

Welding Manual	[Company Name]	Document No.	WM/01
		Issue No.	01
		Date	01-05-2017

[Company Name] Welding Manual WM/01

Reference Standard	DIN EN 1090, Part-2 Technical Requirements For Steel Structural – Execution of Steel Structures and Aluminum Structures ISO 3834, Part-2, Quality requirements for fusion welding of metallic materials – Comprehensive quality requirements		
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2.	Customer	Clients
3.	WM	Welding Manual
4.	WQP	Welding Quality Procedure
5.	SOP	Standard Operating Procedure
6.	QMS	Quality Management System
7.	NCR	Non Conformity Report
8.	CAR	Corrective Action Report
9.	DIN	Deutsches Institute Norms
10.	EN	European Norms
11.	ISO	International Organization for Standardization
12.	WPS	Welding Procedure Specification
13.	NDT	Nondestructive Test
14.	IEC	International Electrotechnical Commission
15.	MNT	Maintenance
16.	FAB	Fabrication
17.	PLG	Planning
18.	WPQR	Welding Procedure Qualification Record
19.	QCD	Quality Control Department
20.	E	Exhibit
21.	EXC1 / EXC2 / EXC3 / EXC4	Execution Classes (Steel Structures)
22.	WPQT	Welding Procedure Qualification Test
23.	PRD	Production
24.	QA&I	Quality Assurance & Inspection
25.	PQR	Procedure Qualification Record
26.	D&D	Design & Development

1.2	Glossary of Terms	
Sr. No.	Abbreviation	For
27.	HT	High Tensile Steel

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Procedure for Preparation & Control of Welding Documents

1.0 Scope

This Chapter deals with the requirements for control of welding during the manufacturing and assembly.

Welding of items shall comply with Welding Procedure Specification prepared, qualified in accordance with **EN ISO 15614-1**. All welding on items shall be performed by qualified welders qualified in accordance with **EN ISO 9606-1**.

2.0 Procedure

Welding procedure to be confirmed and validated every six months by Assistant welding coordinator.

2.1 Qualification of WPS

- Assistant Welding Coordinator shall arrange for the qualification of WPS as per draft WPS issued by Responsible Welding Coordinator. Responsible Welding Coordinator shall witness the welding of the test coupon and record the variables used for each qualification test in the Welding Witness Report which is back up for PQR/WPQ.
- Preparation and testing of the test specimens are performed to meet the requirements of the Standard by a testing laboratory (**NABL Approved**).
- The completed WPS shall describe all the essential, non-essential Variables for each welding process.
- Changes may be made in the nonessential variables of a WPS to suit production requirement without re-qualification provided such changes are documented by revision to the WPS.
- Changes in the essential variables require re-qualification of the WPS (new PQRs shall be made to support the change in essential variables).
- Responsible Welding Coordinator/accreditation body shall approve WPS, certify PQR and WPQ. WPS and PQRs used for Production welding.
- Welding Documents such as WPS, PQR and WPQ shall be maintained by Assistant Welding Coordinator. WPS shall be available to the Welder on shop floor.

2.2 Qualification of Welders

- The Qualification of welders shall be the responsibility of Responsible Welding Coordinator. Qualification of Qualified welders shall be done in accordance with as per **EN ISO 9606-1**. A welder should have a unique identification no. assigned by Assistant Welding Coordinator. This no. should not be reassigned to any other welder.
- A welder qualified to weld in accordance with one qualified WPS is also qualified to weld in accordance with other qualified WPSs, using the same welding process, within the limits of the essential variables.

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- c) A Qualified Welders List (**P-11**) is prepared and maintained by Assistant Welding Coordinator. This Qualified Welders List is distributed to QA&I Engineer and Supervisor. From the Qualified Welders List, appropriately qualified welders are selected by Fabrication Supervisor for welding.
- d) In case a welder is added or deleted or leaves KPTL, the Qualified Welders List shall be revised and re-distributed. The superseded copies of Qualified Welders List shall be withdrawn and destroyed and the master copy shall be retained by Ass. Welding Coordinator duly identified as "OBSOLETE".

2.3 Expiration of Qualification of Qualified welder

The performance qualification of a welder shall be affected when one of the following conditions occurs:

2.3.1 Confirmation of the validity

The qualifications of a welder for a process shall be confirmed every 6 months by the person responsible welding coordinator for welding activities. This is confirming that the welder has worked within the range of qualification and extends the validity of the qualification for a further 6-month period. As per **EN ISO 9606-1 clause-9.2**.

2.3.2 Revalidation of welder qualification

Revalidation shall be carried out by an examiner/examining body as per **EN ISO 9606-1 clause-9.3**.

- The welder is working for the same manufacturer for whom he or she Qualified, and who is responsible for the manufacture of the product;
- The manufacturer's quality programme has been verified in accordance with **ISO 3834-2**.
- The manufacturer has documented that the welder has produced welds of acceptable quality based on application standards; the welds examined shall confirm the following conditions: welding position(s), weld type (FW, BW)

2.4 Revocation of qualification

When there is a specific reason to question a welder's ability to Make Welds that meet the product standard quality requirements, the Qualifications that support the welding he or she is doing shall be revoked. All other qualifications not questioned remain valid.

Note: All above Responsibility under by Responsibility Welding Coordinator.

2.5 Production Welding

- Assistant Welding Coordinator Shall Monitoring Client Drawing and shall include the welding processes proposed. When the "Client" drawings are revised the Same Drawing shall be reviewed by Design Department.
- Welding on Items shall be according to approved WPS indicated in Weld Plan. Supervisor / QC Engineer shall be responsible for ensuring that only qualified welders are assigned for welding using Qualified Welders List and welding is carried out as per WPS given in Route card.

2.6 Welder Identification

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Procedure for control of welding consumables

1.0 Purpose

The purpose of this procedure is to describe controls applied on the welding consumables including the methods used for the storage and handling of the welding consumables to preserve the quality of welding consumables during the storage and handling.

2.0 Scope

This procedure covers all welding consumables received in the **PEC** for the welding of the components / parts.

3.0 Responsibility

3.1 Assistant Welding Coordinator and Store manager is responsible for establishing control on the welding consumables and its inspection and testing upon receipt and ensure that the welding consumable conforms to the specified requirements. Also responsible for ensuring the proper storage and handling of the welding consumables to preserve the quality of welding consumables.

3.2 Store Manager is responsible to ensure proper and effective storage and handling of the welding consumables and ensure proper preservation to maintain quality of welding consumables.

4.0 Description of activity

4.1 Receipt and verification

4.1.1 Upon receipt of welding consumables, the Store keeper informs to Assistant Welding coordinator for the necessary verification of the same as per the purchase order requirements.

4.1.2 Assistant Welding Coordinator will verify the quality of welding consumables as per the inspection and test plan as well as requirements specified in the purchase order. Based on successful verification the accepted welding consumables are transferred to routine storage area for its temporary storage with proper preservation till its consumption in the welding.

4.2 Storage and handling

4.2.1 Welding consumables are transferred to the routine storage area by Store keeper. All such welding consumables are then stored at the designated storage place. Stock record of such welding consumables is updated based on the quantity received.

4.2.2 Followings methods are followed during storage of welding consumables to preserve its quality and to prevent it from the moisture pick-up, oxidation and damages, if any.

4.2.3 Upon receipt of requirements from the production for the welding consumable in terms of material issue slip, the same is verified by Store Keeper. Store keeper issues the required welding consumables to the production for it's during the welding.

4.2.4 FIFO (First In First Out) is followed during the issue of welding consumables to prevent any issues related to quality of welding consumables.

4.2.5 After issue of welding consumables, the stock records for the welding consumables are updated based on issue.

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Procedure of Weld Repair

1.0 Scope

1.1 Major repairs defined here under are to be handled according to this procedure

1.1.1 Weld defects found during or after welding.

1.1.2 Out of control condition causing weld defects.

2.0 Procedure

2.1 Repair of the weld defects.

2.1.1 Weld defects found during or after welding.

➤ Mark the weld defects if visible on surface

2.1.2 Sub surface defects, location shall be marked out by Ultrasonic Testing.

2.2 Remove of defects

2.2.1 The defective area shall be ground with the grinding machine or shall be gouged with the gouging electrode to remove the defects and then the surface shall be finished smoothly by the grinding. Width of the groove after grinding shall be such that sufficient necessary access and torch mobility during repair is possible.

2.3 Repairs Welding

The repair welding shall be done with the in accordance with applicable WPS.

2.4 Examination

The Dye penetrate examination (DP) shall be performed to ensure complete removal of the defects. DP examination shall be carried out as per procedure.

2.5 Cleaning

Area adjacent to the joint to be repaired shall be free from oil, grease and other foreign material, which may affect welding performance.

The cleaning methods are like wire brushing, grinding, etc.

2.6 Visual testing shall be performed again to ensure defect is removed.

2.7 When repair is carried out, the item shall be re-inspected, tested and examined in Accordance with the original requirements.

Different types of defects and its remedy as shown in the below table:

Defect	Remedy
Surface Cracks	Make required grove on crack portion and re-weld
Excessive concavity, Crater, undersize welds, undercut	Clean and deposit additional weld metal
Excessive porosity	Remove by grinding if the porosity is

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Weld Test Plan

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Sr. No.	Inspection and Testing Stages	Inspection Activity & Tasks	Content of examination	Reference standard	Format of Records	PEC	PEC/ Welding coordinator	Remarks
1.	Weld Plan	- Joint preparation - weld details and Requirements - Performance and inspection class. - Testing	100 %	EN ISO 15614-1	Technical Review (F/MKT/01)	P	W	-
2.	WPS & WPQ	Review of welding procedure and qualifications	100 %	EN ISO 15614-1, EN ISO 15609-1, EN ISO 15609-2, EN ISO 9606-1	WPS & WPQ	P	W	-
3.	Parent Material	- Visual Inspection - Dimension - Review of Mill TC and storage & handling	100 %	As Per Customer Specification & Drawing	Incoming material	P	-	-
4.	Welding Consumables	- Visual - Compatibility - Review of Test Certificate - storage & handling	100 %	EN ISO 14341-A-G 42 3 C 3Si1 or Equivalent standard	Incoming material	P	W	-
5.	Inspection Before Welding	- Part review - Joint preparation & fit-up - Jig-Fixture if applicable.	100 % By PEC & Assistant Welding Coordinator	EN ISO 15609-1, EN ISO 15609-2	F/QCD/01	P	W	-
6.	Inspection During Welding	- Check welding Parameters - Essential welding Parameters - Preheating/interpass temperature - Cleaning and shape of runs and layers of weld metal	100 % By PEC & Assistant Welding Coordinator	EN ISO 15614-1	F/QCD/02	P	W	-
7.	Inspection After Welding	- Visual Examination - Final Dimension & Inspection - NDT	100 % By PEC & Assistant Welding Coordinator	EN ISO 5817 EN ISO 17637 EN ISO 17640	F/QCD/03	P	W	-
8.	Final Documentation	Review Of All Documents	-	-	-	P	-	-

Note: P=Performance (PEC), W=Witness/Study (PEC/Welding Coordinator/Assistant Welding coordinator),

Material Inspection Report (MIR)				QA&I/F/01 Issue No.01	
Sr. No. →			Date →		
From →			To → Q.C. Laboratory		
Raw Material			Sample Qty		
Supplier Name					
Qty. Recd.			Challan No. And Date		
Test Required			Results		
Status→					
Requested By			Approved By		
Authorized Person			Dep.Manager (QA&I)		

[Company Name]			
Route Card			F/PRD/03 Issue No.01
Route Sheet		Material Number	
Length	Width	Order Number	Order Qty
Plant	Order Type	Planning Date	Date Of Handover
MIR No.		Inspection Lot	WBS Elements
Information On Routing		Section	Wt in Kg
Master Bundle No.		Bundle No.	

Operation No	Work Centre	Quantity	Date /Shift	Gauge	Name	Remark
Bundle Criteria						
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WELDING INSPECTION REPORT

Date		
Item No:		Welding Process : GMAW (semi automatic)
Type of Joint :		Required Weld Size :

[illegible]