

सत्यमेव जयते GOVERNMENT OF INDIA MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP



Transforming the skill landscape



Participant Handbook

Sector Iron & Steel

Sub-Sector Mechanical Maintenance

Occupation Welding

Reference ID: ISC/Q0911, Version 1.0 NSQF Level 4

> Tungsten Inert Gas Welder (GTAW)

Published by

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Shri Narendra Modi Prime Minister of India







Certificate

COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

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for

SKILLING CONTENT : PARTICIPANT HANDBOOK

Complying to National Occupational Standards of Job Role/ Qualification Pack: <u>'GTA/TIG Welder'</u> QP No. <u>'ISC/Q0911, NSQF Level 4'</u>

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About this book -

This Participant Handbook is designed to enable training for the specific Qualification Pack(QP). Each National Occupational (NOS) is covered across Unit/s.

This job is all about performing manual TIG welding for a range of standard welding requirements. This is for a skilled welder who can weld different materials in various positions and prepare various joints including corner, butt, fillet and tee. Set up and prepare for operations interpreting the right information from the WPS.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

Symbols I	Used —				
Key Learning Outcomes	Steps	Exercise	Tips	Notes	Unit Objectives

Table of Contents

S.No.	Modules and Units	Page No.
1.	Introduction	1
	Unit 1.1 – Understanding of Iron & Steel industry	3
	Unit 1.2 - Understanding various types of Iron & Steel industry	7
	Unit 1.3 – Creation of products in Iron & Steel industry	11
2.	Occupational health and safety (OHAS) (ISC/N0008)	19
	Unit 2.1 – Learn occupational health and safety	21
	Unit 2.2 – What is hazard	24
	Unit 2.3 – Safe working practices	32
	Unit 2.4 – Working at heights and confined spaces	40
	Unit 2.5 – Fire prevention	48
	Unit 2.6 - Emergencies, rescue and first aid procedures	53
3.	55 & housekeeping (ISC/N0008)	61
	Unit 3.1 - Identification of bottlenecks in functioning of work place	63
	Unit 3.2 - Various methods of housekeeping	66
	Unit 3.3 – Waste disposal	77
4.	Tungsten Inert Gas (TIG) welding (CSC/N0141)	81
	Unit 4.1 – Basic welding introduction	83
	Unit 4.2 – GTA or Tungsten inert gas (TIG) welding	87
	Unit 4.3 – Welding joints	91
	Unit 4.4 – Weld types and positions	98
	Unit 4.5 – Drawing and symbols	103
5.	TIG welding equipments, tools and measuring instruments (CSC/N0141)	117
	Unit 5.1 – TIG Welding equipments	119
	Unit 5.2 – Tools required	135
	Unit 5.3 – Measuring instruments required	142
6.	TIG welding setup and operation	147
	Unit 6.1 – TIG welding operating parameters	149
	Unit 6.2 – TIG welding setup and operation	155
	Unit 6.3 – Welding practice	168



7.	Welding quality and defects inspection (CSC/N0141)	171
	Unit 7.1 – Welding quality and defects	173
	Unit 7.2 – Quality and inspection tests	181
8.	Oxy-fuel gas cutting (CSC/N0144)	191
	Unit 8.1 – Oxy-fuel gas cutting	193
	Unit 8.2 – Oxy-fuel gas cutting equipments, gases and torch	196
	Unit 8.3 – Oxy-fuel cutting setup and operation	206
	Unit 8.4 – Oxy-fuel gas cutting techniques	215
	Unit 8.5 – Quality check	224
	Unit 8.6 – Safety practices during oxy-fuel gas cutting	226
9.	Reporting and documentation (ISC/N0008)	229
	Unit 9.1 – Documentation for health and safety	231
	Unit 9.2 - Documentation of defects	236
10.	Problem identification and escalation (ISC/N0008)	239
	Unit 10.1 – Risk management	241
	Unit 10.2 – Escalation matrix	243
11.	Work effectively with others (ISC/N0009)	247
	Unit 11.1 - Ensure appropriate communication with others	249
	Unit 11.2 - Workplace etiquettes	252
12	Employability & Entrepreneurship Skills	255
	Unit 12.1 – Personal Strengths & Value Systems	259
	Unit 12.2 – Digital Literacy: A Recap	278
	Unit 12.3 – Money Matters	284
	Unit 12.4 – Preparing for Employment & Self Employment	295
	Unit 12.5 – Understanding Entrepreneurship	304
	Unit 12.6 – Preparing to be an Entrepreneur	326



Unit 4.4: Weld types and positions

		6
· Unit Ob	jectives	(0

At the end of this unit, you will be able to:

- 1. Discuss about weld types
- 2. Perform different welding positions
- 3. Know about position naming standards

4.4.1 Weld types –

Fillet Welds

A fillet weld joins two surfaces to each other. There are a few sorts of filet weld:

- In full fillet weld, span of the weld is same and thickness of the thinner part is combined.
- An irregular fillet weld, two discontinuous lines of weld made on the joint. It is like TEE joint

where the fillet increases and in contrast with the other line.



Fig 4.4.1 Application of fillet welds

Groove Welds

Groove welds are the second most used welds. Groove welds are of seven types. The depression weld alludes to dabs that are kept in a notch between two individuals to be joined.

Plug Weld

Plug welds are circular welds made through one member of a lap or tee joint joining that member to the other. The weld may or may not be made through a hole in the first member; if a hole is used, the



Fig 4.4.2 Groove welds

Slot Weld

Slot welds are made in an extended hole by a lap or tee joint by joining the uncovered surface through the gap. This gap might be open toward one side and might be halfway or totally loaded with weld metal.



4.4.2 Welding positions -

All welding is done in one of four positions:

- 1. Down hand / Flat
- 2. parallel
- 3. perpendicular
- 4. Overhead

Welding positions naming as per the ISO 6947 standard

- PA parallel welding of butt weld and fillet weld in flat location
- **PB** parallel welding of fillet weld (downhand place)
- PC Transverse place
- PD Horizontal overhead place
- **PE** Overhead place
- **PF** straight up place
- PG straight down place

Welding positions naming as per the American Welding Fig 4.4.4 Welding positions

Society (AWS)

A digit is used to describe the place and an F for Fillet or G for groove refers to the sort of weld.

- 1.refers to a flat spot, either 1F or 1G
- 2.refers to a horizontal spot, either 2F or 2G
- 3..is a vertical spot, either 3F or 3G
- 4.is an overhead spot, either 4F or 4G
- 1. Downhand / Flat Position Welding: In downhand position, the welding is done on the upper side of the joint. Level welding is the favored term; in any case, a similar position is at times called downhand.
- 2. Horizontal Position Welding: In this position, the weld axis is a line passing through the length of the weld, which is opposite to the cross segment at its focal point of gravity.
- 3. Vertical Position Welding

a) In this position, the weld axis is vertical.

b) In vertical position pipe welding, the pipe axis is vertical and welding is done in even position.

4. Overhead Position Welding: tIn this position, the welding is done underside of a joint.



5. Pipe Welding Positions: Pipe welds are made under various prerequisites and in various welding circumstances. The welding position is managed by the occupation. When all is said in done, the position is settled, yet now and again can be moved for level position work.



In groove weld, dimensions are mentioned in two measurements and like the fillet weld; they are showing on left side of the weld drawing. The first measurement is used to set up the edges of workpiece. The second size is the real weld estimate and is encased in enclosures to recognize it from the groove size.



Fig 4.5.18 Groove weld example

Finishing symbols

After the weld has been made, there might be a completing procedure required. A portion of the more typical completing procedures are appeared above.



Commonly used welding power supplies are:

• **Transformers:** A transformer type power supply changes over the moderate voltage and current from utility mains (ordinarily 115 or 230 VAC) into low voltage between 17 to 45 (open-circuit) volts and high current 55 to 590 amperes

supply.

- Generator and alternator: These power supplies changes mechanical energy into electrical energy. In this setup the utility power is changed over first into mechanical energy at that point and then again into electrical energy to accomplish the progression down impact like a transformer. Since the output of the generator can be direct current, or high frequency AC current.
- Inverter: Amperage range of inverter welding machines is much smaller than other types of machines. This smaller size of machine makes it portable and increases the energy efficiency. The use of electronics in the inverter-type welder allows it to produce any desired type of welding power. Before the invention of this machine, each type of welding required a separate machine. Now a solo welding machine can create the precise type of current required for shielded metal



arc welding, gas tungsten arc welding, gas metal arc *Fig 5.1.6 Power Sources* welding and plasma arc cutting.

Rectifiers: Alternating welding current can be changed over to direct current by utilizing a progression of rectifiers. A rectifier enables current to stream in one direction only.
Rectifiers wind up noticeably hot as they change AC to DC. They should be joined to a warmth sink and cooled by having air blown over them. The warmth delivered by a rectifier diminishes the power proficiency of the welding machine..

5.1.1.2 Tungsten electrode -

In TIG welding, only tungsten is used as electrode. Because of its excellent properties, it is an

outstanding non-consumable electrode. Properties of tungsten can be also improved by adding materials like thorium, lanthanum, cerium or zirconium:

- Zirconiated;
- Ceriated;
- Thoriated;
- Tungsten;
- Lanthanated

Addition of above materials make sure better and stable arc striking.

- For DC welding, thoriated tungsten electrodes are utilized.
- For AC welding, zirconiated tungsten electrodes are utilized.

Tungsten electrodes are identified in some countries by coloured rings or the ends being painted according to their alloy content. These colour codes are often country specific.

Electrode Type	Nominal Composition	Colour Code*
Pure Tungsten	99.8 %	Green
Thoriated	0.5 % ThO ₂	Blue
Thoriated	1 % ThO ₂	Yellow
Thoriated	2 % ThO ₂	Red
Thoriated	3 % ThO ₂	Violet
Thoriated	4 % ThO ₂	Orange
Zirconiated	2 % ZrO ₂	Brown
Zirconiated	0.80 % ZrO ₂	White
Lanthanated	1 % LaO ₂	Black
Ceriated	2 % CeO ₂	Grey

Table 5.1.1 Tungsten Electrode Compositions and Colour Code as per European Standard EN 26848, 1991

Tungsten electrodes comes in many diameters which ranges from 0.5mm to 8 mm. Generally used electrode dimensions are 1.6 mm, 2.4 mm, 3.2 mm and 4 mm.



colour code



17



Price: ₹

