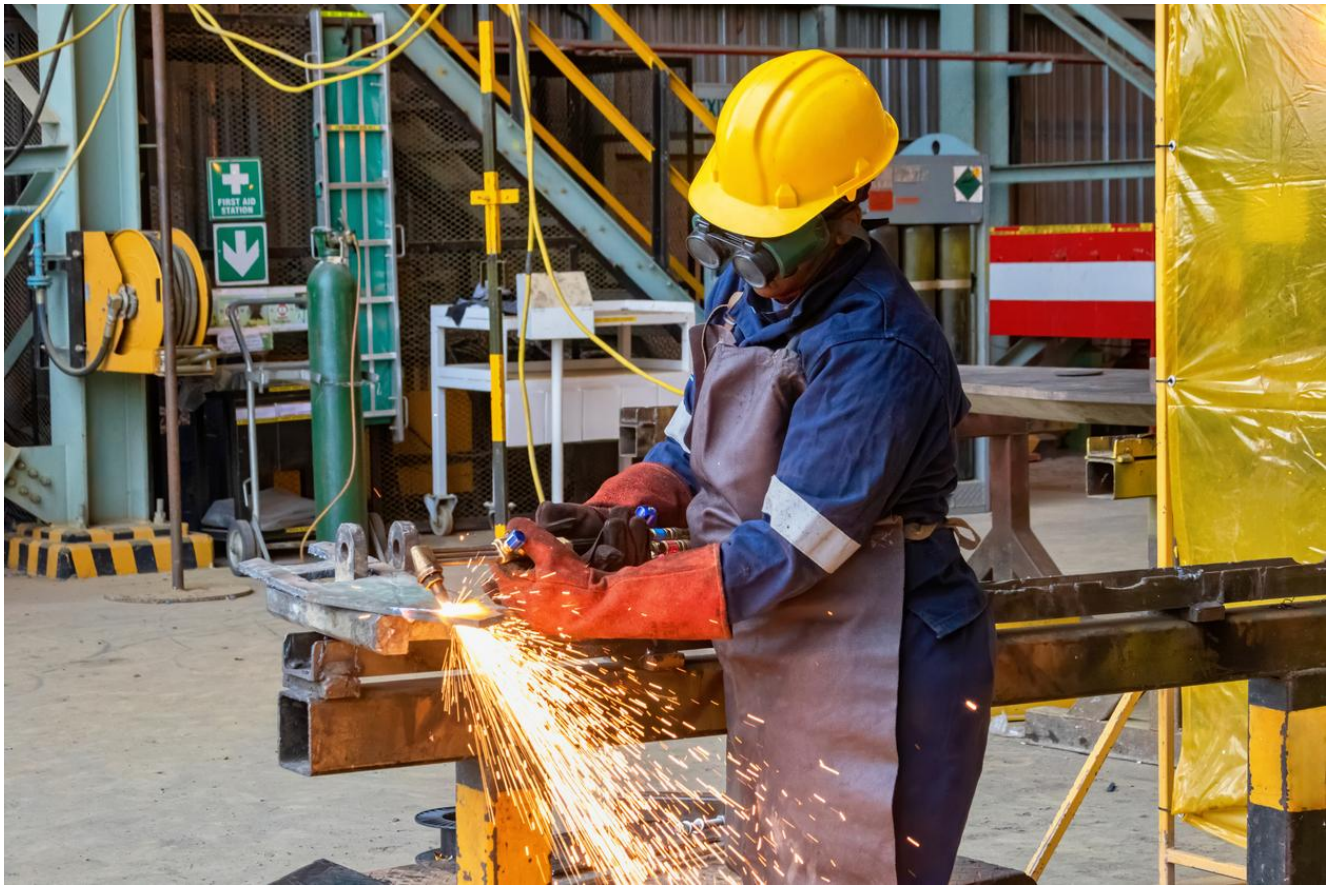

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Model Curriculum

QP Name: Construction Welder

Electives: Metal Inert Gas (MIG) Welding / Tungsten Inert Gas (TIG) Welding / Shielded Metal Arc Welding (SMAW)

QP Code: CON/Q1252

QP Version: 2.0

NSQF Level: 4

Model Curriculum Version: 2.0

Construction Skill Development Council of India|| CPB-201 and 202, Tower 4B, DLF Corporate Park, Mehrauli-Gurgaon Rd, DLF Phase 3, Gurugram, Haryana, 122002

Table of Contents

Training Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure Construction
Occupation	Fabrication
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7212.0303
Minimum Educational Qualification and Experience	12th grade pass OR Completed 2nd year of 3-year diploma after 10th (in Civil / Mechanical Engineering) OR Pursuing 2nd year of 3-year diploma after 10th (in Civil Engineering) OR 10th grade pass with 2 years of ITI (in Welder) OR 10th grade pass and pursuing continuous schooling OR 11th grade pass with 1-year relevant experience OR 10th grade pass with 2-year relevant experience OR 8th grade pass with 4-year relevant experience OR Previous relevant qualification of NSQF Level 3 (Assistant Construction Fitter) with 3-year relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	30/04/2025
Next Review Date	30/04/2028
NSQC Approval Date	08/05/2025
QP Version	2.0
Model Curriculum Creation Date	30/04/2025
Model Curriculum Valid Up to Date	30/04/2028
Model Curriculum Version	2.0
Minimum Duration of the Course	480 hours
Maximum Duration of the Course	1080 hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Perform preparatory works for grinding structural elements
- Perform the grinding of the structural elements
- Perform preparatory works prior to tack welding of structural elements
- Perform tack welding on structural elements
- Explain the process and sequence for pre-heating of materials before cutting and welding process.
- Perform heating of the base metal as per the standard practice.
- Demonstrate effective communication with co-workers, superiors and sub-ordinates across different teams
- Provide support to co-workers, superiors and sub-ordinates within the team and across interfacing teams to ensure effective execution of assigned task.
- Demonstrate practices sensitive to disabilities (physical, mental, intellectual or sensory impairment), cultural diversity and gender neutrality.
- Identify various hazards at construction site.
- Use PPE's relevant to construction welder task.
- Perform safe waste disposal at construction site.
- Demonstrate the activities to check the spread of infection as per medical/ organizational guidelines.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration (Hours)	Practical Duration (Hours)	On-the-Job Training Duration (Mandatory) (Hours)	Total Duration (Hours)
CON/N1206: Carry out grinding activities on structural steel elements NOS Version: 4.0 NSQF Level: 3	**20:00**	**40:00**	**30:00**	**90:00**
Module 1: Bridge Module	05:00	00:00	00:00	05:00
Module 2: Carry out grinding activities on structural steel elements	15:00	40:00	30:00	85:00
CON/N9001: Work according to personal health, safety and environment protocol at construction site NOS Version: 3.0 NSQF Level: 4	**05:00**	**25:00**	**00:00**	**30:00**
Module 3: Follow safety norms as defined by organization, adopt healthy and safe work practices	05:00	25:00	00:00	30:00

CON/N8001: Work effectively in a team to deliver desired results at the workplace NOS Version: 3.0 NSQF Level: 4	**05:00**	**25:00**	**00:00**	**30:00**
Module 4: Communicate effectively at workplace	05:00	25:00	00:00	30:00
DGT/VSQ/N0101: Employability Skills (30 Hours) NOS Version: 1.0 NSQF Level: 2	**30:00**	**00:00**	**00:00**	**00:00**
Module 5: Employability Skills	30:00	00:00	00:00	30:00
Total Duration	**60:00**	**90:00**	**30:00**	**180:00**

Elective Modules

The table lists the modules and their duration corresponding to the Elective NOS of the QP.

Elective 1: Metal Inert Gas (MIG) Welding

NOS and Module Details	Theory Duration (Hours)	Practical Duration (Hours)	On-the-Job Training Duration (Mandatory) (Hours)	Total Duration (Hours)
CON/N1253: Carry out preparatory works for Metal Inert Gas (MIG) welding operations NOS Version: 2.0 NSQF Level: 4	**20:00**	**60:00**	**10:00**	**90:00**
Module 6: Perform preparatory works for MIG welding operations	20:00	60:00	10:00	90:00
CON/N1254: Carry out Metal Inert Gas (MIG) welding as per requirement in fabrication workshop or construction site NOS Version: 2.0 NSQF Level: 4	**40:00**	**150:00**	**20:00**	**210:00**
Module 7: Perform MIG welding as per requirement in fabrication workshop or construction site	40:00	150:00	20:00	210:00
Total Duration	**60:00**	**210:00**	**30:00**	**300:00**

Elective 2: Tungsten Inert Gas (TIG) Welding

NOS and Module Details	Theory Duration (Hours)	Practical Duration (Hours)	On-the-Job Training Duration (Mandatory) (Hours)	Total Duration (Hours)
CON/N1255: Carry out preparatory works for Tungsten Inert Gas (TIG) welding operations **NOS Version: 3.0** **NSQF Level: 4**	**20:00**	**60:00**	**10:00**	**90:00**
Module 8: Carry out preparatory works for TIG welding operations	20:00	60:00	10:00	90:00
CON/N1256: Carry out Tungsten Inert Gas (TIG) welding as per requirement in fabrication workshop or construction site **NOS Version: 3.0** **NSQF Level: 4**	**40:00**	**150:00**	**20:00**	**210:00**
Module 9: Perform TIG welding as per requirement in fabrication workshop or construction site	40:00	150:00	20:00	210:00
Total Duration	**60:00**	**210:00**	**30:00**	**300:00**

Elective 3: Shielded Metal Arc Welding (SMAW)

NOS and Module Details	Theory Duration (Hours)	Practical Duration (Hours)	On-the-Job Training Duration (Mandatory) (Hours)	Total Duration (Hours)
CON/N1257: Carry out preparatory work for Shielded Metal Arc Welding (SMAW) operations **NOS Version: 2.0** **NSQF Level: 4**	**20:00**	**60:00**	**10:00**	**90:00**
Module 10: Perform preparatory work for SMAW operations	20:00	60:00	10:00	90:00
CON/N1258: Carry out Shielded Metal Arc Welding (SMAW) as per requirement in fabrication workshop or construction site **NOS Version: 2.0** **NSQF Level: 4**	**40:00**	**150:00**	**20:00**	**210:00**
Module 11: Perform SMAW as per requirement in fabrication workshop or construction site	40:00	150:00	20:00	210:00
Total Duration	**60:00**	**210:00**	**30:00**	**300:00**

Module Details

Module 1: Bridge Module: Introduction to Construction Welder

Bridge Module, Mapped to CON/N1206, v 4.0

Terminal Outcomes:

- Explain the role and responsibilities of Construction Welder.
- Discuss the career progression of a Construction Welder.

Duration: 05:00	***Duration: 00:00***
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the role and responsibilities of a Construction welder. • Define the personal attributes required in fabrication occupation. • Explain the future possible progression and career development options of a Construction welder.	
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Trade specific charts and other teaching aids	
Tools, Equipment and Other Requirements	
N.A.	

Module 2: Carry out grinding activities on structural steel elements
Mapped to CON/N1206, v 4.0

Terminal Outcomes:

- Perform preparatory works for grinding structural elements.
- Perform the grinding of the structural elements.

Duration: 15:00	*Duration: 40:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the different types of grinding machines, their application and specifications. • Explain the different parts of the grinding machine. • Explain the safety norms adopted while using grinding equipment. • List the different types of consumables used in welding and their specifications. • Explain the need for cleaning of the surface before starting the grinding operation. • Explain the various operations of the grinding machine. • Discuss the importance of maintaining comfortable body position while grinding. • Explain various patterns of grinding. • Describe importance of angle of grinding. • Discuss the pressure applied during grinding and its utility in minimizing wastage. • Explain the use and application of different hand and power tools used for fabrication activity. • Describe the process followed for basic maintenance of different hand and power tools. • Explain standard practices followed for heavy material lifting and shifting.	• Demonstrate the process of ensuring that the grinder is in proper working condition. • Demonstrate the process of checking the accessibility (in between joints, large distance from power source) for operation of grinder machine. • Demonstrate the cleaning of the metal surface for removing foreign matter like dust, rust, paint, oil etc. • Demonstrate the clamping and fixing of the metal before grinding. • Demonstrate the process of grinding off defective weld joints to required depth of joints.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Trade specific charts and other teaching aids	
Tools, Equipment and Other Requirements	
Portable/ Hand/ Angle grinder, Chalk/ marker, Measuring tapes, Hammer, Tweezers, Safety Helmet, Hand gloves, Nose mask, Ear muffs, Googles, Jump suit, Safety harness, Safety shoes	

Module 3: Follow safety norms as defined by organization, adopt healthy and safe work practices

Mapped to CON/N9001, v 3.0

Terminal Outcomes:

- Identify various hazards at construction site.
- Use PPE's relevant to construction welder task.
- Perform safe waste disposal at construction site.
- Demonstrate the activities to check the spread of infection as per medical/ organizational guidelines.

Duration: 05:00	***Duration: 25::00***
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the types of hazards at the construction sites and identify the hazards specific to the domain related works. • Recall the safety control measures and actions to be taken under emergency situation. • Explain the classes of fire and types of fire extinguishers. • Explain the importance of participation of workers in safety drills. • Explain the reporting procedure to the concerned authority in case of emergency situations. • Describe the standard procedure for handling, storing and stacking of material, tools, equipment and accessories. • Explain different types of waste at construction sites and their disposal method. • Explain the purpose and importance of vertigo test at construction site. • List out basic medical tests required for working at construction site. • Explain the types and benefits of basic ergonomic principles, which should be adopted while carrying out specific task at the construction sites. • Explain the importance of housekeeping works. • List different types of infectious disease that can spread/ originate at a construction site • Discuss the ways of transmission of the various infectious disease.	• Demonstrate the operating procedure of the fire extinguishers. • Demonstrate use of PPEs as per work requirements. • Demonstrate vertigo test. • Demonstrate safety techniques to be adopted in case of accidents. • Demonstrate safe waste disposal practices followed at construction site. • Demonstrate safe housekeeping practices. • Demonstrate the practices to maintain personal hygiene, workplace hygiene and site/ workplace sanitization. • Demonstrate the methods to clean and disinfect all materials, tools and supplies before and after use. • Demonstrate the procedure to report to the concerned authority regarding the outbreak/ hazard of any infectious disease/ pandemic.

• Explain the methods to check the spread of the infectious disease. • Describe the symptoms and cure of the various infectious disease.	
Classroom Aids:	
Black/White board, marker, Projector/LED Monitor, Computer, Trade specific charts, Safety tags, Safety Notice board, registers and other teaching aids	
Tools, Equipment and Other Requirements	
Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guard leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass, Fire Extinguisher, Fire prevention kit, First Aid box, Safety tags, Safety Notice board	

Module 4: Communicate effectively at workplace

Mapped to CON/N8001, v 3.0

Terminal Outcomes:

- Demonstrate effective communication with co-workers, superiors and sub-ordinates across different teams
- Provide support to co-workers, superiors and sub-ordinates within the team and across interfacing teams to ensure effective execution of assigned task.
- Demonstrate practices sensitive to disabilities (physical, mental, intellectual or sensory impairment), cultural diversity and gender neutrality.

Duration: 05:00	***Duration: 25:00***
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the effects and benefits of timely actions relevant to the task at hand with examples. • Explain the importance of teamwork and its effects relevant to the task at hand with examples. • Explain the importance of proper and effective communication and its adverse effects in case of failure of proper communication. • Discuss about gender and its related concept: gender equality, gender equity (group work) • Discuss different types of disabilities (physical, mental, intellectual or sensory impairment). • Discuss the activities sensitive to the cultural diversity, disabilities and gender neutrality at the workplace. • Discuss the basic rules and regulations related to gender sensitivity, disabilities, and cultural diversity, with their impact on operations of a workplace. • Discuss how to take initiative in resolving issues among co-workers in a given situation. • Discuss reporting procedure followed at the workplace.	• Apply effective communication skills while interacting with co-workers, trade seniors and others during the assigned task. • Use appropriate writing skills and verbal communication reporting as per commonly applicable organisational norms. • Demonstrate teamwork skills during assigned task. • Demonstrate acceptable interpersonal transactions with individuals having disabilities (physical, mental, intellectual or sensory impairment) or cultural diversity. • Demonstrate the process modifications required to make the workplace free from gender biases.
Classroom Aids:	
Black/White board, marker, Projector/LED Monitor, Computer, Trade specific charts, Safety tags, Safety Notice board, registers and other teaching aids	
Tools, Equipment and Other Requirements	
N/A	

Module 5: Employability Skills (30 Hours)

Mapped to DGT/VSQ/N0101, v 1.0

Duration: 30:00
Theory – Key Learning Outcomes
Introduction to Employability Skills Duration: 1 Hour After completing this programme, participants will be able to: 1. Discuss the importance of Employability Skills in meeting the job requirements **Constitutional values - Citizenship Duration: 1 Hour** 2. Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen. 3. Show how to practice different environmentally sustainable practices **Becoming a Professional in the 21st Century Duration: 1 Hour** 4. Discuss 21st-century skills. 5. Display a positive attitude, self-motivation, problem-solving, time management skills and continuous learning mindset in different situations. **Basic English Skills Duration: 2 Hours** 6. Use appropriate basic English sentences/phrases while speaking **Communication Skills Duration: 4 Hours** 7. Demonstrate how to communicate in a well-mannered way with others. 8. Demonstrate working with others in a team **Diversity & Inclusion Duration: 1 Hour** 9. Show how to conduct oneself appropriately with all genders and PwD 10. Discuss the significance of reporting sexual harassment issues in time **Financial and Legal Literacy Duration: 4 Hours** 11. Discuss the significance of using financial products and services safely and securely. 12. Explain the importance of managing expenses, income, and savings. 13. Explain the significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws **Essential Digital Skills Duration: 3 Hours** 14. Show how to operate digital devices and use the associated applications and features, safely and securely 15. Discuss the significance of using the internet for browsing, and accessing social media platforms, safely and securely **Entrepreneurship Duration: 7 Hours** 16. Discuss the need for identifying opportunities for potential business, sources for arranging money and potential legal and financial challenges **Customer Service Duration: 4 Hours** 17. Differentiate between types of customers 18. Explain the significance of identifying customer needs and addressing them 19. Discuss the significance of maintaining hygiene and dressing appropriately **Getting ready for Apprenticeship & Jobs Duration: 2 Hours** 20. Create a biodata 21. Use various sources to search and apply for jobs 22. Discuss the significance of dressing up neatly and maintaining hygiene for an interview 23. Discuss how to search and register for apprenticeship opportunities

Elective 1: Metal Inert Gas (MIG) Welding

Module 6: Perform preparatory works for MIG Welding operations

Mapped to CON/N1253, v 2.0

Terminal Outcomes:

- Prepare welding equipment for welding operation.
- Prepare base metal of thickness 1 mm and above.

Duration: 20:00	*Duration: 60:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Interpret the fabrication drawings and symbols. • Describe the correct handling and storage of gas cylinders for welding purposes. • Explain the effect of polarity on setup. • List the power ratings of welding equipment. • Explain the relationship between wire feed, speed control and voltage. • Describe the gas regulation, rate of flow of shielding gas and its effects. • List components of welding gun, equipment and their functions. • Explain the effects of welding fumes. • Explain the use of welding mask. • Explain the types of consumable used for MIG welding operations. • Explain the specifications of welding electrodes. • Describe the properties of different types of shield gases and their application. • Discuss the effects of unclean surface on welds. • Explain the preparation of weld joints.	• Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks to ensure termination of electrical connections. • Demonstrate the checks to confirm that the electrodes used are as per requirement. • Demonstrate process used to confirm the base metal is free from oil, grease, paint or any other impurity. • Demonstrate visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored. • Demonstrate the process of removing any oxides, dust or foreign particles from the surface.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding MIG welding	
Tools, Equipment and Other Requirements	
Wire brush, Cloth, cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut Bastard File, Round Cross-Cut Bastard File, Scribe, Soap Stone, GMAW welding machine inclusive of regulators, Gas hose and all standard accessories. Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, shielding gas trolley with chains, Arc welding cables, Work clamps, Universal Weld measuring gauge, Temp stick, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards' leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	

Module 7: Perform MIG Welding as per requirement in fabrication workshop or construction site

Mapped to CON/N1254, v 2.0

Terminal Outcomes:

- Perform MIG welding operation in 1G, 1F, 2G, 2F, 3G, 3F positions for structural elements.
- Perform visual inspection during and post welding.

Duration: 40:00	*Duration: 150:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Interpret fabrication drawings and symbols. • Interpret welding specifications and parameters from WPS (Welding procedure specification). • Interpret welding details (symbols, location, length, position etc.) from shop drawings. • Interpret manufactures guidelines relating to specifications of consumables, equipment etc. • Interpret fit up details/ reports to understand the specification of joints. • Describe the gas regulation, rate of flow of shielding gas and its effects. • Discuss the various components of welding gun, equipment and their functions. • Explain effects of welding fumes. • Describe the specification, types and use of various consumable for MIG welding operation. • Discuss the different types of shielding gases and their uses in different conditions. • Explain of unclean surface on welds. • Describe the various types of welded joints. • Explain the positions of welding. • Explain the patterns of welding and their application. • Describe the defects in welding. • Describe the preparation of weld joints.	• Demonstrate the process of MIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I- section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways to ensure proper penetration of weld. • Demonstrate the process of covering the weld pool with shielding gas. • Demonstrate the checks for root pass for cracks. • Demonstrate the checks for visual inspections of weld for spatters, cracks, craters, undercuts etc.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding MIG welding	
Tools, Equipment and Other Requirements	
GMAW welding machine inclusive of regulators, Gas hose and all standard accessories, Welding Transformer with all accessories , Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, Shielding gas trolley with chains, Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	

Elective 2: Tungsten Inert Gas (TIG) Welding

Module 8: Perform preparatory works for TIG Welding operations

Mapped to CON/N1255, v 2.0

Terminal Outcomes:

- Prepare welding equipment for welding.
- Prepare base metal of thickness 1 mm and above.

Duration: 20:00	*Duration: 60:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the correct handling and storage of gas cylinders for welding purposes. • Explain the effects of polarity on setup. • Discuss the power ratings of welding equipment. • Explain the relationship between wire feed, speed control and voltage the gas regulation, rate of flow of shielding gas and its effects. • List the components of welding gun, equipment and their functions. • Explain the effects of welding fumes. • Explain the types and specification of consumable used for TIG welding operation. • List the different types of shielding gases and their uses in different conditions. • Discuss the various positions and patterns of welding and their application. • Explain the importance of proper lighting and ventilation at welding location. • Explain how to check the electrical connections for welding equipment. • Explain how to detect gas leakage.	• Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks for ensuring termination of electrical connections. • Demonstrate the checks for confirming that the electrodes used are as per requirement. • Demonstrate the process for removing any oxides, dust or foreign particles from the surface. • Demonstrate the checks used to confirm that the base metal is free from oil, grease, paint or any other impurity. • Demonstrate visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding TIG welding	
Tools, Equipment and Other Requirements	
Wire brush, Cloth, cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut Bastard File, Round Cross-Cut Bastard File, Scribe, Soap Stone, GMAW welding machine inclusive of regulators, Gas hose and all standard accessories. Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, shielding gas trolley with chains, Arc welding cables, Work clamps, Universal Weld measuring gauge, Temp stick, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards, leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	

Module 9: Perform TIG Welding as per requirement in fabrication workshop or construction site

Mapped to CON/N1256, v 2.0

Terminal Outcomes:

- Perform TIG welding operation in 1G, 1F, 2G, 2F, 3G, 3F positions for structural elements.
- Perform visual inspection during and post welding.

Duration: 40:00	*Duration: 150:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Interpret fabrication drawings and symbols. • Interpret welding specifications and parameters from WPS (Welding procedure specification). • Interpret welding details (symbols, location, length, position etc.) from shop drawings. • Interpret manufactures guidelines relating to specifications of consumables, equipment etc. • Interpret fit up details/ reports to understand the specification of joints. • Describe the gas regulation, rate of flow of shielding gas and its effects. • List the various components of welding gun, equipment and their functions. • Explain the effects of welding fumes. • Describe the specification, types and use of various consumable for tungsten inert gas welding. • List the different types of shielding gases and their uses in different conditions. • Explain effects of unclean surface on welds. • Describe the various types of welded joints. • Explain the positions of welding. • Explain the patterns of welding and their application. • Explain the defects in welding. • Describe the preparation of weld joints. • Explain the process of TIG welding. • Explain the physical and chemical changes occurring during welding. • Describe the behaviour of metal upon heating, the plasticity curve etc.	• Demonstrate TIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I-section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways for ensuring proper penetration of weld. • Demonstrate the process of covering the weld pool with shielding gas. • Demonstrate how to check root pass for cracks.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding TIG welding	

Tools, Equipment and Other Requirements
GTAW welding machine inclusive of regulators, Gas hose and all standard accessories, Welding transformer with all accessories, Filler wire spool, Welding Gun, Shielding Gas, Shielding gas trolley with chains, Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick, Tungsten Electrode, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass

Elective 3: Shielded Metal Arc Welding (SMAW)

Module 10: Perform preparatory work for SMAW operations

Mapped to CON/N1257, v 2.0

Terminal Outcomes:

- Prepare welding equipment for welding.
- Prepare base metal of thickness 1 mm and above.

Duration: 20:00	*Duration: 60:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define welding terminologies like arc, flux, slag, etc. • List the different types of sections, plates, etc. • List the different materials used in fabrication. • Explain different welding parameters. • Describe correct calibration of welding kit and various adjustments in the same. • Explain the importance of cleaning the surface of the material prior to welding. • Explain the checks carried on the prepared edges against the specifications. • Describe the importance of proper joint finishing. • Explain the weld joint and welding position. • Interpret various welding specifications from charts and tables. • Explain the process of selection and handling of electrodes. • Explain basics of SMAW process. • Explain the effect of polarity on welding.	• Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks for ensuring termination of electrical connections. • Demonstrate the checks for confirming that the electrodes used are as per requirement. • Demonstrate process used for confirming that the base metal is free from oil, grease, paint or any other impurity. • Demonstrate the visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored. • Demonstrate the process for removing oxides, dust or foreign particles from the metal surface.
Classroom Aids:	
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding SMAW welding	
Tools, Equipment and Other Requirements	
Wire brush, Cloth, Cleaning solutions, Light source , Ventilation/ exhaust fan , Clamps, jigs and fixtures, Anchors, Ball Peen Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut Bastard File, Round Cross-Cut Bastard File, Scribe, Soap Stone, SMAW welding machine inclusive of regulators, Gas hose and all standard accessories, Welding Transformer with all accessories , Filler wire spool, Welding Gun , Arc welding cables, Work clamps , Universal Weld measuring gauge, Temp stick, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass	

Module 11: Perform SMAW as per requirement in fabrication workshop or construction site

Mapped to CON/N1258, v 2.0

Terminal Outcomes:

- Perform SMAW welding operation in 1G, 1F, 2G, 2F, 3G, 3F positions for structural elements.
- Perform visual inspection during and post welding.

Duration: 40:00	*Duration: 150:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Interpret fabrication drawings and symbols. • Interpret welding specifications and parameters from WPS (Welding procedure specification). • Interpret welding details (symbols, location, length, position etc.) from shop drawings. • Interpret manufactures guidelines relating to specifications of consumables, equipment etc. • Interpret Fit up details/ reports to understand the specification of joints. • Explain the different welding parameters. • Explain the correct calibration of welding kit and various adjustments in the same. • Explain the importance of cleaning the surface of the material prior to welding. • Explain the importance of proper joint finishing. • Explain the basics of SMAW process to be carried out. • Describe the effect of polarity on welding. • Explain the importance of preheating and post heating. • Explain the importance of light, ventilation and proper body posture. • Describe the different patterns of welding. • Explain the assembling and disconnecting of the welding kit. • Explain how and why the slag should be removed. • Explain the parameters for checking the correctness of weld. • Define the welding terminologies like arc, flux, slag, etc. • Explain the relation of arc length with heat transfer. • Explain the effect of atmospheric agents on welding.	• Interpret welding specifications and parameters from WPS (Welding procedure specification). • Interpret welding details (symbols, location, length, position etc.) from shop drawings. • Interpret manufactures guidelines relating to specifications of consumables, equipment etc. • Interpret Fit up details/ reports to understand the specification of joints. • Demonstrate process of SMAW welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways to ensure proper penetration of weld. • Demonstrate how to check root pass for cracks. • Demonstrate how to do visual inspections of weld for spatters, cracks, craters, undercuts etc.

Classroom Aids:
Black/White board, Projector/LED Monitor, Computer, Registers, Charts and displays regarding SMAW welding
Tools, Equipment and Other Requirements
Wire brush, Cloth, cleaning solutions, Light source, Ventilation/ exhaust fan, Clamps, jigs and fixtures, Anchors, Ball Peen Hammer, Needle Nose Pliers, Lineman's Pliers, Tape Measure, Combination Square, Chipping Hammer, Flat Cross-Cut Bastard File, Round Cross-Cut Bastard File, Scribe, Soap Stone, GMAW welding machine inclusive of regulators, Gas hose and all standard accessories. Welding Transformer with all accessories, Filler wire spool, Wire feeding machine, Welding Gun, Shielding Gas, shielding gas trolley with chains, Arc welding cables, Work clamps, Universal Weld measuring gauge, Temp stick, Leather Hand Gloves, Jump suit, Wire brush, Hand and Leg guards leather, Safety goggles, Nose mask, Ear protection, Fire extinguishers, Sand buckets Flashback arrestors, Welding helmet, Welding glass

On-the-Job Training

Mapped to Construction Welder, v 2.0

CON/N1206: Carry out grinding activities on structural steel elements, v 4.0
Mandatory Duration: 30:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate the process of ensuring that the grinder is in proper working condition. • Demonstrate the process of checking the accessibility (in between joints, large distance from power source) for operation of grinder machine. • Demonstrate the cleaning of the metal surface for removing foreign matter like dust, rust, paint, oil etc. • Demonstrate the clamping and fixing of the metal before grinding. • Demonstrate the process of grinding off defective weld joints to required depth of joints.
CON/N1253: Carry out preparatory works for MIG welding operations, v 2.0
Mandatory Duration: 10:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks to ensure termination of electrical connections. • Demonstrate the checks to confirm that the electrodes used are as per requirement. • Demonstrate process used to confirm the base metal is free from oil, grease, paint or any other impurity. • Demonstrate visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored. • Demonstrate the process of removing any oxides, dust or foreign particles from the surface.
CON/N1254: Carry out MIG (Metal Intert Gas) welding as per requirement in fabrication workshop or construction site, v 2.0
Mandatory Duration: 20:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate the process of MIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I- section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways to ensure proper penetration of weld. • Demonstrate the process of covering the weld pool with shielding gas. • Demonstrate the checks for root pass for cracks. • Demonstrate the checks for visual inspections of weld for spatters, cracks, craters, undercuts etc.

CON/N1255: Carry out preparatory works for TIG welding operations, v 2.0
Mandatory Duration: 10:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks for ensuring termination of electrical connections. • Demonstrate the checks for confirming that the electrodes used are as per requirement. • Demonstrate the process for removing any oxides, dust or foreign particles from the surface. • Demonstrate the checks used to confirm that the base metal is free from oil, grease, paint or any other impurity. • Demonstrate visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored.
CON/N1256: Perform TIG (Tungsten Inert Gas) welding as per requirement in fabrication workshop or construction site, v 2.0
Mandatory Duration: 20:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate TIG welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I-section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways for ensuring proper penetration of weld. • Demonstrate the process of covering the weld pool with shielding gas. • Demonstrate how to check root pass for cracks.
CON/N1257: Perform preparatory work for SMAW (Shielded Metal Arc Welding) operations, v 2.0
Mandatory Duration: 10:00 Hours
Location: On-Site
Terminal Outcomes • Demonstrate the process of connecting all electrical connections keeping in mind the polarity. • Demonstrate the process of checking the welding gun, nozzle and gauges for damage. • Demonstrate the process of adjusting the wire feed rate, shielding gas flow rate, current and voltage etc. in the welding machine. • Demonstrate the checks for ensuring termination of electrical connections. • Demonstrate the checks for confirming that the electrodes used are as per requirement. • Demonstrate process used for confirming that the base metal is free from oil, grease, paint or any other impurity. • Demonstrate the visual check for the root gap and bevel angle. • Demonstrate how to check that the base metal is properly anchored. • Demonstrate the process for removing oxides, dust or foreign particles from the metal surface.

CON/N1258: Perform SMAW (Shielded Metal Arc Welding) as per requirement in fabrication workshop or construction site, v 2.0
Mandatory Duration: 20:00 Hours
Location: On-Site
Terminal Outcomes • Interpret welding specifications and parameters from WPS (Welding procedure specification). • Interpret welding details (symbols, location, length, position etc.) from shop drawings. • Interpret manufactures guidelines relating to specifications of consumables, equipment etc. • Interpret Fit up details/ reports to understand the specification of joints. • Demonstrate process of SMAW welding on groove and fillet joints in 1G,1F, 2G, 2F, 3G,3F positions using instructed pattern of welding on different sections like angle, plate, pipe, channels, I section etc. of varying thickness (1 mm and above). • Demonstrate assembling, dismantling and cleaning of the equipment. • Demonstrate ways to ensure proper penetration of weld. • Demonstrate how to check root pass for cracks. • Demonstrate how to do visual inspections of weld for spatters, cracks, craters, undercuts etc.

Annexure

Trainer Requirements

Trainer Prerequisites					
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Preferable Training Experience**	
		Years	***Specialization***	***Years***	***Specialization***
B.E./B. Tech	Mechanical Engineering	2	Welding and Fabrication Work	1	Welding of Structures at Site
OR					
Diploma	Mechanical Engineering	3	Welding and Fabrication Work	1	Welding of Structures at Site
OR					
ITI	Welder Trade	6	Welding and Fabrication Work	1	Welding of Structures at Site
OR					
Graduation	in any Stream	6	Welding and Fabrication Work	1	Welding of Structures at Site
OR					
Ex-Army Graduate	in any Stream	6	Welding and Fabrication Work	1	Welding of Structures at Site

Trainer Certification	
Domain Certification	**Platform Certification**
Recommended that the Trainer is certified for the Job Role: "Construction Welder", mapped to the Qualification Pack: "CON/Q1252, v2.0". The minimum accepted score is 80%.	Recommended that the Trainer is certified for the Job Role: "Trainer (VET and skills)", mapped to the Qualification Pack: "MEP/Q2601, v3.0". The minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites			
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**	
		Years	***Specialization***
B.E. / B.Tech	Mechanical Engineering	2	Welding of Structures at Site
OR			
Diploma	Mechanical Engineering	5	Welding of Structures at Site
OR			
ITI	Relevant Trade	7	Welding of Structures at Site

Assessor Certification	
Domain Certification	**Platform Certification**
Recommended that the Assessor is certified for the Job Role: "Construction Welder", mapped to the Qualification Pack: "CON/Q1252, v2.0". The minimum accepted score is 80%.	Recommended that the Assessor is certified for the Job Role: "Trainer (VET and skills)", mapped to the Qualification Pack: "MEP/Q2701, v3.0". The minimum accepted score is 80%.

Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. **Assessment system Overview:**

   Assessment is done through CSDCI affiliated Assessment Agencies. Assessors are trained & certified by CSDCI after Training of Assessor (ToA) program. Assessments is conducted to gauge and assess the trainee's skill and knowledge competency in the specified areas. The assessment will have both theory and practical components in 30:70 ratio for **Construction Welder** job role.

   During the practical task, trainees are assessed on their workmanship, quality of finished product and time management. They will be graded for all their assessments based on the approved assessment strategy which is signed off by CSDCI. The Assessor submits an assessment plan to CSDCI prior to assessments.
   The assessment plan contains the following information:

   - What will be assessed, i.e. the competency based on each NOS based on theory and practical questions
   - How assessment will occur i.e. methods of assessment
   - When the assessment will occur
   - Duration of assessment
   - Where the assessment will take place i.e. context of the assessment (workplace/simulation)
   - The criteria for decision making i.e. those aspects that will guide judgments
   - Where appropriate, any supplementary criteria used to make a judgment on the level of performance.

2. **Testing Environment:**
   - Training partner shares the batch start date and end date, number of trainees and the job role.
   - Assessment will be fixed for a day after the end date of training. It could be next day or later. Assessment will be conducted at the training venue/test center.
   - The knowledge/theory assessments is conducted with proper seating arrangements with enough space between the candidates to prevent mal-practicing.
   - Question set for theory and practical will be distributed to each candidate by the Assessor. Theory testing will include multiple choice questions, pictorial question, etc. which will test the trainee on his theoretical knowledge of the subject. The skill /practical assessments will be conducted in the approved test centers. The training provider will ensure adequate tools and materials are available to conduct the practical test.
   - If number of candidates are more than 30, more assessors will be organized on same day to complete the assessment.
   - The assessment has to comprise of two components, namely:
     - Knowledge assessment (theory/viva assessment)
     - Skill assessment (practical/hands-on skill assessment)

3. **Mode of assessment:**
   - Demonstration/Practical for Performance /Skill Assessment
   - Synoptic multiple-choice question test
   - Viva for Knowledge Assessment

4. **Performance/skill assessment:**
   - The performance/skill assessment will be conducted through demonstration/practical

- For the practical test trainees are assessed through a given task, which they have to complete correctly for them to be marked as passed.
- The assessment is conducted in a simulated working environment. Due to this fact, the assessors must note that the naturally occurring evidence of competence is unavailable or infrequent. Simulation must be undertaken in a Realistic Working Environment which provides an environment that replicates the key characteristics of the workplace in which the skill to be assessed is normally employed.

5. Knowledge Assessment:

- The knowledge assessments are conducted through written test/ viva.
- Synoptic test is used for this. It is an MCQ (Multiple Choice Question) test which are prepared externally and externally marked, meaning by agency having no link with training partners. The test may be conducted by the assessor in the oral mode, if required, considering the lack of reading and comprehending acumen (skills) of trainees. In such cases, the assessor will mention it on top of the MCQ submitted to CSDCI.
- The assessment strategy, weightage and duration of assessment for **Construction Welder** is summarized below

Assessment Type	Formative or Summative	Strategies	Weightage	Duration (hours)
Knowledge	Summative	MCQ/Viva	30	1.5
skill	Summative	Structured Practical Task	70	5.5

6. Assessment Quality Assurance framework:

- CSDCI has developed assessment criteria framework for each Qualification pack as per National Occupational Standards. The criteria framework includes weightages/marks for each criterion under knowledge and skill. The criteria ensure quality assurance as it ensures valid, consistent and fair assessments at all locations. Issued to the affiliated Assessment body. The Assessment body develop questions based on CSDCI issued assessment criteria.
- Evidences in the form of answer sheets in case of knowledge assessments are collected. For skill assessments videos and photographs are prepared as evidence. These are submitted by the assessor to the assessment agency. CSDCI does random checks of the same with the participant/ trainee's ID and ascertains authenticity and validity of assessments.
- The training partner will intimate the time of arrival of the assessor and time of leaving the venue. Random spot checks/audit is conducted by CSDCI to monitor assessment.

7. Methods of Validation:

- Unless the trainee is registered, the person cannot undergo assessment. To further ensure that the person registered is the person appearing for assessment, ID verification is carried out. Aadhar card number is part of registering the candidate for training. This forms the basis of further verification during the assessment.
- Assessor conducts the assessment through theory and practical questions developed in accordance with the assessment criteria and guidelines issued by CSDCI. This too is verified by random audits carried out by CSDCI.
- Evidences for assessments are to be collected and submitted to CSDCI for verification as per demand.
- Assessment agency is responsible to put details in SIP. CSDCI will also validate the data and result received from the assessment agency.

8. Method of assessment documentation and access:

- The assessment agency will upload the result of assessment in the portal. The data will not be accessible for change by the assessment agency after the upload. The assessment data will be

validated by CSDCI assessment team. After upload, only CSDCI can access this data.

- CSDCI approves the results within five days after which results are uploaded on SIDH by Assessment Agency.

9. On the Job Training:

- During "On the Job Training (OJT)", candidates undergo training and leaning at actual workplace for a fixed period of time and a certain weightage of assessment is allocated out of total skill weightage of Qualification Pack for undergoing OJT as stipulated by CSDCI. This OJT score and assessors' end point score are combined to arrive at final Marking/grading of trainees' skill test. The OJT score is determined by Supervisor of company under which candidates undergo On the Job Training.

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do it upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
MSDE	Ministry of Skill Development and Entrepreneurship
NCVET	National Council for Vocational Education and Training
NSDC	National Skill Development Corporation
CSDCI	Constriction Skill Development Council of India
SIDH	Skill India Digital Hub
AB	Awarding Body
SSC	Sector Skill Council
PMKVY	Pradhan Mantri Kaushal Vikas Yojana
DDU-GKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana
SANKALP	Skill Acquisition and Knowledge Awareness for Livelihood Promotion
STRIVE	Skills Strengthening for Industrial Value Enhancement
JSS	Jan Shikshan Sansthan
STT	Short Term Training
RPL	Recognition of Prior Learning
NAPS	National Apprenticeship Promotion Scheme
AA	Assessment Agency
TP	Training Provider / Training Partner
TC	Training Centre
ITI	Industrial Training Institute
NSQC	National Skill Qualification Committee
NSQF	National Skills Qualification Framework
Q-File	Qualification File
QP	Qualification Pack
MC	Model Curriculum
NOS	National Occupational Standards
PC	Performance Criteria
KU	Knowledge and Understanding
GS	Generic Skills
MCQ	Multiple Choice Question
EHS	Environment Health and Safety
PPE	Personal Protective Equipment
QA/QC	Quality Assurance / Quality Control
IS Code	Indian Standards Code
PMI	Positive Material Identification
MCB	Miniature Circuit Breaker
WPS	Welding Procedure Specification
PQR	Procedure Qualification Record
MIG	Metal Inert Gas Welding
TIG	Tungsten Inert Gas Welding
SMAW	Shielded Metal Arc Welding
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
FCAW	Flux Cored Arc Welding
SAW	Submerged Arc Welding

PAW	Plasma Arc Welding
LBW	Laser Beam Welding
EBW	Electron Beam Welding
ESW	Electro Slag Welding
UT	Ultrasonic Testing (NDT Method)
RT	Radiographic Testing (X-ray Inspection)
PT	Penetrant Testing (Dye Penetrant Test)
MPT	Magnetic Particle Testing
VT	Visual Testing
FAB	Fabrication
HSS	Hollow Structural Section
CJP	Complete Joint Penetration
PJP	Partial Joint Penetration
HFW	High-Frequency Welding
ISMC	Indian Standard Medium Channel
ISMB	Indian Standard Medium Beam
ISWB	Indian Standard Wide Flange Beam