NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

JANUARY 2023

PROPOSED OCCUPATIONAL STANDARDS

OCCUPATION: WELDING TECHNICIAN

LEVEL: NTA 5

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ABBREVIATIONS

AC	Alternating Current (AC)
CBET	Competency Based Education and Training
DC	Direct Current (DC)
EWD	Electrode-to-wire Distance
EWPD	Electrode-to-welded Part Distance
ET	Eddy current Testing
MAG	Metal Active Gas Arc Welding
MIG	Metal Inert-gas Welding
MT	Magnetic Particle Testing
NACTVET	National Council for Technical and Vocational Education and Training
NDT	Non-destructive Testing
NOS	National Occupational Standards
OS	Occupational Standards
PT	Penetrant Testing
RT	Radiographic Testing
TET	Technical Education and Training
TIG	Tungsten Inert Gas Welding
TVET	Technical and Vocational Education and Training
UT	Ultrasonic Testing
VPPAW	Variable Polarity Plasma Welding

WFS	Wire Feed Rate

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks - essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service).
Occupational Standards:	Specific requirements of competences for personnel in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tools of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which, if proved true under working conditions, means that an individual is meeting an expected level and type of performance.

Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance criteria, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to products, service, or decisions.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the working conditions.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training of Tanzania has begun the job of drafting Occupational Standards that will eventually be adopted as National Occupational Standards for TET in order to ensure that it meets the needs of the labour market and the country's economic agenda.

National Occupational Standards (NOS) are performance criteria that are matched with labour market demands. Each National Occupational Standard describes functions, performance standards, and knowledge/understanding for one important function or task. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruiting, supervision, and appraisal, as well as TET standards. They're also helpful for benchmarking and harmonizing qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current and consistent in delivery across all public and private institutions.

However, it must be noted that, Occupational Standards and Training standards/qualifications standards are different. Occupational Standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical wiring circuits, performs troubleshooting in electrical wiring, etc.) and they are usually defined by employers following procedures agreed upon by all stakeholders. Education and training standards are developed from the activities defined in occupational standards, and they include learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him or her to function at an agreed level in an occupation. Education and Training standards are used to define curricula in training institutions. It is however critical that there must be a direct link between the Occupational Standards and the training standards to respond to demands of the labour market.

In TET delivery, Tanzania adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the Occupational Standards. Occupational Standards are thus the starting point for developing competency-based training (CBET) programmes. TET institutions will be required to benchmark their curricula with relevant Occupational Standards.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical

education and training (TET).

The Welding Technician Occupation has its own set of occupational standards. The document explains how the Occupational Standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The Occupational Standards development process began with an examination of major documents that guide Tanzanian skill development. The *10-year National Skills Development Strategy (2016-2026)* was one of the documents reviewed, and it outlined six (6) economic sectors that should be prioritized when developing skills development programmes.

These sectors include: Transport and Logistics, Tourism and Hospitality, Agribusiness, Construction, Energy and ICT. NACTE labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a workshop comprised of experts and educators with substantial knowledge and experience in the occupation conducted an occupational analysis utilizing the DACUM approach to produce the occupational profile. The analysis resulted in DACUM Charts, which are attached as **Appendix 1** to this document.

The Occupational Standards were then developed. Experts in Occupational Analysis and the Development of Occupational Standards facilitated the workshop. Interviews, online surveys, and a stakeholder forum were used to validate the Occupational Standards. Engineers, supervisory technicians on the job, and experienced Welding Technicians were key informants in the survey to discover occupational trends. The information was used to gain insight from the workplaces regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation. A total of ..... online surveys were completed by experts from the labour market across the country. Apart from the survey aiding in defining the scope for the occupational analysis, they also served to engage a wide cross-section of experts in the occupation. Apart from this, the stakeholders' forum was attended by ... participants from different parts of the country representing various companies.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR WELDING ENGINEERS

These standards cover a broad range of duties and tasks that can be performed by a Welding Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Welding Engineer may perform tasks in a number of key areas of

the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Welding Technician shall weld and inspect welded joints in various engineering structural parts in a safe environment under the supervision of engineers. In the workshop, technicians complete various welding and inspection tasks, ranging from simple manual shielded metal arc welding of flat butt joints to gas welding of all positions, developing welding procedures, and inspecting welding defects. Generally, the Welding Technician performs the following duties:

a) Implementation of welding safety operation

b) Formulation of simple welding process

c) Inspection and maintenance of welding equipment

d) Manual Shielded Metal Arc Welding (SMAW) of flat butt joint

e) Manual Shielded Metal Arc Welding (SMAW) of horizontal butt joint

f) Manual Shielded Metal Arc Welding (SMAW) of vertical butt joint

g) Gas Metal Arc Welding (GMAW) of flat butt joint with consumable electrode and gas shield

h) Gas Metal Arc Welding (GMAW) of horizontal butt joint with consumable electrode and gas shield

i) Gas Metal Arc Welding (GMAW) of vertical butt joint with consumable electrode and gas shield

j) Manual tungsten inert gas welding of flat butt joint

k) Horizontal and vertical manual tungsten inert gas welding

l) Gas welding of flat fillet joint

m) Gas welding of flat butt joint

n) All-position gas welding

o) Brazing of low carbon steel

p) Inspection of welding defects

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 4, 5 and 6.

4.0. Method validity period

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5. OCCUPATIONAL STANDARDS for the WELDING TECHNICIANS-NTA 5

OCCUPATION	**WELDING TECHNICIAN**	**OCCUPATION CODE**	
DUTY TITLE	INSPECTION AND MAINTENANCE OF THE WELDING EQUIPMENT	**DUTY NO.**	**501**
TASK TITLE	SAFETY INSPECTION AND MAINTENANCE OF THE SHIELDED METAL ARC WELDING EQUIPMENT, TOOLS AND FIXTURES	**TASK NO.**	**5011**
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and maintain the corresponding equipment, tools and fixtures according to the specific operation requirements.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Shielded metal arc welding g power supply; 2. Ground clamps; 3. Electrode Holders; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. File; 8. Welding rod drying box; 9. Welding rod insulation barrel; 10. Welding mask; 11. Wire brush; 12. Hammer; 13. Chisel; 14. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Inspect and maintain welders; 4. Inspect and maintain electrode holders; 5. Inspect and maintain welding cables; 6. Inspect and maintain Angle grinders; 7. Inspect and maintain welding operation frames;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use protective tools; 1.2 Carry out the emergency treatment of accidents. **2.0 Methods** The person performing this task must be able to explain the following principles:

8. Inspect and maintain labor protection supplies and tools; 9. Inspect the surrounding environment; 10. Clean the tools, equipment and the workplace; **11.** Store the tools and equipment.	2.1 Operation principles of shielded metal arc welding machines; 2.2 Safety protection principles of the protective equipment. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Requirements for wearing the personal protective equipment; 3.2 Selection standards of process parameters; 3.3 Requirements for looking at pictures and reading them. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The corresponding equipment, tools and fixtures are inspected and maintained according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Occupational health and safety; 3. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSPECTION AND MAINTENANCE OF THE WELDING EQUIPMENT	**DUTY NO.**	**501**
TASK TITLE	SAFETY INSPECTION AND MAINTENANCE OF THE GAS METAL ARC WELDING EQUIPMENT, TOOLS AND FIXTURES	**TASK NO.**	**5012**
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and maintain the corresponding equipment, tools and fixtures according to the specific operation requirements.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. CO_2 shielded arc welding; 2. Wire feeder; 3. Welding gun; 4. Gas supply systems (gas cylinder); 5. Welding operation frames; 6. Slag hammer; 7. Angle grinder; 8. File; 9. Welding rod insulation barrel; 10. Welding masks; 11. Wire brush; 12. Hammer; 13. Chisel; 14. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Inspect and maintain welders; 4. Inspect and maintain the wire feeder and welding gun; 5. Inspect and maintain the gas supply system (gas cylinder); 6. Inspect and maintain Angle grinders; 7. Inspect and maintain welding operation frames;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use protective tools; 1.2 Carry out the emergency treatment of accidents. **2.0 Methods** The person performing this task must be able to explain the following principles: 2.1 Operation principles of the carbon dioxide gas shielded welding machine;

8. Inspect and maintain labor protection supplies and tools; 9. Inspect the surrounding environment; 10. Clean the tools, equipment and the workplace; 11. Store the tools and equipment.	2.2 Safety protection principles of the protective equipment. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Surrounding environment requirements of carbon dioxide gas shielded welding; 3.2 Installation requirements of carbon dioxide gas cylinders; 3.3 Operation requirements of the carbon dioxide gas shielded welding machine; 3.4 Operation requirements of the angle grinder; 3.5 Requirements for de-rusting and lubricating of welding operation frames. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE:	The corresponding equipment, tools and fixtures are inspected and maintained according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Occupational health and safety; 3. Waste disposal methods; 4. Environmental safety requirements.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSPECTION AND MAINTENANCE OF THE WELDING EQUIPMENT	**DUTY NO.**	**501**
TASK TITLE	SAFETY INSPECTION aND MAINTENANCE oF THE MANUAL TUNGSTEN INERT GAS WELDING EQUIPMENT, TOOLS aND FIXTURES	**TASK NO.**	**5013**
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and maintain the corresponding equipment, tools and fixtures according to the specific operation requirements.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. manual tungsten inert gas welding machine; 2. Welding gun; 3. Gas supply systems (gas cylinder); 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. File; 8. Welding mask; 9. Wire brush; 10. Hammer; 11. Chisel; 12. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Inspect and maintain welders; 4. Inspect and maintain the gas supply system (gas cylinder); 5. Inspect and maintain Angle grinders; 6. Inspect and maintain welding operation frames; 7. Inspect and maintain labor protection supplies and tools; 8. Inspect the surrounding environment; 9. Clean the tools, equipment and workplace;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out the safety inspection and maintenance of welding machines; 1.2 Carry out the safety inspection and maintenance of gas supply systems (gas cylinder); 1.3 Carry out the safety inspection and maintenance of angle grinders; 1.4 Carry out the safety inspection and maintenance of welding operation frames. **2.0 Methods**

10. Store the tools and equipment.	The person performing this task must be able to explain the following principles: 2.1 Operation principles of the manual tungsten inert gas welding machines: 2.2 Operation principles of the carbon dioxide gas shielded welding machine. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Installation requirements of argon gas cylinders; 3.2 Operation requirements of the manual tungsten inert gas welding machines: 3.3 Operation requirements of the angle grinder; 3.4 Requirements for de-rusting and lubricating of welding operation frames. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The corresponding equipment, tools and fixtures are inspected and maintained according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Occupational health and safety; 3. Waste disposal methods; 4. Environmental safety requirements.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSPECTION AND MAINTENANCE OF THE WELDING EQUIPMENT	DUTY NO.	501
TASK TITLE	SAFETY INSPECTION AND MAINTENANCE OF GAS WELDING EQUIPMENT, TOOLS AND FIXTURES	TASK NO.	5014
PERFORMANCE CRITERIA	The person performing this task must be able to inspect and maintain the corresponding equipment, tools and fixtures according to the specific operation requirements.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Gas cylinders and pressure reducers; 2. Rubber hoses; 3. Welding torch; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. File; 8. Dust mask; 9. Gas welding glass; 10. Wire brush; 11. Hammer; 12. Chisel; 13. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Inspect and maintain gas cylinders and pressure reducers; 4. Inspect and maintain rubber hoses; 5. Inspect and maintain welding torch; 6. Inspect and maintain Angle grinders; 7. Inspect and maintain welding operation frames; 8. Inspect and maintain labor protection supplies and tools; 9. Inspect the surrounding environment;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out the safety inspection and maintenance of welding machines; 1.2 Carry out the safety inspection and maintenance of gas supply systems (gas cylinder); 1.3 Carry out the safety inspection and maintenance of angle grinders; 1.4 Carry out the safety inspection and maintenance of welding operation frames; 1.5 Carry out the safety inspection and maintenance of labor protection supplies and tools. **2.0 Methods**

10. Clean the tools, equipment and the workplace; 11. Store the tools and equipment.	The person performing this task must be able to explain the following principles: 2.1 Operation principles of the gas welding equipment. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Welding daylighting, ventilation, explosion-proof and other surrounding environmental requirements of the gas welding; 3.2 Requirements for de-rusting and lubricating of welding operation frames. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The corresponding equipment, tools and fixtures are inspected and maintained according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Occupational health and safety; 3. Waste disposal methods; 4. Environmental safety requirements.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MANUAL SHIELDED METAL ARC WELDING (SMAW) OF HORIZONTAL BUTT JOINT	**DUTY NO.**	**502**
TASK TITLE	Horizontal butt welding of low carbon or low alloy steel plates using shielded metal arc welding	**TASK NO.**	**5021**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the butt horizontal welding electrode arc welding of low carbon steel or low alloy steel plate according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Power supply for shielded metal arc welding; 2. Ground clamp; 3. Electrode holder; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. File; 8. Welding rod drying box; 9. Welding rod insulation barrel; 10. Welding mask; 11. Wire brush; 12. Hammer; 13. Chisel; 14. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the matching electrodes; 4. Remove oil stains, moisture and other dirt within 20mm of the groove surface and both sides of the front and back sides of the groove until metallic luster is exposed; 5. Trim the blunt edge of the bottom groove, assemble, perform the positioned welding and preset the anti-deformation;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine welding parameters; 1.2 Carry out the butt horizontal shielded metal arc welding of low carbon steel or low alloy steel electrode arc welding plates. **2.0 Methods** The person performing this task must be able to explain the following principles:

6. Determine the number of welding layers and tracks; 7. Implement the reasonable process to control the heat input for reducing the welding deformation; 8. Carry out the butt horizontal welding and backing welding; 9. Carry out the butt horizontal welding and filing welding; 10. Carry out the butt horizontal welding and capping welding; 11. Clean the tools, equipment and the workplace; 12. Store the tools and equipment.	2.1 Requirements for preparing the base metal groove, cleaning, assembling and performing the positioned welding; 2.2 Requirements for the bottom welding; 2.3 Requirements for cleaning slags and spatter materials and inspecting the welding quality. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Selection standard of welding electrode for low carbon steel or low alloy steel; 3.2 Selection and preparation standards of the groove of shielded metal arc welding of low carbon steel or low alloy steel; 3.3 Essentials of groove grinding and cleaning. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MANUAL SHIELDED METAL ARC WELDING (SMAW) OF HORIZONTAL BUTT JOINT	DUTY NO.	502
TASK TITLE	BUTT VERTICAL FIXED SHIELDED METAL ARC WELDING OF LOW CARBON STEEL OR LOW ALLOY STEEL PIPES	TASK NO.	5022
PERFORMANCE CRITERIA	The person performing this task must be able to complete the butt vertical fixed shielded metal arc welding of low carbon steel or low alloy steel pipes according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Power supply for shielded metal arc welding; 2. Ground clamp; 3. Electrode holder; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. Welding rod drying box; 8. Welding rod insulation barrel; 9. Welding mask; 10. Wire brush; 11. Hammer; 12. Chisel; 13. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the matching electrodes; 4. Requirements for preparing the base metal groove, cleaning, assembling and performing the positioned welding; 5. Determine the number of welding layers and tracks; 6. Implement process requirements; 7. Butt the vertical fixed backing welding;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine welding parameters; 1.2 Carry out butt vertical fixed shielded metal arc welding of low carbon steel or low alloy steel pipes. **2.0 Methods** The person performing this task must be able to explain the following principles:

8. Butt the vertical fixed filling welding; 9. Butt the vertical fixed capping welding; 10. Clean the tools, equipment and the workplace; 11. Store the tools and equipment.	2.1 Requirements of the leaning groove surface and assembling; 2.2 Criterias for selecting the position of starting welding places; 2.3 Methods of the bottom welding; 2.4 Methods and standards for cleaning slags and spatter materials. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Selection and preparation principles of the groove of butt shielded metal arc welding of low carbon steel or low alloy steel pipes; 3.2 Essentials of the groove grinding and cleaning; 3.3 Welding operation essentials of the butt vertical fixed shielded metal arc welding of low carbon steel or low alloy steel pipes; **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Customer service skills; 4.4 Teamwork skills; 4.5 Report writing skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Occupational health and safety; 3. Methods and skills of the welding operation; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	GAS METAL ARC WELDING (GMAW) OF HORIZONTAL BUTT JOINT WITH CONSUMABLE ELECTRODE AND GAS SHIELD	**DUTY NO.**	**503**
TASK TITLE	HORIZONTAL GAS METAL ARC WELDING (GMAW) OF FLAT BUTT JOINT WITH CONSUMABLE ELECTRODE AND GAS SHIELD OF LOW CARBON STEEL OR LOW ALLOY STEEL PLATE	**TASK NO.**	**5031**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the welding of the steel plate butt-joint according to the welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Welding power source for Gas Metal Arc Welding (GMAW); 2. Ground clamps; 3. Electrode holders (welding gun); 4. Welding operation frames; 5. Gas supply system; 6. Slag hammer; 7. Angle grinder; 8. File; 9. Welding mask; 10. Wire brush; 11. Hammer; 12. Chisel; 13. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.); 14. Welding detecting tools and measuring tools.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Formulate the welding process scheme; 4. Formulate the guarantee measures of welding quality; 5. Clean the tools, equipment and workplace; 6. Store tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Wear personal protective articles; 1.2 Inspect whether the air supply pipeline of the gas cylinder is damaged or blocked, and whether the connection is tight; 1.3 Inspect whether the connection between workpieces and grounding wires, welding guns, wire feeders, gas cylinders, gas-pressure meters and gas lines are correct and reliable 1.4 Inspect the welding quality.

	2.0 Methods The person performing this task must be able to explain the following principles: 2.1 Operation principles of the gas shielded welding with the melting electrode; 2.2 Inspection principles of the welding quality. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 Welding parameters of the carbon dioxide gas shielded welding: 3.2 Selection criteria of wire diameters, welding currents, arc voltages, welding speeds, gas flows, dry extensions, power polaritys, loop inductances and dip angles of welding guns . **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	According to the concrete form of welding structures, a reasonable welding process scheme is worked out.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	GAS METAL ARC WELDING (GMAW) OF HORIZONTAL BUTT JOINT WITH CONSUMABLE ELECTRODE AND GAS SHIELD	**DUTY NO.**	**503**
TASK TITLE	BUTT VERTICAL FIXED GAS METAL ARC WELDING OF LOW CARBON STEEL OR LOW ALLOY STEEL PIPES	**TASK NO.**	**5032**
PERFORMANCE CRITERIA	The person performing this task should complete the vertical fixed welding of steel pipe butt-joint according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Welding power source for Gas Metal Arc Welding (GMAW); 2. Ground clamps; 3. Electrode holders (welding gun); 4. Welding operation frames; 5. Gas supply system; 6. Slag hammer; 7. Angle grinder; 8. File; 9. Welding mask; 10. Wire brush; 11. Hammer; 12. Chisel; 13. Personal protective equipment (safety shoes, protective suits, welding gloves, etc.); 14. Welding detecting tools and measuring tools.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the matching welding materials; 4. Requirements for preparing the base metal groove, cleaning, assembling and performing the positioned welding; 5. Weld the structure of special parts; 6. Weld that cannot be inspected after welding or the key parts cannot be repaired;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Perform vertical fixed operations of the pipe butt-joints; 1.2 Carry out the assembly positioned welding; 1.3 Select the welding starting place; 1.4 Select the welding mode; 1.5 Clean up molten slags and splashes; 1.6 Inspect the front and back welds. **2.0 Methods**

7. Deal with welding defects and technical problems after welding; 8. Clean the tools, equipment and workplaces; 9. Store tools and equipment.	2.1 Operation principles of the gas shielded welding with the melting electrode; 2.2 Inspection principles of the welding quality. 3.0 Methods The person performing this task must be able to explain the following: 3.1 Requirements of the counterpart and the positioned welding; 3.2 Welding requirements for the bottom layer; 3.3 Welding requirements for the filling layer; 3.4 Methods of welding large diameter pipelines by the single person. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The welding and inspection of the vertical fixed structure of the pipe butt-joint is completed according to technical requirements and welding process requirements
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	**WELDING TECHNICIAN**	**OCCUPATION CODE**	
DUTY TITLE	MANUAL TUNGSTEN INERT GAS WELDING OF FLAT BUTT JOINT	**DUTY NO.**	**504**
TASK TITLE	FLAT MANUAL TUNGSTEN INERT GAS WELDING OF LOW CARBON STEEL OR LOW ALLOY STEEL PLATE CORNER JOINT OR T JOINT	**TASK NO.**	**5041**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the flat welding of corner joint or T joint of low carbon steel or low alloy steel plate according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. manual tungsten inert gas welding power supply; 2. Ground clamp; 3. Electrode holder; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. Welding masks; 8. Wire brush; 9. Hammer; 10. Chisel; 11. Needle-nose pliers; 12. Adjustable wrench; 13. Personal protective equipment (safety shoes, protective suits, welder gloves, earplugs, masks, etc.); 14. Welding detecting tools and measuring tools (weld gauge, steel straightedges, steel angle rulers, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the matching welding wires; 4. Prepare base metals, clean, assemble and perform the positioned welding; 5. Determine the number of welding layers and tracks; 6. Carry out the process to control the heat input;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Perform the flat welding. **2.0 Methods** The person performing this task must be able to explain the following principles: 2.1 Technical principles to be followed in the manual tungsten inert gas welding of low carbon steel or low alloy steel.

7. Inspect the appearance quality of welds; 8. Clean the tools, equipment and workplace; 9. Store tools and equipment.	**3.0 Methods** The person performing this task must be able to explain the following: 3.1 The welding occupational health and safety and related standards; 3.2 Working principles, characteristics and applications of the manual tungsten inert gas welding; 3.3 Welding methods and application points of the manual tungsten inert gas welding, essentials of grinding and cleaning before welding and the circumstantial knowledge of the positioned welding; 3.4 Operation essentials of the manual tungsten argon arc welding for low carbon steel or welding wires of low alloy steel; 3.5 Structures of the manual tungsten inert gas welding equipment and working principles of welding equipment/parts; 3.6 Forms of welding defects, the causes, and the prevention and control requirements of hazard measures; 3.7 Selections and adjustment requirements of welding parameters of the manual tungsten inert gas welding equipment; 3.8 Common equipment problems related to the manual tungsten inert gas welding; 3.9 Basic knowledges of the welding deformation of corner joints and T joints of low carbon steel or low alloy steel plate by manual tungsten arc welding. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	**WELDING TECHNICIAN**	**OCCUPATION CODE**	
DUTY TITLE	MANUAL TUNGSTEN INERT GAS WELDING OF FLAT BUTT JOINT	**DUTY NO.**	**504**
TASK TITLE	FLAT WELDING OF LOW CARBON STEEL OR LOW ALLOY STEEL PLATES BY THE MANUAL TUNGSTEN INERT GAS WELDING	**TASK NO.**	**5042**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the butt flat welding of low carbon steel or low alloy steel plate according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. manual tungsten inert gas welding power supply; 2. Ground clamp; 3. Electrode holder; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. Welding masks; 8. Wire brush; 9. Hammer; 10. Chisel; 11. Needle-nose pliers; 12. Adjustable wrench; 13. Personal protective equipment (safety shoes, protective suits, welder gloves, earplugs, masks, etc.); 14. Welding detecting tools and measuring tools (weld gauge, steel straightedges, steel angle rulers, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the matching welding wires; 4. Prepare base metals, clean, assemble and perform the positioned welding; 5. Determine the number of welding layers and tracks; 6. Carry out the process to control the heat input; 7. Detect the appearance quality of welds;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine welding parameters; 1.2 Carry out the butt welding of low carbon steel or low alloy steel plates by the manual tungsten inert gas welding. **2.0 Methods** The person performing this task must be able to explain the following principles:

8. Clean the tools, equipment and workplace; 9. Store tools and equipment.	2.1 Technical principles to be followed in the manual tungsten inert gas welding of low carbon steel or low alloy steel. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 The welding occupational health and safety and related standards; 3.2 Working principles, characteristics and applications of the manual tungsten inert gas welding; 3.3 Flat welding methods and application points of the manual tungsten inert gas welding; 3.4 Selection and preparation principles of the welding groove for the manual tungsten inert gas welding; 3.5 Essentials of the groove grinding and cleaning; 3.6 Operation essentials of the manual tungsten argon arc welding for low carbon steel or welding wires of low alloy steel; 3.7 Constructions of the manual tungsten inert gas welding equipment; 3.8 Forms of welding defects, the causes, and the prevention and control requirements of hazard measures; 3.8 Selection standards of welding parameters for the manual tungsten inert gas welding equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	GAS WELDING OF FLAT BUTT JOINT	**DUTY NO.**	**505**
TASK TITLE	FLAT BUTT WELDING AND GAS WELDING OF LOW CARBON OR LOW ALLOY STEEL PLATES	**TASK NO.**	**5051**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the flat butt welding and gas welding of low carbon or low alloy steel plates according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Gas welding equipment (① acetylene cylinder and acetylene generator ② oxygen cylinder ③ tempering preventator ④ pressure reducer); 2. Gas supply system; 3. Welding torch (welding gun); 4. Welding rotary operation frame; 5. Slag hammer; 6. Straight grinder; 7. Angle grinder; 8. Welding masks; 9. Wire brush; 10. Hammer; 11. Adjustable wrench; 12. Personal protective equipment (safety shoes, protective suits, welder gloves, earplugs, masks, etc.); 13. Welding detecting tools and measuring tools (weld gauge, steel straightedges, steel angle rulers, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the welding material matched with the base metal; 4. Requirements for preparing the base metal groove, cleaning, assembling and performing the positioned welding; 5. Determine the number of welding layers and tracks; 6. Carry out the process to control the heat input; 7. Clean the tools, equipment and workplaces;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out the flat welding and the gas welding operation. **2.0 Methods** The person performing this task must be able to explain the following principles: 2.1 Technical principles to be followed in the gas welding of low carbon steel or low alloy steel. **3.0 Methods**

8. Store tools and equipment.	The person performing this task must be able to explain the following: 3.1 The welding occupational health and safety and related standards; 3.2 Working principles, characteristics and applications of the gas welding flat butt welding; 3.3 Welding methods and application points of the gas welding and the flat butt welding; 3.4 Essentials of the grinding and cleaning before welding preparation; 3.5 Welding technology essentials of the butt flat welding and the gas welding of low carbon steel or low alloy steel plates: 3.6 Common equipment problems related to the gas welding; 3.7 Forms of welding defects, the causes, and the prevention and control requirements of hazard measures; 3.8 Basic knowledge of the welding deformation of the butt flat welding and the gas welding of low carbon steel or low alloy steel plates. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	GAS WELDING OF FLAT BUTT JOINT	**DUTY NO.**	**505**
TASK TITLE	HORIZONTAL ROTATION GAS WELDING OF THE BUTT JOINT OF LOW-CARBON STEEL PIPES	**TASK NO.**	**5052**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the welding operation and inspection of the butt horizontal rotation gas welding of low carbon steel pipes according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. Gas welding equipment (① acetylene cylinder and acetylene generator ② oxygen cylinder ③ tempering preventator ④ pressure reducer); 2. Gas supply system; 3. Welding torch (welding gun); 4. Welding rotary operation frame; 5. Slag hammer; 6. Straight grinder; 7. Angle grinder; 8. Welding masks; 9. Wire brush; 10. Hammer; 11. Adjustable wrench; 12. Personal protective equipment (safety shoes, protective suits, welder gloves, earplugs, masks, etc.); 13. Welding detecting tools and measuring tools (weld gauge, steel straightedges, steel angle rulers, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate tools, equipment, and safety protective equipment; 2. Use and maintain protective equipment; 3. Select the welding material matched with the base metal; 4. Requirements for preparing the base metal groove, cleaning, assembling and performing the positioned welding; 5. Welding the structure with the poor accessibility; 6. Weld that cannot be inspected after welding or the key parts cannot be repaired; 7. Deal with welding defects and technical problems after welding;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out the horizontal rotation gas welding joint clearance for the butt joint of low-carbon steel pipes; 1.2 Carry out the butt welding of low-carbon steel pipes by the horizontal rotation gas welding and the positioned welding. **2.0 Methods** The person performing this task must be able to explain the following principles:

8. Clean the tools, equipment and workplace; 9. Store tools and equipment.	2.1 Welding process requirements of the butt horizontal rotation gas welding of low-carbon steel pipes: 2.2 Surface cleaning methods of horizontal rotation gas welded joint of the low carbon steel pipe butt joint. **3.0 Methods** The person performing this task must be able to explain the following: 3.1 The welding occupational health and safety and related standards; 3.2 Working principles, characteristics and applications of the gas flat; 3.3 Welding methods and application points of the gas welding and the flat butt welding; 3.4 Essentials of the grinding and cleaning before welding preparation; 3.5 Welding operation essentials of the gas welding of low carbon steel welding wires; 3.6 Structures of the manual tungsten inert gas welding equipment and working principles of welding equipment/parts; 3.7 Forms of welding defects, the causes, and the prevention and control requirements of hazard measures; 3.8 Requirements for the selection and adjustment of welding parameters of the gas welding equipment. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The weld seam meeting quality requirements is welded according to technical standards and welding procedures.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.

OCCUPATION	WELDING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	GAS WELDING OF FLAT BUTT JOINT	**DUTY NO.**	**505**
TASK TITLE	FLAT BUTT WELDING OF THE STAINLESS STEEL PLATES BY THE MANUAL TUNGSTEN INERT GAS WELDING.	**TASK NO.**	**5053**
PERFORMANCE CRITERIA	The person performing this task must be able to complete the butt welding of stainless steel plates by the manual tungsten inert gas welding according to the specific welding process.		
RANGE STATEMENT	The task can be performed in the welding workshop under the supervision of welding engineers or mechanical engineers. The tools and equipment to be used include: 1. manual tungsten inert gas welding power supply; 2. Ground clamp; 3. Electrode holder; 4. Welding operation frames; 5. Slag hammer; 6. Angle grinder; 7. Welding masks; 8. Wire brush; 9. Hammer; 10. Chisel; 11. Needle-nose pliers; 12. Adjustable wrench; 13. Personal protective equipment (safety shoes, protective suits, welder gloves, earplugs, masks, etc.); 14. Welding detecting tools and measuring tools (weld gauge, steel straightedges, steel angle rulers, etc.).		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the manual tungsten inert gas welding groove for the butt welding of stainless steel plates; 2. Reserve the reverse deformations of the butt welding of the manual tungsten inert gas welding of stainless steel plates; 3. Weld the root weld bead, fill the weld bead and cover the weld bead of the butt welding and flat welding of stainless steel plates by the manual tungsten inert gas welding;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 The manual tungsten inert gas welding is carried out to weld stainless steel butt joints. **2.0 Methods** The person performing this task must be able to explain the following principles: 2.1 Technological principles to be followed in the manual tungsten inert gas welding of stainless steel.

4. Carry out the root cleaning treatments on the back of the weld bead at the root of the double-sided welding of the butt welding and flat welding of stainless steel plates by the manual tungsten inert gas welding; 5. Clean the surface of the butt welding manual tungsten inert gas welding-joint of stainless steel plates; 6. Self-check the appearance quality of the manual tungsten inert gas welding seam of the butt welding of stainless steel plates.	**3.0 Methods** The person performing this task must be able to explain the following: 3.1 The welding occupational health and safety and related standards; 3.2 Working principles, characteristics and applications of the manual tungsten inert gas welding; 3.3 Flat welding methods and application points of the manual tungsten inert gas welding; 3.4 Selection and preparation principles of the welding groove for the manual tungsten inert gas welding; 3.5 Essentials of the groove grinding and cleaning; 3.6 Operation essentials of the manual tungsten argon arc welding for low carbon steel or welding wires of low alloy steel; 3.7 Forms of welding defects, the causes, and the prevention and control requirements of hazard measures; 3.7 Selections and adjustment requirements of welding parameters of the manual tungsten inert gas welding equipment; 3.8 Circumstantial knowledge of the self-check of surface defects and appearance qualities of the manual tungsten inert gas welding-joints for the butt welding of stainless steel plates. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Management skills; 4.3 Teamwork skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The butt flat welding of stainless steel plates is completed by the manual tungsten inert gas welding in accordance with technical requirements and welding process requirements
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation and use of equipment and tools; 2. Safety operation and use of testing tools; 3. Occupational health and safety; 4. Waste and waste disposal methods.