



Preface to NSQF (Level-3) Compliant Edition



Directorate General of Training (DGT) under the Ministry of Skill Development and Entrepreneurship (MSDE) is the apex body in the country as regards planning, formulating and prescribing norms, standards, procedures and guidelines in respect of various vocational training schemes like craftsmen training scheme (CTS), apprenticeship training scheme (ATS), craft instructors' training scheme (CITS) and several other similar schemes, the core objective of which is to equip young people with skills as would help them secure decent employment. Of all these schemes CTS implemented through a vast network of Industrial Training Institutes, is by far the biggest in terms of not only the number of trainees deriving benefit, but also in terms of well-established and fully-equipped institutional framework.

Prescribing well designed curriculum and putting in place appropriate assessment and certification procedure are among the vital aspects of vocational training. **WELDER TRADE**, which is one of the very popular trades and is of one year training duration falls under the sector of Capital Goods and Manufacturing.

The latest syllabus (version 2.0) for Welder Trade as revised in July 2022 has since been notified by DGT. The significant change has been revision of NSQF level of this trade from four to three, besides rationalising / eliminating some topics and with significant addition of **Welding of Plastics**.

This book has been prepared and redesigned taking due note of the latest changes in the syllabus. Besides covering all necessary topics related to trade theory, as hitherto, each module is supplemented by adequate set of Multiple-Choice Questions. Further ten Model Papers with key and essential explanatory notes have been incorporated which, we believe, should be of immense help to the trainees to prepare for the final trade test with proper understanding of trade theory subject, and with confidence.

We do firmly believe and hope that this **3-in-1 volume** viz.,

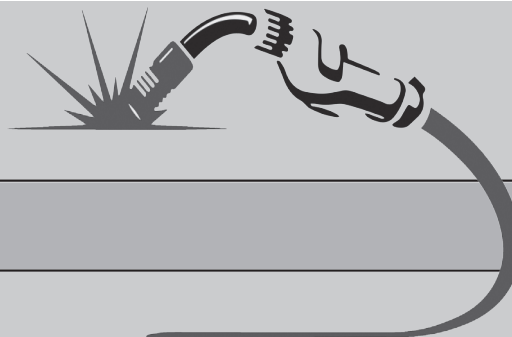
1. **Trade Theory**
2. **Assignment (MCQs)**
3. **Model Papers (Solved) for Annual A.I.T.T. Exam**

will be of great help to trainees to learn and understand theory subject of Welder trade and also equip them to confidently face All Indian Trade Test. We would, undoubtedly, welcome suggestions from our esteem readers that would help us make further improvements in subsequent editions.

— Author

This book covers the syllabus of trade theory subject for the following ITI trades as well:

- Welder (GMAW & GTAW)
- Welder (Pipe)
- Welder Structural
- Welder (Fabrication and Fitting)
- Welder (Welding and Inspection)



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NSQF (LEVEL 3) COMPLIANT COMPETENCY BASED CURRICULUM



**WELDER TRADE THEORY
EFFECTIVE FROM 01-09-2022**

Duration – One Year	
Duration	Professional Knowledge (Trade Theory)
Professional Skill 47 Hrs; Professional Knowledge 11 Hrs	<ul style="list-style-type: none"> Importance of trade Training. 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.
	<ul style="list-style-type: none"> 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 21 Hrs; Professional Knowledge 05 Hrs	<ul style="list-style-type: none"> Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc. Types of welding joints and its applications. Edge preparation and fit up for different thickness. Surface Cleaning
Professional Skill 20 Hrs; Professional Knowledge 05 Hrs	<ul style="list-style-type: none"> Basic electricity applicable to arc welding and related electrical terms & definitions. Heat and temperature and its terms related to welding. Principle of arc welding. And characteristics of arc.
Professional Skill 23 Hrs; Professional Knowledge 05 Hrs	<ul style="list-style-type: none"> 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.
Professional Skill 126 Hrs; Professional Knowledge 31 Hrs	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> Welding positions as per EN & ASME: flat, horizontal, vertical and overhead position. Weld slope and rotation. Welding symbols as per BIS & AWS.
	<ul style="list-style-type: none"> Arc length – types – effects of arc length. Polarity: Types and applications.

	<ul style="list-style-type: none"> Weld quality inspection, common welding mistakes and appearance of good and defective welds Weld gauges & its uses.
	<ul style="list-style-type: none"> Calcium carbide uses and hazard. Acetylene gas properties and flashback arrestor.
	<ul style="list-style-type: none"> Oxygen gas and its properties, uses in welding. Charging process of oxygen and acetylene gases Oxygen and Dissolved Acetylene gas cylinders and Color coding for different gas cylinders. Uses of single and double stage Gas regulators.
	<ul style="list-style-type: none"> Oxy acetylene gas welding Systems (Low pressure and High pressure). Difference between gas welding blow pipe (LP & HP) and gas cutting blow pipe Gas welding techniques. Rightward and Leftward techniques.
	<ul style="list-style-type: none"> 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 80 Hrs; Professional Knowledge 17 Hrs	<ul style="list-style-type: none"> Specification of pipes, various types of pipe joints, pipe welding all positions, and procedure. Difference between pipe welding and plate welding.
	<ul style="list-style-type: none"> Pipe development for Elbow joint, “T” joint, Y joint and branch joint Brief use of Manifold system
	<ul style="list-style-type: none"> 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.
	<ul style="list-style-type: none"> Electrode : types, functions of flux, coating factor, size specifications of electrode. Effects of moisture pick up. Storage and baking of electrodes.

Professional Skill 61 Hrs; Professional Knowledge 06 Hrs	<ul style="list-style-type: none"> Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature. Welding of low, medium and high carbon steel and alloy steels. Stainless steel types- weld decay and weldability.
Professional Skill 25 Hrs; Professional Knowledge 04 Hrs	<ul style="list-style-type: none"> Induction welding, brazing of copper tubes. Brass – types – properties and welding methods. Copper – types – properties and welding methods. Brazing cutting tools.
Professional Skill 21 Hrs; Professional Knowledge 04 Hrs	<ul style="list-style-type: none"> Aluminium properties and weldability, Welding methods Arc cutting & gouging.
Professional Skill 20 Hrs; Professional Knowledge 04 Hrs	<ul style="list-style-type: none"> Cast iron and its properties types. Welding methods of cast iron. (04hrs)
Professional Skill 25 Hrs; Professional Knowledge 04 Hrs	<ul style="list-style-type: none"> Types of Inspection methods Classification of destructive and NDT methods Welding economics and Cost estimation.
Professional Skill 166 Hrs; Professional Knowledge 32 Hrs	<ul style="list-style-type: none"> Safety precautions in Gas Metal Arc Welding and Gas Tungsten Arc welding. Introduction to GMAW - equipment – accessories. Various other names of the process. (MIG/MAG/CO₂ welding.) Advantages of GMAW welding over SMAW , limitations and applications Process variables of GMAW. Wire feed system – types – care and maintenance. Welding wires used in GMAW, standard diameter and codification as per AWS. Name of shielding gases used in GMAW and its applications. Flux cored arc welding – description, advantage, welding wires, coding as per AWS. Edge preparation of various thicknesses of metals for GMAW. GMAW defects, causes and remedies Heat input and techniques of controlling heat input during welding. Heat distribution and effect of faster cooling.

	<ul style="list-style-type: none"> Pre heating & Post Weld Heat Treatment. Use of temperature indicating crayons. Submerged arc welding process – principles, equipment, advantages and limitations. Thermit welding process- types, principles, equipments, Thermit mixture types and applications. Use of backing strips and backing bars
Professional Skill 80 Hrs; Professional Knowledge 14 Hrs	<ul style="list-style-type: none"> GTAW process - brief description. Difference between AC and DC welding, equipments, polarities and applications. Power sources for GTAW - AC & DC Tungsten electrodes – types & uses, sizes and preparation. GTAW Torches - types, parts and their functions. GTAW filler rods and selection criteria. Edge preparation and fit up. GTAW parameters for welding of different thickness of metals. Argon / Helium gas properties – uses. GTAW Defects, causes and remedy.
Professional Skill 20 Hrs; Professional Knowledge 04 Hrs	<ul style="list-style-type: none"> Friction welding process- equipment and application Laser beam welding (LBW).
Professional Skill 20 Hrs; Professional Knowledge 03 Hrs	<ul style="list-style-type: none"> Plasma Arc Welding (PAW) and cutting (PAC) process – equipments and principles of operation. Types of Plasma arc, advantages and applications.
Professional Skill 20 Hrs; Professional Knowledge 02 Hrs	<ul style="list-style-type: none"> Resistance welding process - types, principles, power sources and welding parameters. Applications and limitations.
Professional Skill 41 Hrs; Professional Knowledge 10 Hrs	<ul style="list-style-type: none"> Metalizing – types of metalizing principles. Manual Oxy – acetylene powder coating process- principles of operation and applications Reading of assembly drawing Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR)
Professional Skill 24 Hrs; Professional Knowledge 01 Hrs	<ul style="list-style-type: none"> Hard facing / surfacing necessity, surface preparation, various hard facing alloys and advantages of hard facing. Plastic welding machine with hot air gun and plastic material: Polypropylene (PP) Polyethylene (PE) Polyvinylchloride (PVC)