GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

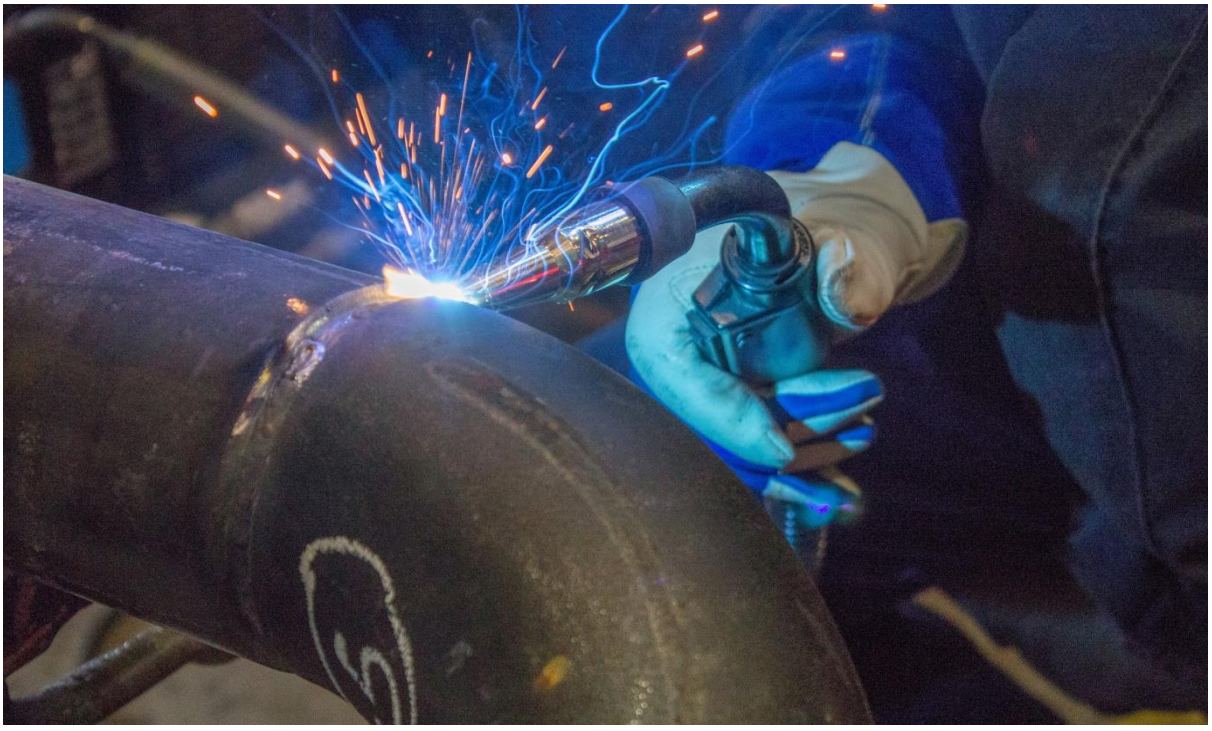
COMPETENCY BASED CURRICULUM

WELDER (PIPE)

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 2.5



SECTOR – CAPITAL GOODS AND MANUFACTURING

Directorate General of Training

WELDER (PIPE)

(Engineering Trade)

(Revised in March 2023)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 2.5

Developed By

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1. COURSE INFORMATION

During the one-year duration of "Welder (Pipe)" trade, a candidate is trained on Professional Skill, Professional Knowledge and Employability Skill related to job role. In addition to this, a candidate is entrusted to undertake project work, extracurricular activities and on-the-job training to build up confidence. The broad components covered under Professional Skill subject are as below:-

In the one-year duration, trainee learns about elementary first aid, firefighting, environment regulation and housekeeping etc. The practical part starts with basic pipe work viz. cutting of pipes, threading, joining, etc. Cutting Pipes in different angles, joining of pipes of different diameter and angles by gas welding, thread cutting on different types of pipes & fittings accessories. On completion of each job the trainees will also evaluate their jobs by visual inspection, and identify the defects for further correction/improvement. They learn to adapt precautionary measures such as preheating; maintaining inter-pass temperature and post weld heat treatment for Welding Alloy steel, Cast Iron etc. The Work Shop calculation taught will help them to plan and cut the required jobs economically without wasting the material and also used in estimating the Electrodes, filler metals etc. The Workshop Science taught will help them to understand the materials and properties, effect of alloying elements etc. Engineering Drawing taught will be applied while reading the job drawings and will be useful in understanding the location, type and size of weld to be carried out.

Professional Knowledge subject is simultaneously taught in the same fashion to apply cognitive knowledge while executing task. In addition, components like Physical properties of engineering materials, different types of iron, properties and uses, introduction to GTAW & GMAW, Heat & Temperature are also covered under theory part.In addition to above components the core skills components viz., Workshop calculation & science, Engineering drawing, employability skills are also covered. These core skills are essential skills which are necessary to perform the job in any given situation.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Welder (Pipe) trade under CTS is one of the popular courses delivered nationwide through network of ITIs. The course is of one year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) impart requisite core skills, knowledge and life skills. After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can take admission in diploma course in notified branches of Engineering by lateral entry.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:-

S No.	Course Element	Notional Training Hours
		1st Year
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
5	Employability Skills	120
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

On the Job Training (OJT)/ Group Project	150
Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment (Internal)** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by **Controller of examinations, DGT** as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while

due regard for safety procedures and practices	undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Marks in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Welder, Gas; fuses metal parts together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined, holds them together by some suitable device and if necessary makes narrow groove to direct flow of molten metal to strengthen joint. Selects correct type and size of welding rod, nozzle etc. and tests welding, torch. Wears dark glasses and other protective devices while welding. Releases and regulates valves of oxygen and acetylene cylinders to control their flow into torch. Ignites torch and regulates flame gradually. Guides flame along joint and heats it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. and rectifies defects if any. May join part at various spots to prevent distortion of shape, form dimension etc. May preheat materials like cast iron prior to welding. May also weld by other gases such as argon coal etc.

Welder, Electric; Arc Welder fuses metals using arc-welding apparatus and electrodes (welding material). Examines parts to be welded, cleans them and sets joints together with clamps or any other suitable device. Starts generator or transformer (welding apparatus and regulates current according to material and thickness of welding. Clamps one lead (insulated wire carrying current from generator) to part to be welded, selects required type of electrode and clamps it to holder connected with other lead). Generates sparks between electrode and joint, simultaneously guiding and depositing melting electrode uniformly for welding. Takes precautionary measures such as wearing rubber gloves, holding welding screen of dark glass etc. May join parts first at various points for holding at specified angles, shape, form and dimension.

Welder, Machine; operates gas or electric welding machine to joint metal parts by fusion. Sets machine for operation by igniting burners and adjusting flames or by switching on current. Regulates flow of gas or current and adjusts machine according to material to be welded. Checks cooling system and adjusts movement of conveyor, if any. Feeds material to be welded with either one by one or in batch according to type of machine and welds them by pressing paddle, or by automatic arrangements. May use fixtures or other suitable devices for mass production work. Is designated as SPOT WELDER, FLASH WELDER, etc. according to machine and type of work done.

Gas Cutter; Flame Cutter cuts metal to required shape and size by gas flame either manually or by machine. Examines material to be cut and marks it according to instruction of specification. Mounts template and sets machine to cut to specifications. Makes necessary connections and fits required size of nozzle or burner in welding torch. Releases and regulates flow of gas in nozzle or burner, ignites and adjusts flame. Guides flame by hand or machine along cutting line at required speed and cuts metal to required size. May use oxyacetylene or any other appropriate gas flame.

Brazer; fuses metal parts by heating using flux and fillings. Cleans and fastens parts to be joined face to face by wire, by seaming or by any other suitable means and prepares paste of flux and fillings. Applies it to joint and hearts in furnace or by torch to melt filling into joint. Allows it to cool down. Welding or joining two or more metals together using resistive heat caused by changing electromagnetic fields. Check for induction welded joints.

Reference NCO-2015:

(i) 7212.0100 – Welder, Gas
(ii) 7212.0200 – Welder, Electric
(iii) 7212.0300 – Welder, Machine
(iv) 7212.0400 – Gas Cutter
(v) 7212.0500 – Brazer

Reference NOS:

i) CSC/N0204
ii) CSC/N0201
iii) CSC/N0207
iv) CSC/N0212
v) CSC/N0209
vi) CSC/N9401
vii) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**WELDER (PIPE)**
Trade Code	DGT/1085
NCO - 2015	7212.0100, 7212.0200, 7212.0300, 7212.0400, 7212.0500
NOS Covered	CSC/N0204, CSC/N0201, CSC/N0207, CSC/N0212, CSC/N0209, CSC/N9401, CSC/N9402
NSQF Level	Level-2.5
Duration of Craftsmen Training	One year (1200 Hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 8th class examination
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, DEAF, HH
Unit Strength (No. Of Student)	20 (There is no separate provision of supernumerary seats)
Space Norms	100 sq. m
Power Norms	16 KW
Instructors Qualification for	
1. Welder (Pipe) Trade	B.Voc/Degree in Mechanical/ Metallurgy/ Production Engineering/ Mechatronics from AICTE/UGC recognized university/ college with one year experience in relevant field. **OR** 03 years Diploma in Mechanical/ Metallurgy/ Production Engineering/ Mechatronics from AICTE/ recognized technical board of education or relevant Advanced Diploma (Vocational) from DGT with two years experience in relevant field. **OR** NTC/NAC passed in the Trade of "Welder (Pipe)" with three years' experience in the relevant field. **<u>Essential Qualification:</u>** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. ***Note: Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However both of them must possess NCIC in any of its variants.***
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.

	OR 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants NCIC in RoDA or any of its variants under DGT
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering/ Draughtsman group of trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade OR Regular/RPL variants NCIC in RoDA or any of its variants under DGT
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES:

1. Join MS plates by SMAW in different positions following safety precautions. (NOS: CSC/N0204)
2. Join MS sheet by Gas welding in different positions following safety precautions. (NOS: CSC/N0204)
3. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process. (NOS: CSC/N0201)
4. Perform different types of MS pipe joints by Gas welding (OAW). (NOS: CSC/N0204)
5. Weld different types of MS pipe joints by SMAW. (NOS: CSC/N0204)
6. Perform welding of Stainless steel, Cast iron, Aluminium and Brass by OAW. (NOS: CSC/N0204)
7. Perform Arc gauging on MS plate. (NOS: CSC/N0204)
8. Perform Plasma cutting. (NOS: CSC/N0207)
9. Carry out single V groove welds on MS plates by SMAW in 1G, 2G, 3G and 4G positions. (NOS: CSC/N0204)
10. Carry out single V groove welds on MS pipes by SMAW in 1G, 2G, 5G and 6G positions. (NOS: CSC/N0204)
11. Perform Root pass welds in Weld single Vee butt joints on schedule 40 pipes in 1G, 2G and 5G positions by GTAW. (NOS: CSC/N0212)
12. Perform Root pass welds in Weld single Vee butt joints on schedule 60 pipes and schedule 80 pipes in 6G positions by GTAW and intermediate and cover pass weld by SMAW. (NOS: CSC/N0212)
13. Perform single Vee butt joint welding on MS pipes by GMAW in 1G position. (NOS: CSC/N0209)
14. Carry out Dimensional inspection and testing of weldments. (NOS: CSC/N0204)
15. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9401)
16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Join MS plates by SMAW in different positions following safety precautions. (NOS: CSC/N0204)	Plan and select the type & size of electrode, welding current, type of edge preparation etc. as per requirement.
	Prepare, set and tack the pieces as per drawing.
	Set up the tacked pieces in specific position.
	Deposit the weld maintaining appropriate arc length, electrode angle, welding speed, weaving technique and safety aspects.
	Clean the welded joint thoroughly.
	Carry out visual inspection for appropriate weld joint.
	Inspect the weld using DPT/MPT.
2. Join MS sheet by Gas welding in different positions following safety precautions. (NOS: CSC/N0204)	Plan and select the nozzle size, working pressure type of flame, filler rod as per requirement.
	Prepare, set and tack the pieces as per drawing.
	Setting up the tacked joint in specific position.
	Deposit the weld following proper welding technique and safety aspect.
	Carry out visual inspection to ascertain quality weld joint.
3. Perform straight, bevel &circular cutting on MS plate by Oxy-acetylene cutting process. (NOS: CSC/N0201)	Plan and mark on MS plate surface for straight/bevel/circular cutting.
	Select the nozzle size and working pressure of gases as per requirement.
	Set the marked plate properly on cutting table.
	Perform the straight and bevel cutting operation maintaining proper techniques and all safety aspects.
	Perform the circular cutting operation by using profile cutting machine maintaining proper techniques and all safety aspects.
	Clean the cutting burrs and inspect the cut surface for soundness of cutting.
4. Perform different types of MS pipe joints by Gas welding (OAW). (NOS: CSC/N0204)	Plan and prepare the development for a specific type of pipe joint.
	Mark and cut the MS pipe as per development.
	Select the size of filler rod, size of nozzle, working pressure etc.
	Set and tack the pieces as per drawing.
	Deposit the weld bead maintaining proper technique and safety aspects.
	Inspect the welded joint visually for poor penetration, uniformity of bead and surface defects.
5. Weld different types of MS pipe joints by SMAW (NOS: CSC/N0204)	Plan and prepare the development for a specific type of pipe joint.
	Mark and cut the MS pipe as per development.
	Select the electrode size and welding current for welding.
	Set and tack the pieces as per drawing.
	Deposit the weld bead maintaining proper technique and safety

	aspects.
	Insect the welded joint visually for root penetration, uniformity of bead and surface defects.
6. Weld Stainless steel, Cast iron, Aluminium and Brass by OAW. (NOS: CSC/N0204)	Plan and prepare the pieces for welding.
	Select the type and size of filler rod and flux, size of nozzle, gas pressure, preheating method and temperature as per requirement.
	Set and tack plates as per drawing.
	Deposit the weld maintaining appropriatetechnique and safety aspects.
	Cool the welded joint by observing appropriate cooling method. Use post heating as per requirement.
	Clean the joint and inspect the weld for its uniformity and different types of surface defects.
7. Perform Arc gauging on MS.(NOS: CSC/N0204)	Plan and select the size of electrode for Arc gouging.
	Select the polarity and current as per requirement.
	Perform gouging adapting proper gouging technique.
	Clean and check to ascertain the required stock removed.
8. Perform Plasma cutting. (NOS: CSC/N0207)	Plan and mark on MS plate surface for straight/bevel cutting.
	Set the plasma cutting machine.
	Set the marked plate properly on cutting table.
	Perform the Plasma cutting on M.S plate by Plasma cutting maintaining proper techniques and all safety aspects.
	Clean the cutting burrs and inspect the cut surface for soundness of cutting.
9. Carry out single V groove welds on MS plates by SMAW in 1G, 2G, 3G and 4G positions. (NOS: CSC/N0204)	Prepare, set and tack weld the plates as per drawing.
	Select size of SMAW electrode welding current as per requirement.
	Set up the tacked joint in specific position.
	Deposit the root pass weld by SMAW in 1G, 2G, 3G and 4G positions on a separate pair of joints adapting proper welding technique and safety aspects.
	Carry out visual inspection to ensure quality of root pass weld.
	Deposit the intermediate and cover pass welds by SMAW in 1G,2G,3G and 4G positions adapting proper welding technique and safety aspects.
	Inspect the weld by visual inspection and correct defects if any.
10. Carry out single V groove welds on MS pipes by SMAW in 1G, 2G, 5G and 6G positions.	Prepare, schedule 40 pipes and tack the pieces as per drawing.
	Select size of SMAW electrode, welding current as per requirement.
	Set up and tack weld the joints.

(NOS: CSC/N0204)	Deposit the root pass weld by SMAW in 1G, position adapting proper welding technique and safety aspects.
	Carry out LP test to ensure quality of root pass weld.
	Deposit the intermediate and cover pass welds by SMAW in 1G position adapting proper welding technique and safety aspects.
	Clamp the pipes in 2G,5G and 6G positions and carry out root pass welds.
	Inspect the root pass welds by visual inspection and correct defects if any.
	Deposit the intermediate and cover pass welds by SMAW in 1G,2G,5G and 6G positions adapting proper welding technique and safety aspects.
11. Perform Root pass weld on single Vee butt joints on schedule 40 pipes in 1G, 2G and 5G positions by GTAW. (NOS: CSC/N0212)	Prepare schedule 40 pipes as per drawing.
	Set the GTAW machine and select the type of welding current, size and type of tungsten electrode, size of nozzle, gas flow rate and welding current as per requirement.
	Set and tack the piece as per drawing.
	Deposit the root pass weld in 1G position maintaining proper technique and safety aspects.
	Clamp the pipes and deposit the root pass weld in 2G position maintaining proper technique and safety aspects.
	Clamp the pipes and deposit root pass weld in 5G position maintaining proper technique and safety aspects.
	Clean and inspect the root pass welds for quality of welding.
12. Perform Root pass on weld single Vee butt joints on schedule 60 and schedule 80 pipes in 6G positions by GTAW and intermediate and cover pass weld by SMAW. (NOS: CSC/N0212)	Prepare, schedule 60 pipes and schedule as per drawing.
	Set the GTAW machine and select the type of welding current, size and type of tungsten electrode, size of nozzle, gas flow rate and welding current as per requirement.
	Set and tack the piece as per drawing.
	Clamp the pipe and deposit the root pass weld in 6G position maintaining proper technique and safety aspects.
	Clean and inspect the root pass welds for quality of welding by LP test.
	Deposit the intermediate and cover pass welds by SMAW in 6G position adapting proper welding technique and safety aspects.
	Clean and inspect the weld for quality of welding.
	Prepare, schedule 80 pipes and schedule as per drawing.
	Set the GTAW machine and select the type of welding current, size and type of tungsten electrode, size of nozzle, gas flow rate and welding current as per requirement.
	Set and tack the piece as per drawing.
	Clamp the pipe and deposit the root pass weld in 6G position maintaining proper technique and safety aspects.
	Clean and inspect the root pass welds for quality of welding by LP test.

	Deposit the intermediate and cover pass welds by SMAW in 6G position using Low hydrogen type of electrode and adapting proper welding technique and safety aspects.
	Clean and inspect the weld for quality of welding.
13. Perform single Veebutt joint welding on MS pipes by GMAW in 1G position. (NOS: CSC/N0209)	Prepare, schedule 40 and schedule 60 pipes as per drawing.
	Set GMAW machine and select size of electrode wire, welding voltage, gas flow rate and wire feed rate as per requirement.
	Set and tack the piece by as per drawing.
	Deposit the root pass weld in 1G position maintaining proper technique and safety aspects.
	Deposit the cover pass welds in 1G position maintaining proper technique and safety.
	Inspect the joint for soundness of weld.
14. Carry out Dimensional inspection and testing of weldments. (NOS: CSC/N0204)	Plan and select the job and clean the surface thoroughly.
	Carry out dimensional inspection of weldments.
	Carry out visual inspection of welds.
	Select the appropriate non destructive testing methods and carry out Non destructive testing of welds adapting standard operating procedure.
	Prepare Bend test specimen and carry out bend test according to codes and standards.
	Accept/reject the job based on test result.
15. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/9401)	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS FORWELDER (PIPE) TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 41Hrs; Professional Knowledge 08Hrs	Join MS plates by SMAW in different positions following safety precautions.	Induction training: 1. Familiarization with the Institute. 2. Importance of trade Training. 3. Machinery used in the trade. 4. Introduction to safety equipment and their use etc. 5. Hack sawing, filing square to dimensions. 6. Marking out on MS plate and punching. 7. Setting up of Arc welding machine & accessories and striking an arc. 8. Setting of oxy-acetylene welding equipment, Lighting and setting of flame.	- General discipline in the Institute. - Elementary First Aid. - Importance of Welding in Industry. - Safety precautions in Shielded Metal Arc Welding, and Oxy-Acetylene Welding and Cutting. - Introduction and definition of welding. - Arc and Gas Welding Equipments, tools and accessories. - Various Welding Processes and its applications. - Arc and Gas Welding terms and definitions.
Professional Skill 21Hrs; Professional Knowledge 04 Hrs	Join MS sheet by Gas welding in different positions following safety precautions.	9. Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position. 10. Edge joint on MS sheet 2 mm thick in flat position without filler rod. 11. Marking and straight line cutting of MS plate. 10 mm thick by gas.	- Different process of metal joining methods: Bolting, riveting, soldering, brazing. - Types of welding joints and its applications. Edge preparation and fit up for different thickness. - Surface Cleaning
Professional Skill 184Hrs; Professional Knowledge 36 Hrs	Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.	12. Straight line beads on M.S. plate 10 mm thick in flat position. 13. Copper tube ½ inch swage joint by brazing with induction welding. 14. Square butt joint on M.S. sheet 2 mm thick in flat	- Basic electricity applicable to arc welding and related electrical terms & definitions. - Heat and temperature and its terms related to welding

		Position. 15. Fillet "T" joint on M. S. Plate 10 mm thick in flat position.	- Principle of arc welding. And characteristics of arc. - Common gases used for welding & cutting, flame temperatures and uses. - Types of oxy-acetylene flames and uses. - Oxy-Acetylene Cutting Equipment principle, parameters and application.
		16. Bevelling of MS plates 10 mm thick by gas cutting. 17. Open corner joint on MS Sheet 2 mm thick in flat Position. 18. Fillet lap joint on M.S. plate 10 mm thick in flat position.	- Arc welding power sources: Transformer, Rectifier and Inverter type welding machines and its care & maintenance. Advantages and disadvantages of A.C. and D.C. welding machines.
		19.Iron pipe ½ inch butt joint by induction welding 20.Fillet "T" joint on M S sheet 2 mm thick in flat position. 21.Open Corner joint on MS plate 10 mm thick in flat position.	- Welding positions as per EN & ASME: flat, horizontal, vertical and overhead position. - Weld slope and rotation. Welding symbols as per BIS & AWS.
		22.Fillet Lap joint on MS sheet 2 mm thick in flat position. 23.Single "V" Butt joint on M S plate 12 mm thick in flat position (1G).	- Arc length - types - effects of arc length. - Polarity: Types and applications.
		24.Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position. 25. Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position. 26. F "T" 10 mm thick in Horizontal position.	- Calcium carbide uses and hazards - Acetylene gas properties. - Acetylene gas Flash back arrestor.

		27.Fillet Lap joint on M.S. sheet 2 mm thick in horizontal position. 28. Fillet Lap joint on M.S. plate 10 mm thick in horizontal position.	- Oxygen gas and its properties - Charging process of oxygen and acetylene gases - Oxygen and Dissolved Acetylene gas cylinders and Color coding for different gas cylinders. Uses of Single stage and double stage Gas regulators.
		29.Make a long elbow joint with PVC pipe by plastic welding 0 2.5 inch (pipe) and length 30 mm of pipe. 30. Square Butt joint on M.S. sheet. 2 mm thick in vertical position. 31.Single Vee Butt joint on M.S. plate 12 mm thick in horizontal position (2G).	- Oxy acetylene gas welding Systems (Low pressure and High pressure). Difference between gas welding blow pipe(LP & HP) and gas cutting blowpipe Gas welding techniques. Rightward and Leftward techniques.
		32.T-joint of PVC sheet, with dimension (150*50*5mm) two pieces from plastic welding with hot air. 33.Fillet "T" joint on M.S sheet 2 mm thick in vertical position. 34.F "T" 10 mm thick in vertical position.	- Arc blow - causes and methods of controlling. - Distortion in arc & gas welding and methods employed to minimize distortion Arc Welding defects, causes and Remedies.
Professional Skill 42Hrs; Professional Knowledge 08Hrs	Perform different types of MS pipe joints by Gas welding (OAW).	35.Structural pipe welding butt joint on MS pipe 0 50 and 3mm WT in 1G position. 36.Fillet Lap joint on M.S. Plate 10 mm in vertical position. 37.Open Corner joint on MS plate 10 mm thick in vertical position. 38.Pipe welding - Elbow joint on MS pipe 0 50 and 3mm WT. 39.Pipe welding "T" joint on MS pipe 0 50 and 3mm WT. 40.Single "V" Butt joint on M S plate 12 mm thick in vertical position (3G).	- Specification of pipes, various types of pipe joints, pipe welding positions, and procedure. - Difference between pipe welding and plate welding. - Pipe development for Elbow joint, "T" joint, Y joint and branch joint. - Uses of Manifold system - Gas welding filler rods, specifications and sizes. - Gas welding fluxes - types

			and functions. - Gas Brazing &Soldering: principles, types fluxes & uses - Gas welding defects, causes and remedies.
Professional Skill 44 Hrs; Professional Knowledge 10 Hrs	Weld different types of MS pipe joints by SMAW.	41.Pipe welding 45 ° angle joint on MS pipe 0 50 and 3mm WT. 42.Straight line beads on M.S. plate 10mm thick in overhead position.	- Electrode: types, functions of flux, coating factor, sizes of electrode. - Effects of moisture pick up. - Storage and baking of electrodes.
		43.Pipe Flange joint on M.S plate with MS pipe 0 50 mm X 3mm WT. 44. F "T"10 mm thick in overhead position.	- Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature.
		45.Pipe welding butt joint on MS pipe 0 50 and 5 mm WT. in 1G position. 46.Fillet Lap joint on M.S. plate 10 mm thick in overhead position.	- Welding of low, medium and high carbon steel and alloy steels.
		47.Single "V" Butt joint on MS plate 10mm thick in over head position(4G)(06hrs.) 48.Pipe butt joint on M. S. pipe 0 50mm WT 6mm (1G Rolled).	- Stainless steel: types- weld decay and weldability.
Professional Skill 22Hrs; Professional Knowledge 04Hrs	Perform welding of Stainless steel, Cast iron, Aluminium and Brass by OAW.	49.Square Butt joint on S.S. sheet. 2 mm thick in flat position. 50.Square Butt joint on S.S. Sheet 2 mm thick in flat position. 51.Square Butt joint on Brass sheet 2 mm thick in flat position.	- Brass - types - properties and welding methods. - Copper - types - properties and welding methods. - Introduction to induction welding, its parameter and check.
Professional Skill 42 Hrs; Professional Knowledge 08Hrs	Perform Arc gauging on MS plate.	52.Square Butt & Lap joint on M.S. sheet 2 mm thick by brazing. 53.Single "V" butt joint C.I. plate 6mm thick in flat position. 54.Arc gouging on MS plate 10 mm thick.	- Aluminium, properties and weldability, Welding methods - Arc cutting & gouging,

		55.Square Butt joint on Aluminium sheet. 3 mm thick in flat position."B" butt joint) 6mm thick plate.	- Cast iron and its properties types. - Welding methods of cast iron.
Professional Skill 24Hrs; Professional Knowledge 04 Hrs	Perform Plasma cutting.	56.Familiarization with the machinery used in the trade. 19. Cutting practice on M.S. plates using gas cutting methods. 20. Cutting practice of M.S. plates using plasma cutting methods. 21. Gouging practice.	- Outline of the subjects to be covered - Importance of pressure vessels and pipe welding - Gas cutting & plasma cutting - Safety in welding
Professional Skill 123Hrs; Professional Knowledge 24Hrs	Carry out single V groove welds on MS plates by SMAW in 1G, 2G, 3G and 4G positions.	22. Edge preparation for plate groove welding. 23. Fit up of joints by tack welding using simple fixtures. 24. Pipe and plate flange joint welding. 25. T and Y and pipe joint welding. 26. Groove welding on plate in 1G & 2Gpositions. 27. Inspection and clearance using LPI testing during Root pass and cover pass.	- Principles of Shielded Metal Arc Welding (SMAW). - Types of power source. - Polarity type and arc length. - Welding positions and importance. - Edge preparation and tack welding procedure. - Welding fixtures and clamps.
		28. Groove welding on plate in 3G position. 29. Inspection and clearance using LPI testing during Root pass and cover pass.	- Electrodes - types - description - Functions of flux and characteristic of flux.
		30. Groove welding on plate in 3G position. 31. Inspection and clearance using LPI testing during Root pass and cover pass.	- Selection of electrodes (Rutile / Cellulosic / Low hydrogen etc.) & coating factors. - Electrode storage and backing temperature.
		32. Groove welding on plate in 4G position. 33. Inspection and clearance using LPI testing during Root pass and cover pass.	- Types of metals and their characteristics.
		34. Groove welding on plate in 4G position.	- Introduction to pipe welding.

		35. Inspection and clearance using LPI testing during Root pass and cover pass.	– Types of pipes and pipe schedule. – Preparation work before welding.
Professional Skill 45Hrs; Professional Knowledge 08Hrs	Carry out single V groove welds on MS pipes by SMAW in 1G, 2G, 5G and 6G positions.	36. Preparation of pipe joint for pipe welding (schedule 40). 37. Prepare the edges, clean the joint surfaces, Fit up the pipes and tack weld the pipes. 38. Fit up inspection.	– Basic pipe welding procedure uphill welding, downhill welding and horizontal welding.
		39. Welding of pipes (schedule 40) in 1G position. (08hrs.) 40. Inspection and clearance using LPI testing during Root pass and cover pass. (05hrs.) 41. Welding of pipes (schedule 40) in 2G position. (07hrs.) 42. Inspection and clearance using LPI testing during Root pass and cover pass. (05hrs.)	– Pipe welding position 1G, 2G, 5G & 6G – Selection of electrode (SMAW) for root pass and cover pass welding. – Procedure for welding heavy wall pipes in 5G position welding. (07 hrs.)
Professional Skill 123Hrs; Professional Knowledge 24Hrs	Perform Root pass welds in Weld single Vee butt joints on schedule 40 pipes in 1G, 2G and 5G positions by GTAW.	43. Root welding of pipes (schedule 40) in 5G position. 44. Intermediate and cover pass welding in 5G position. 45. Inspection and clearance using LPI testing.	– Procedure for welding heavy wall pipes in 6G position welding – Welding symbols
		46. Root welding of pipes (schedule 40) in 5G position 47. Intermediate and cover pass welding in 5G position. 48. Inspection and clearance using LPI testing.	– Procedure for welding of thin wall pipes in downhill position. – Procedure for welding pipes in 2G position.
		49. Beading practice by TIG on MS sheets. 50. Square butt joint on M.S. sheet in flat position. 51. Square butt joint on M.S. sheet in flat position. 52. Inspection and clearance	– Welding procedure for complicated pipe joint, T-joints with intersection. – Top, Bottom and Side - Y joint etc.

		using LPI testing.	
		53. Square butt joint on M.S. sheet in 2G position. 54. Inspection and clearance using LPI testing. 55. Square butt joint on M.S. sheet in 3G position. 56. Inspection and clearance using LPI testing.	- Introduction to GTAW welding -Advantages, Equipment – Electrode.
		57. Square butt joint on M.S. sheet in 4G position. 58. Inspection and clearance using LPI testing.	- Shielding Gas and Advantage of root pass welding by GTAW.
		59. Root pass welding of pipes(schedule 40) 1G positions by TIG. 60. Inspection and clearance using LPI testing. 61. Root pass welding of pipes (schedule 40) 2G positions by TIG. 62. Inspection and clearance using LPI testing.	- Importance of preheating, post heating and post weld heat treatment - Welding metallurgy - weld stress - Distortion and control. - Correction of distorted section.
Professional Skill 85Hrs; Professional Knowledge 16Hrs	Perform Root pass welds in Weld single Vee butt joints on schedule 60 pipes and schedule 80 pipes in 6G positions by GTAW and intermediate and cover pass weld by SMAW.	63. Root pass welding of pipes (schedule 60) 5G positions by TIG. 64. Inspection and clearance using LPI testing. 65. Root pass welding of pipes (schedule 60) 6G positions by TIG. 66. Inspection and clearance using LPI testing. 67. Pipe welding dia 50mm in 2G position by GTAW.	- Introduction to GMAW & Flux cored arc welding - Equipment, accessories, Advantages and Limitations.
		68. Root pass welding of pipes (schedule 60) 6G positions by TIG. 69. Inspection and clearance using LPI testing. 70. Cover pass Intermediate pass by SMAW. 71. Inspection and clearance using LPI testing.	- Power source - Wire feeder -Electrode wires - shielding gases - Types of metal transfer and welding parameters
		72. Root pass welding of pipes (schedule 80) 6G positions by SMAW (by	- Types of welding defects, cause and remedy.

		pipe welding electrode) 73. Inspection and clearance using LPI testing. 74. Cover pass and Intermediate passes by SMAW. (by low hydrogen electrode) 75. Inspection and clearance using LP testing.	- Non-destructive testing methods. - Introduction to plastic welding (PP,PE& PVC), its parameter & Check
		76. Square butt joint on M.S. sheet in flat position by GMAW. 77. Single V joint on M.S. plate in flat position by GMAW. 78. Inspection and clearance using LP testing.	- Requirement for qualification in different codes. - Qualification procedure under various codes. - Different tests and inspection involved in qualification.
Professional Skill 22 Hrs; Professional Knowledge 04 Hrs	Perform single Vee butt joint welding on MS pipes by GMAW in 1G position.	79. Pipe (schedule 40) welding by GMAW in 1G position by GMAW. 80. Pipe (schedule 60) welding by GMAW in 1G position by GMAW.	- Inspection and testing of weldments. - Visual inspection kits and Gauges.
Professional Skill 22 Hrs; Professional Knowledge 04 Hrs	Carry out Dimensional inspection and testing of weldments.	81. Dimensional inspection of weldments. 82. Visual inspection of weldments. 83. Non-destructive testing of weldments 84. Bend Testing of specimen according to codes and standards.	- Pressure welding codes and standards (IBR, ASME etc.) - Writing procedure for WPS and PQR
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED- 40 hrs.	Read and apply engineering drawing for different application in the field of work.	**ENGINEERING DRAWING:** - Introduction to Engineering Drawing and Drawing Instruments; Conventions Sizes and layout of drawing sheets Title Block, its position and content Drawing Instrument - Free hand drawing of; Geometrical figures and blocks with dimension Transferring measurement from the given object to the free hand sketches. Free hand drawing of hand tools and measuring tools. - Lines Types and applications in drawing	

		- Drawing of Geometrical figures; Angle, Triangle, Circle, Rectangle, Square, Parallelogram. Lettering & Numbering – Single Stroke, double stroke, inclined - Reading of dimension and Dimensioning Practice. - Reading of fabrication drawing, sectional view of different types of welding Joints. Sectional view of different pipe joints - Symbolic representation different symbols used in the related trades Reading of Job Drawing of related trades.
Workshop Calculation & Science: 38 Hrs.		
Professional Knowledge WC- 38 hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION & SCIENCE :** - Unit, Fractions - Square root, Ratio and Proportions, Percentage - Material Science - Mass, Weight, Volume and Density - Heat & Temperature and Pressure - Basic Electricity - Mensuration - Trigonometry

SYLLABUS FOR CORE SKILLS
1. Employability Skill s(Common for all CTS trades) (120 hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in /dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
WELDER (PIPE) (For Batch of 20 Candidates)			
S No.	**Name of the Tool &Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOLS KIT			
1.	Welding helmet fiber		21(20+1) nos.
2.	Welding hand shield fiber		21(20+1) nos.
3.	Chipping hammer with metal handle	250 Grams	21(20+1) nos.
4.	Chisel cold flat	19 mm x 150 mm	21(20+1) nos.
5.	Centre punch	9 mm x 127 mm	21(20+1) nos.
6.	Dividers	200 mm	21(20+1) nos.
7.	Stainless steel rule (engraved)	300mm	21(20+1) nos.
8.	Scriber	150 mm double point	21(20+1) nos.
9.	Flat Tongs	350mm long	21(20+1) nos.
10.	Hack saw frame fixed	300 mm	21(20+1) nos.
11.	File half round bastard	300 mm	21(20+1) nos.
12.	File flat	350 mm bastard	21(20+1) nos.
13.	Hammer ball pane	1 kg with handle	21(20+1) nos.
14.	Tip Cleaner (Gas welding nozzle)		21(20+1) nos.
15.	Try square	150 mm.	21(20+1) nos.
B. GENERAL MACHINERY SHOP OUTFIT			
16.	Spindle key (O_2, CO_2, C_2H_2, Ar)		02 each gas
17.	Screw Driver	300mm blade and 250 mm blade	1 each
18.	Number punch	6 mm	2 set
19.	Letter punch	6 mm	2 set
20.	Swaging & flaring tool kit	45^0 tubing 1/8 to ¾ inch	1
21.	Magnifying glass	100 mm. dia	2 nos
22.	Universal Weld measuring gauge		2 nos
23.	Spanner D.E.	6 mm to 32mm	2 sets
24.	C-Clamps	10 cm and 15 cm	2 each
25.	Hammer sledge double faced	4 kg	2
26.	S.S tape 5 meters flexible in case		5
27.	H.P. Welding torch with	5 nozzles	2 sets
28.	Oxygen Gas Pressure regulator double stage		2
29.	Acetylene Gas Pressure regulator double stage		2
30.	CO_2 Gas pressure regulator, with flow meter		2 set
31.	Argon Gas pressure regulator with flow meter		2 set
32.	Metal rack	182 cm x 152 cm x 45 cm	1
33.	First Aid box		1
34.	Steel lockers	with 8 Pigeon holes	2
35.	Steel almirah / cupboard		4

36.	Black board and easel with stand		1
37.	Flash back arrester (torch mounted)		4 pairs
38.	Flash back arrester (cylinder mounted)		4 pairs
39.	Auto Darkening Welding Helmet		5 nos.
C. GENERAL INSTALLATION			
40.	Welding Transformer with all accessories	400A , OCV 60 - 100 V, 60% duty cycle	1 sets
41.	Welding Transformer or Inverter based welding machine with all accessories	300A , OCV 60 - 100 V, 60% duty cycle	1 sets
42.	D.C Arc welding rectifiers set with all accessories	400 A. OCV 60 -100 V, 60% duty cycle	1 sets
43.	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories		1 set
44.	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.		01set
45.	Air Plasma cutting equipment with all accessories, capacity to cut 12 mm clear cut		01 set
46.	Air compressor suitable for air plasma cutting system	2 stage compressor, 3 phase 3HP motor, pressure 8-10 bar and capacity 110 to 120 m^3/hr, tank mounted	01 no
47.	Pipe beveling machine		01 no
48.	Universal Testing machine		Optional
49.	Pug cutting machine Capable of cutting Straight & Circular with all accessories		01 set
50.	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm		2
51.	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia.	150 mm	1
52.	AG 4 Grinder		4 Nos
53.	Suitable gas welding table with fire bricks		2 Nos
54.	Suitable Arc welding table with positioner		6
55.	Trolley for cylinder (H.P. Unit)		2
56.	Hand shearing machine capacity to cut 6 mm sheets and flats		1
57.	Power saw machine, 450 mm.	Min. depth 450-500 mm	1
58.	Portable drilling machine (Cap. 6 mm)		2
59.	Oven, electrode drying capacity	0 to 350°C, 10 kg	1
60.	Work bench	340x120x75 cm with 4 bench vices of 150 mm jaw opening	5 sets
61.	Oxy Acetylene Gas cutting blow pipe		2 sets

62.	Oxygen, Acetylene Cylinders(O_2, C_2H_2) Standard size	7 m^3	2 each
63.	CO_2 cylinder	30 kg	21 No
64.	Argon gas cylinder		2 No
65.	Anvil 24 sq. inches working area with stand		1 No.
66.	Swage block		1 No.
67.	Magnetic particle testing Kit		1 set
68.	Fire extinguishers (foam type and CO_2 type)		1
69.	Fire buckets with stand		4 nos
70.	Portable abrasive cut-off machine		1 No
71.	Centre Lathe swing over radius250mm.		Optional
72.	Suitable gas cutting table		1 No
73.	Welding Simulators for SMAW/GTAW/GMAW		1 each (Optional)
74.	Induction/Brazing welding machine with stand. Accessories with water cooling system and tank	250 – 300 amp	1
75.	Plastic welding machine for PE, PP and PVC with stand. accessories	Single phase	1
D. LIST OF CONSUMABLE			
76.	Leather Hand Gloves	350 mm.	21pairs
77.	Cotton hand Gloves	200 mm.	21pairs
78.	Apron (leather)		21pairs
79.	S.S Wire brush	5 rows and 3 rows	21nos.each
80.	Leather hand sleeves	400 mm.	21 pairs
81.	Leather Safety boots for welders	Size 7,8,9,10	21 pairs
82.	Leg guards leather		21 pairs
83.	Rubber hose clips	1/2"	21pairs
84.	Rubber hose oxygen	8 mm dia X 10 Mts long as per BIS	2 nos.
85.	Rubber hose acetylene	8 mm dia X 10 Mts long as per BIS	2 nos.
86.	Arc welding cables multi cored copper	400/ 600 amp as per BIS	45 mts. each
87.	Arc welding single coloured glasses	108 mm x 82 mm x 3 mm. DIN 11A &12 A	42 nos.
88.	Arc welding plain glass	108 mm x 82 mm x 3 mm.	68 nos.
89.	Gas welding Goggles with Colour glass 3 or 4A DIN		42 nos.
90.	Bubble face clear shield with adjustable head band		42 nos.
91.	Cup Spark lighter for welding		6 nos.
92.	AG 4 Grinding wheels		50 nos.
93.	AG 4 cutting wheels		100 nos.
94.	CCMS filler wire 1mm		4 kg

95.	Brass filler wire 1 mm for brazing		4 kg
96.	Copper filler wire 1 mm		2Kg
97.	Flux for brass and copper brazing		500 gram each
98.	PVC binder roll		1
99.	Die penetrant testing kit		1 set
100.	Earth clamp	600A	6 nos
101.	Electrode holder	600 amps	6

ANNEXURE – II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of Expert members participated in preparation of course curriculum of Welder (Pipe) trade			
S No.	**Name & Designation Shri/Mr./Ms.**	**Organization**	**Remarks**
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2.	Dr. K. Ashokkumar, AGM	BHEL, Trichy	Member
3.	Prof. Jyothi Mukhopadhya	IIT, Ahmedabad	Member
4.	B.Pattabhiraman, MD	GB Engineering, Tricgy	Member
5.	Dr. Rajeevkumar	IIT, Mandi	Member
6.	Dr. Vishalchauhan	IIT, Mandi	Member
7.	D. K. Singh	IIT, Kanpur	Member
8.	Navneet Arora	IIT, Roorkee	Member
9.	R. K. Sharma,Head	SDC, JBM Group, Faridabad	Member
10.	Puneet Sinha, Deputy Director	MSME, New Delhi	Member
MENTOR			
11.	Deepankar Mallick, DDG (C&P)	DGT HQtr.	Mentor
MEMBERS OF CORE GROUP			
12.	M Thamizharasan, JDT	CSTARI, Kolkata	Member
13.	M Kumaravel, DDT	FTI , Bangalore	Team Leader
14.	Sushil Kumar, DDT	DGT HQtr.	Member
15.	S.P.Khatokar, T.O.	ATI, Mumbai	Member
16.	V.L. Ponmozhi, TO	CTI, Chennai	Member
17.	D. Pani, TO	ATI, Howrah	Member
18.	Amar Singh, TO	ATI, Ludhiana	Member
19.	Gopalakrishnan, TO	NIMI, Chennai	Member
20.	Manjunatha B.S, JTO	GITI, K.G.F. Karnataka	Member
21.	Venugopal PC	ITI Chalakudi, Kerala	Member

Abbreviations used:

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities
OAW	Oxy-Acetylene gas Welding
OAGC	Oxy-Acetylene Gas Cutting
F	Fitting
WT	Wall Thickness.
SMAW	Shielded Metal Arc welding
GTAW	Gas Tungsten Arc Welding
SAW	Submerged Arc Welding
GMAW	Gas Metal Arc Welding
PP	Polypropylene
PE	Polyethylene
PVC	Polyvinylchloride


कौशलं बलम्