inline welds
CI	Connection Zones, Inlide welds

Other Columns

Abbreviation

BW	Butt weld
FW	Fillet weld
MT	Magnetical particle testing
PT	Penetrant testing (Not used on project Öresundslink_HB)
UT	Ultra sonic testing
RT	Radiographic testing
VIS	Visual inspection
LAM	Lamination testing
OK	Accepted without remarks
OKE	Accepted with remarks
NOK	Not accepted
NC	Not Controlled (the % is taken on another weld)

WELD SUMMARY LIST

Rep. no.: 980325

Date 980325

Page 1 of 2

Project: Oresundslink_HB Section: 3500 Drawing: 09-F.702A-4W3541

Client: Sundlink_Contractors Line: -

Spool: -

Rev.: 00

S. no.: WPY

Sign.: 

Search status:

ENGINEERING		PRODUCTION										QUALITY INSPECTION											
Weld no.	NDE gr.	Weld length/thickn.	Joint type	Material id. A/B	Batch no filler	Welders' id	WPS	Date/ Hour	Form. acc./ sign.	MT/PT Length Report Date	Acc Sign.	UT Length Report Date	Acc Sign.	RT Length Report Date	Acc Sign.	Extra rep. available				Weld rep. Report Date			
																1	2	3	4				
1	MOF	11819 18.0	BW		3061	89 97	3032-1	980204 13:00	OK MAL	600 980216	OK PB	11819 305 980216	NOK PB			OK PB							
1R1	MOF	11819 18.0	BW		3061	89 97	3032-1	980217 15:23	OK MAL		NC PB	11819 308 980209	NOK PB			OK PB							
1R2	MOF	960 18.0	BW		3061	89 97	3032-1	980225 10:14	OK MAL	600 980225	OK PB	960 980225	OK PB			OK PB							
2	MOP	11819 18.0	BW		3063	89 97	3032-1	980204 10:00	OK MAL	600 980216	OK PB	1200 980216	OK PB			OK PB							
3	MF	11819 18.0	FW		3063	89 97	3032-1	980204 13:00	OK MAL	600 980216	OK PB					OK PB							
4	MF	11819 18.0	FW		3063	89 97	3032-1	980204 13:00	OK MAL	600 980216	OK PB					OK PB							
5	MF	11619 16.0	FW			86	3032-1	980202 15:30	OK MAL	600 980216	OK PB					OK PB							
6	MF	11619 18.0	FW			86	3032-1	980202 15:30	OK MAL	600 980216	OK PB					OK PB							
7	MF	11619 16.0	FW			86	3032-1	980130 09:00	OK MAL	600 980216	OK PB					OK PB							
8	MF	11619 18.0	FW			86	3032-1	980202 10:00	OK MAL	600 980216	OK PB					OK PB							
10	MF	920 18.0	FW			100	3032-1	980205 00:45	OK MAL	100 980216	OK PB					OK PB							
11	MF	920 18.0	FW			100	3032-1	980205 15:30	OK MAL	100 980216	OK PB					OK PB							
12	MF	5380 18.0	FW			100 101	3032-1	980205 21:30	OK MAL	1264 980216	OK PB					OK PB							
13	MF	5380 18.0	FW			100 101	3032-1	980205 20:15	OK MAL	980216	NC PB					OK PB							
14	MF	5380 18.0	FW			100 101	3032-1	980205 18:30	OK MAL	980216	NC PB					OK PB							

© QM Software		IDENTIFICATION AND TRACEABILITY		Procedure No.: 4.2-1		
		Rev. no.:	Page: 9 of: 13			
Project:		Order:	Section:			
Target:	Ensure that the system for identification and traceability is according the specified requirements.					
Purpose:						
Scope:						
Responsibility:						Welding Coordinator
Reference:						
			OK/ NOK	Not rel.	Date sign.	
	1. Verify if the requirements for identification and traceability can be met.					
	2. Is it requirements for a system for personnel identification ?					
	3. Is it required a system for material traceability, ie a code which follows each item of plate/profile/pipe and which leads back to the material certificate ?					
	4. Is it required a system for identification of the welds, ie requirements for production status with documentation of: - Welding Procedure used - Identification of the welder(s) - Visual inspection - NDE operator(s)					
	5. Is it required a system for documentation of status ? - Approved -Not approved - Documentation for repair - No of repairs per weld - Control reports					
	6. If none of the requirements can be fulfilled, a system must be established or a non-conformance request for deviation from the contract requirements must be approved by the client.					

Created by:	Approved by:	Date:	Manual no.:
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company

VISUAL WELDING INSPECTION REPORT

REPORT NO.

REV.

DATE

SHIFT [DAY]

[NIGHT]

SHEET

JOB NO. :

PROJECT NAME :

CLIENT :

LOCATION :

WELDED PART/COMPONENT :

NO.	JOINT NO.	WPS NO.	WELDER NO.	RESULT		REMARKS
				ACC	REJECT	

TYPE OF WELD VISUAL UNACCEPTABLE	Accepted Criteria	SKETCH :
UC : Under Cut		
WS : Welding Spatter	No	
GM : Gouging Marks	No	
UWP : Unacceptable Weld Profile	No	
IW : Incomplete Weld	No	
CR : Cracks	No	
CT : Craters	No	
CL : UnCleaning	No	

INSPECTED BY. QC. INSPECTOR	REVIEWED BY. Sr. QC OFFICER	ACCEPTED BY ,
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List of approved WPS's and PQR's

INGL Project Name/Nr: _____
 Contractor: _____ Document NO: _____
 Third party Inspection: _____ Supervision Company: **Ludan Engineering** **Status Date:** _____

No.	PQR Nr.	WPS Nr.	Material Range	Diameter Range	Wall Thickness	Position	Process	Station / Pipeline	Rem
1									
2									
3									
4									
5									
6									
7									
8									
9									

The PQR's and WPS's have been reviewed and are attached to this listing

Contractor:	Supervision Company:	Client / Consultant:	Third Party Inspe
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INGL Form 410 - May 2012

ark
ction:

List of approved Welders

Project Name/Nr: NATURAL GAS PIPELINE. Project Nr. 2021

Contractor: _____ Documet No. _____

Third party Inspection: ISIM _____ Supervision Company: _____ Status Date: _____

No.	Welders Name	Date of Birth	Welder ID Number	Diameter Range	wall thickness [mm]	Position	Process	First Issued (Date)	To be extended latest (Date)
1			H-1	80 - 500 mm	141: (3.00- 8.00) mm 111: (3.75 - 10.30) mm	All except PJ, J-L045	141/111		
2				≤ 115 mm	141: (4.12 - 11.00) mm	All except PJ, J-L045	141		
3				≥ 22.75 mm	Branch: ≥ 5.00 mm Pipe: (3.00 - 18.30) mm	All except PJ, J-L045	141/111		
4				≥ 325 mm	141: (2.62 - 7.00) mm 111: (6.90- 18.4) mm	All except PJ, J-L045	141/111		
5			H-2	80 - 500 mm	141: (3.00- 8.00) mm 111: (3.75 - 10.30) mm	All except PJ, J-L045	141/111		
6				≤ 115 mm	141: (4.12 - 11.00) mm	All except PJ, J-L045	141		
7				≥ 22.75 mm	Branch: ≥ 5.00 mm Pipe: (3.00 - 18.30) mm	All except PJ, J-L045	141/111		
8				≥ 325 mm	141: (2.62 - 7.00) mm 111: (6.90- 18.4) mm	All except PJ, J-L045	141/111		
9			H-10	80 - 500 mm	141: (3.75 -10.00) mm 111 : (4.80 -13.00) mm	PA, PE, PF, PH	141/111		
10			H-6	≥ 325 mm	141: (2.62 - 7.00) mm 111: (6.90- 18.4) mm	All except PJ, J-L045	141/111		
11			H-3	80 - 500 mm	141: (3.75 -10.00) mm 111 : (4.80 -13.00) mm	PA, PE, PF, PH	141/111		
12			H-4	80 - 500 mm	141: (3.75 -10.00) mm 111 : (4.80 -13.00) mm	PA, PE, PF, PH	141/111		

The welders Certificates have been reviewed and are attached to this listing

Contractor:	Supervision Company:	Client/Consultant:	Third Party Inspection:

MANUFACTURER Logo		
Natural Gas Pipeline		
<u>Welding and Inspection Quality Procedure</u>		
Document #:	Rev. 00	Date: 28.05.2021

Client: **Natural Gas Lines**

Project: **12" NATURAL GAS PIPELINE**

Welding and Inspection quality procedures

Document #:

			Signature & Date	Signature & Date	Signature & Date	Signature & Date
Revision Tracking and Approval						
1		For Approval				
			Contractor	2nd Party	3rd party	Client
<i>Rev</i>	<i>Date</i>	<i>Description</i>	<i>Issued by</i>	<i>Checked by</i>	<i>Approved by</i>	<i>Reviewed by</i>

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

TABLE OF CONTENTS

1. Introduction.....	3
2. Personnel.....	4
3. Welding Specification and Standards.....	4
4. Materials and Materials Control.....	5
4.1 Pipes and Pipe Fittings.....	5
4.2 Welding Consumables.....	5
5. WPS & POR.....	5
6. Certifications.....	6
7. Welding Application.....	7
8. NDT Inspections.....	8
9. Welding Repairs.....	11
10. Golden Welds.....	12
11. Production Weld Testing.....	13
12. Quality Control Documents.....	13
13. Safety.....	14

1. Introduction

The purpose of this Welding and Inspection Quality Plan (WIQP), together with other referenced documents, is to establish and maintain the Manufacturers General Policy for the control of the welding and inspection quality related activities in order to achieve the Quality standards and contractual requirements for the natural gas transmission piping system project.

All the Manufacturers nominated managers in this project will supervise and check the work performed by their staff in accordance with the requirements of this WIQP Quality control procedures and to all specified contract welding and inspection requirements which are applicable to specific area.

2. PERSONNEL

Responsible Welding Engineer / Coordinator – the welding engineer/ coordinator is responsible to prepare and follow the execution of welding specifications (WPS) and welding activities, the welding engineer will give solutions to welding problems when they occur. He will make sure that all welding and NDT activities at site will be manage and coordinated according to the approved procedures and specification. Contractor welding supervisors shall have knowledge of all specification and applicable standards and codes.

Welding Inspector – the welding inspector is responsible that all welds will be carry out in accordance with the approved WPS , he is also responsible that welds are carried out as per the quality standards as defined in the welding and inspection quality procedure.

Welders - Welders shall be certified in accordance with EN 3650, EN 12723 and EN ISO 9606-1 the contractor will show evidence of welder's qualifications and certification before start welding.

3. WELDING SPECIFICATION AND STANDARDS (latest edition)

1. EN 3650 -2 REQUIREMENTS FOR PIPALINE SYSTEMS PART 2 – STEEL.
2. EN 12732 Gas supply systems, welding steel pipe work – functional requirements.
3. For PQR: EN ISO 15614 for station / pipeline.
4. EN 12732 Appendix A & EN 3650 & EN ISO 9606-1 approval testing of welders qualification
5. Field Welding Procedure.
6. Welding Inspection Procedure

In addition, the Manufacturer shall be certified according to ISO 9001 and according to EN ISO 3834 part 2 the following procedure will be in accordance to the mentioned standards.

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Natural Gas Pipeline		
<u>Welding and Inspection Quality Procedure</u>		
Document #:	Rev. 00	Date: 28.05.2021

All welding activities are in accordance with the following listed documents/ procedures:

- Inspection and test plan Doc
- Welding Consumables Handling procedure:
- VT procedures:
- Gold Weld and Tie in Procedure

4. Materials and materials control

4.1 pipes and pipe fittings

All pipes, pipe fittings materials and products supplied by the client shall be subjected to inspection by the QC supervisor, upon receipt he will assure that materials / products are in accordance with the technical and specification requirements. All materials shall have certificates before using them.

Pipes will be cut with manual flux and will be beveled with suitable beveling machines or manually. Pipe fittings, hot bends, and cold bend can be cut only after approval of the inspection parties.

4.2 WELDING CONSUMABLES

The purpose of this section is to describe the methods for storing and maintain welding consumables in the Manufacturer. There are several steps in the welding consumables life cycle:

- Purchasing
- Receiving
- Storing and maintaining
- Before Welding

Any welding activity shall start only after presenting the welding consumables certificates. For more information see welding consumables handling procedure

5. WPS & PQR

The following steps should be fulfilled when issuing WPS – supervision attendance, monitoring, Reviewing and / or holding point shall be in accordance with ITP.

5.1 Issue a p WPS, according to the specification – it shall be signed by the Manufacturers Responsible Welding Coordinator and the client representatives.

5.2 After approval of the pWPS, carry out a welding test under site conditions, welding the joint according to the p WPS and followed by weld report recording the weld parameters, such as position, amps, voltage, travel speed etc. The weld shall be visual inspected according EN ISO 17637 and EN ISO 15614-1 requirements for welding in stations and pipeline. The welding process shall be witnessed by the Manufacturers welding inspector, by the client representatives and TPI.

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Natural Gas Pipeline		
<u>Welding and Inspection Quality Procedure</u>		
Document #:	Rev. 00	Date: 28.05.2021

5.3 Nondestructive tests - NDT shall be in accordance with the requirements of EN ISO 15614-1 and customer specific requirements for welding in stations and pipeline and should be signed by the Manufacturers NDT subcontractor, and the client representatives and TPI.

5.4 Upon completion of the NDT, the PQR welded specimen will be tested under mechanical examinations in an ISO 17025 approved laboratory. The test shall comply with the client's field welding specifications. The results shall comply with the requirements of EN 12732 paragraph 11 and EN ISO 15614-1 requirements for welding in stations and pipeline. The test shall be witnessed by the Manufacturer Responsible Welding Coordinator, the client representative and third party inspector.

5.5 After the mechanical tests approval, the PQR and WPS will be issued and shall be signed by the Manufacturer Responsible Welding Coordinator, the client representative, and the third party and management consultant.

5.6 In case that the Manufacturer has an Existing and approved WPQR relevant to the project specification, a WPS based on the existing WPQR will be submitted for approval.

The QC manager shall maintain in his office a copy of all documents related to the WPS and PQR, all be organized in a hard copy file - WPS data book. The documents will be available to all welding parties involved, and a copy will be available in the field.

All welding repair procedure specification (WRPS for repair of weld) is required and will be issued in the same process as for issuing WPS.

The WPS (and its related documents such as: PQR mechanical results, NDT results etc.) of the project will be submitted as separate, and will be handed as part of the AS built documents.

List of WPS form -attached to the developed ITP

6. Certifications

6.1. Welding inspector Certification

All welding processes shall be witnessed and supervised by a certified welding Inspector.

The welding inspector shall inspect the whole process of welding from the fabrication to the completion of weld.

The welding Inspector/NDT subcontractor shall be formally approved by the client and, if case, the TPI.

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Natural Gas Pipeline		
<u>Welding and Inspection Quality Procedure</u>		
Document #:	Rev. 00	Date: 28.05.2021

6.2. Welders Certification

All welders for each welding process and position that will be used in the project shall be qualified according to EN 12732 Annex A/EN 3650 and EN ISO 9606-1 and meet the requirements of visual inspection, radiographic examination. The qualification shall be done according to approved WPS and shall be witness by the Manufacturers Welding inspector, the client representative, and Thirt Party Inspection (TPI).

The Responsible Welding Coordinator shall maintain in his office a copy of all the certificates and approval documentation (all NDT files associated). The Responsible Welding Coordinator shall submit the documentation to the client welding inspector and 3rd Party for approval and signature prior to any welding being performed by a welder.

A master list of qualified welders that will document the welders ID, their qualified welding process, welding position and the date of each individual qualification shall be made available to all parties involved in the project welding activity. A List of approved welders will be submitted.

Any welding activity shall start only after presenting the welders certificates.

7. Welding Application

7.1 General

All production welding shall be in accordance with WPS, and it is the welding QC inspector responsibility to verify that the entire production field welding is done in accordance with appropriate and approved WPS. Before, during and on completion of the welding process.

In the frame of this procedure the term defect is used in the meaning of not allowed imperfection. The acceptance ciriteria will have to be previously established by the customer and the Manufacturer will also have to be aware of those criteria.

7.2 Inspections before Welding

All welding preparation activities such as but not limited to safety regulation conformance, Edge preparation, fit-up and alignment, pre-heating, maximum inter-pass temperature and correct use of welding consumables, welding parameters shall be controlled by the Welding inspector.

The following shall be inspected prior welding:

- Pipe/Fittings to be joined and weld method are in accordance with the

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Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

Appropriate WPS

- Welders are qualified according the WPS and their certificates are valid
- Pipe's Registration on pipe
- internal clean of pipe – internally cleaned of any dirt or debris
- Pipe End cleanliness – shall be cleaned mechanically with a wire brush, at least 50 mm from each end on both, the inner and outer surface of the pipe. Surface defects and welds-end defects, which cannot be repaired, shall be normally removed by cutting away the damaged section with a flame cutter, and then bevels the end.
- Joint design shall meet the WPS requirements.
- quality of Pipes – no deformations (indents) are allowed to be carried out visually
- Consumables to be used are according to the WPS and welding consumables and storage handling procedure.
- Perform Pre-heat in accordance with WPS requirements – Pre-Heat extended to 60mm to each side of the seam. Acetylene burners shall not be used. The temperature shall be checked with calibrated electrical thermometer or temperature sticks.
- Weld alignment – the gap between the components and HI LOW according to EN 13732 table G.2 requirements shall be in accordance with the approved WPS. Alignment method (tack, external, internal) shall be carried out in accordance with the WPS requirements.

Table G.2 — Permitted misalignment of surfaces

Wall thickness (T)	Permissible external misalignment	Permissible internal misalignment
≤ 10 mm	0,3 x T	1 mm on entire circumference
10 mm < T ≤ 24 mm	3,0 mm	2 mm over length DN
T > 24 mm	0,125 x T	2,5 mm over length 1/3 DN

- The seam of longitudinally welded pipes shall, as far as possible, be placed in the upper third of the pipe circumference .longitudinal or helical seems at girth welds shall be offset by at least 100 mm from each other (exceptions may be made with factory bends, tees, etc., un this cases approved deviation by the client will be required prior to any activity)
- The minimum distance between 2 welds shall not be less than 0.5 x OD , however, if the required length is less than 1.5 m / 2m for tie ins are unavoidable we will notify the supervision prior welding. For pipes greater than "4 an ultrasonic test for detection of lamination shall be performed prior to cutting.
- Registration on pipe – the welding inspector will write the following:

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

- weld number
- weld date,
- welders ID
- Length (also for cut pipes)
- WPS
- VT results on the pipe and the inspector will sign on the pipe after performing the VT. (after completing the weld)

- The weld names are defined in the welding log book. For this project specific the registration will be the following:

Project No	Section No.	Kilometer No.	Weld No.	Additions
2021	Sxx	Kxx	xxx	<ul style="list-style-type: none">○ /1 ; /2 ; /3... = Additional Welds○ S = Stub on Weld○ N = New Weld (After cut-out)○ R = Repaired Weld○ RS = Re-shoot Weld○ T = Temporary Weld○ GW=Golden Weld○ CS = Casing

7.3 INSPCETION DURING WELDING

Welding process shall meet the requirements as mentioned in the field weld welding specification.

While welding the inspector/VT certified operator shall verify that welding parameters - amps , volts , travel, speed , inter - pass , temperature, gas flow etc. are all in accordance with the parameters as described in the

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Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

WPS . In addition, the welding inspector will verify that the weld is clean and free of slag and weld spatter. The welding inspector shall record the parameters of at least one weld per day for each WPS. The welding engineer will also resolve any problem that might occur during welding.

7.4 Inspections at the end of welding

At the end of the welding the weld, the welding inspector/VT certified operator will verify that:

- Visual inspection – visual inspection according to ISO 17637 acceptance criteria according to EN 12732/EN ISO 5817 requirements , in addition the welding inspector will verify that the weld is clean and free of slag and weld spatter .
- Width of weld – verify that the width of weld is within the specification limits
- Arc strike is prohibited the welding inspector shall verify that the welders will not perform any arc strike.

In addition, at the end of every day the weld inspector / welding team will verify that all pipeline ends are sealed with temporary caps.

7.5 WELDS DOCUMENTATION

For each weld the welding inspector will fill the Manufacturers field welding report. At the end of each day the welding QC inspector will transfer the weld reports to the QC supervisor, all data will be updated to the welding pipe book see pipe book.

At the end of the project the Manufacturer will submit to the client the pipe book and the welding inspections reports.

Once a week the contractor will issue welding report summarizing welding activities.

8. NDT INSPECTIONS

After the visual test by the Manufacturers welding inspector (according ISO 17637 / EN 12732) additional nondestructive testing shall be carried out by sub-contractor (as described below) the quality of the welds shall be verified by nondestructive examinations as per EN 12732 paragraph 8.

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

Prior to any NDT inspection starts, the NDT subcontractor shall submit to the QC manager for approval the following documentation:

- Names, qualifications and documentation of certifications of the NDT personnel to be used including level of certifications and expiration data.
- Name and valid certificate of the level 2 operators – according to EN ISO 9712 requirements.
- Approved laboratory certification (EN ISO 17025).
- List of equipment, current calibration documentation of equipment to be used.
- NDT procedures and methods for performing all required NDT as required by EN 3650, EN 12732:2013 and and contractual requirements for all procedures will be submitted by the NDT sub-contractor and will be approved by the client prior to any production welding.
- All NDT procedures shall be approved by NDT Sub contractor Level 3 operator.

The nondestructive tests are:

- Visual testing in accordance with the VT Procedure– will be carried out by the Manufacturers welding inspector and/or VT level 2 qualified operator. For more information see VT Procedure.

Other NDT that will be carried out by a subcontractor are:

- Magnetic examination (MT) – weld connections perpendicular to the pipe such as nozzles welding etc.
- Radiography examination (RT) – 100% of welds (apart from nozzles weldolets), shall be performed by x ray. Gamma ray shall be used be a case to case approval by the client. 10% of the casing pipe welds below highway or railway.
- Ultrasonic examination (UT) – lamination inspection at weld connections perpendicular to the pipe such nozzles out lets prior of drilling in the pipe. In cases where UT evaluation indicates defects with shape and nature like cracks area will be cut out.
- lamination checks for cut end pipes that are cut more than 25mm from the original pipe bevel ; Pipe with wall thickness less that 7mm need no lamination
- Ultrasonic testing on the first 25 manual welds and thereafter ultrasonic testing on 10% butt welds
- 10% UT of casing pipe welds.
- 100% UT test for golden welds and welds inside casing (Pipes)
- Liquid penetrate or magnetic particle testing of pipe, welds, to components, as required
- Ultrasonic thickness measurements to determine remaining wall thickness in each area where any defect or damage is repaired by grinding on the body of a pipe or component as required.

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

The welding inspector or QC manager shall submit a written order to the NDT subcontractor to perform NDT. It shall include the weld identification, pipes dimensions (WT pipe OD etc.) NDT method (s)

After completion of the NDT an NDT report including the radiographic films when RT is performed shall be submitted to the Welding Engineer. All the documents including the radiographic films shall be properly kept at the QC manager site office. The NDT documents shall be made available to all parties involved in the project welding activity. This applies to all other NDT tests (UT, MT, etc.)

For all NDT reports that will be issued the NDT supervisor from the subcontractor will mention on the report whether he accept the weld or not, if there is a defect, the NDT supervisor will then mention it in the report, including the position of the for defect and the reason for the defect .

RT Films reports shall be submitted not later than 72 Hours from the weld completion. Max 2 days after interpretation the films will be arranged in appropriate boxes on shelves in the viewing room.

Note: for more information see the specific NDT procedures.

9. Welding repairs

If a repair is required and there is a defect in the weld, then the Manufacturer will use welding repair procedures specification (WRPS) according to the client specifications. As mentioned earlier, the process for issuing WRPS is the same as for issuing WPS.

Welding repairs shall be in accordance with the approved WRPS and according to the NDT report, the welding repair shall be recorded in a field welding report, QC welding inspector will mark the location of the repair for the welders. Repair in a previously repaired area are not be permitted and the weld seam shall be cut out. Welds with cracks, or repairs for more than 20% of the circumference are not allowed and the weld will be cut out.

At the end of the repair the Responsible Welding engineer /Inspector will write on the pipe the date of the weld, and will rewrite the number of the weld with the letter "R" at the end of the weld number, this to identify that the weld has been repaired. The field welding report will be transferred to the welding coordinator / welding engineer and will be updated in the pipe book. Repair welds will be registered in the Weld Follow up & Repair Register.

10. Golden Welds

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

A Golden weld joint is that joint in which the new piping is connected to the existing piping. Hence this joint cannot be hydrostatically tested. So it has to be ensured that it should be defect free as per norm requirements.

Golden welds shall be performed according to approved WPS by a certified welder(s) having the least amount of rejects during the welding activity. The Welding inspector shall be present throughout the entire welding process including pre-welding preparation and shall verify that the welding parameters are within the limits and recorded. After the successful completion of the weld, he shall complete and sign the "Report for Golden Welds" –See Attachment Gold Weld Report. All the above mentioned activities shall be recorded in the detailed welding form. In addition to the RT and UT reports that will be issued for the gold weld.

The welding inspector will fill the parameters report during the golden weld; parameters will be taken from each pass. For More information see Gold Weld and Tie in Procedure.

11 Production Weld Testing

Production weld testing shall be planned and executed according to specific instructions.

Production weld will be performed on selected field weld, chosen from the 2nd and 3rd Party inspectors according to the following table:

Pipeline Length (km)	Number of Test Welds
Up to and including 5 km	1
Above 5 km to 20 km	2
Above 20 km to 40 km	3
Above 40 km to 80 km	4

The results of the tests have to make evident that the required quality is in conformity with the requirements of EN 3650 including the additional specific requirements.

11.1 Inspection of Production test

The Manufacturer shall be responsible for performance, interpretation of results and documentation of the nondestructive examination in accordance with EN 3650-2, EN-12732 and/or client specification. All production butt welds shall be nondestructively examined for 100% of their lengths in accordance with paragraph 8 of this procedure.

MANUFACTURER Logo**Natural Gas Pipeline****Welding and Inspection Quality Procedure**

Document #:

Rev. 00

Date: 28.05.2021

12. Quality Control Documents

To control and record all QC documents, the following table summarizes all the mentioned reports. All these report will be attached to the ITP.

Document name	Manufacturers Responsible Person	ITP Forms
List of approved WPS-WPQR	Responsible Welding Coordinator	
List of Approved welders	Responsible Welding Coordinator	
NDT Technicians Certificates	Responsible Welding Coordinator	
NDT equipment & Lab register	Responsible Welding Coordinator	
Welding consumables & certificate register	Responsible Welding Coordinator	
Welding consumable - storage and Handling	Storage Manager/ Material supervisor/ Welding Inspector	
Listing of Golden Welds	Welding Coordinator Responsible	
Golden Weld Report	Responsible Welding Coordinator	
Daily Welding / Visual Inspection	Welding QC Inspector	
Weld Parameters Report	Welding QC Inspector	
Welding Book	Welding Coordinator Responsible	
Weekly Welding Report	Responsible Welding Coordinator	
Weld Follow UP & Repair Register	Responsible Welding Coordinator	

13. Safety

The following table summarizes the risk assessments during welding, all workers in relate with welding activities will be guided and be instructed accordingly.

Risk	Solution	Responsibility of
Fire while welding/burns	<ul style="list-style-type: none"> - When welding in a welding cell the helper will be in the cell to warn in any case a fire starts - A fire extinguisher will be located in every welding cell\6 m from the welders - welders apron, the welders shall not wear flammable cloths 	Safety superior and work manager and weld team foreman
Eye Burns	- No direct look at the welding is allowed, welders must wear welder mask during all time of the weld	Safety supervisor and work manager and weld team foreman
Breathing problems	- The welding cell must be vented and	Safety supervisor

MANUFACTURER Logo

Natural Gas Pipeline

Welding and Inspection Quality Procedure

Document #:

Rev. 00

Date: 28.05.2021

	the vent must work during all time of weld	and work manager and weld team foreman
Collapse of pit walls while welding in a pit	The slopes will be at 45 degrees to overcome any collapsing that may occur, the Manufacturer will also use trench box or step the pit's walls	Safety supervisor and work manager and weld team foreman
Danger of falling into the pits	1- The pits will be fenced and will have warning signs on them to warn all workers and public, and prevent any falling 2- A ladder will be located in the pit to enable safe lowering to the pit; the ladder will be removed at the end of the day to prevent any entrance of unauthorized people. 3- For machines and heavy equipment a ramp will be located to enable safe lowering and lifting of equipment. 4- in case of heavy machinery near the pits a leading operator will direct the drivers	Safety supervisor and work manager and weld team foreman

Project: Gas Transmission
Client: SAMPLE LTD
Supervision: LONG LTD
TPI: ISIM
Contractor: MUSTERMAN LTD

Project no.:

Date: _____ Page#: _____ Document No. : _____

MATERIAL Pipe 12"	HEAT NUMBER	PIPE S/N	DN Diameter	LENGTH (m)	BEND	BEND DIR.	Wall th.			DATE	PROGR. LENGTH (m)	WPS	Welders ID	VIS. INSPEC	REMARKS	
					(°)			Km	No.							
Pipe 12' PE 3mm API 5L X52																

Contractor: _____

Name & Signature: _____

HL - HORIZONTAL BEND LEFT VH - VERTICAL BEND HIGH VHLO - VERTICAL HIGH LEFT OBLIQUE VLLO - VERTICAL LOW LEFT OBLIQUE
HR - HORIZONTAL BEND RIGHT VL - VERTICAL BEND LOW VHRO - VERTICAL HIGH RIGHT OBLIQUE VLRO - VERTICAL LOW RIGHT OBLIQUE