



## WORLD CONSTRUCTION CHAMPIONSHIP

### Qualification criteria for applicants in the team nomination "I&C Installation"

#### APPLICANTS

Currently employed specialists; students.

#### COUNTRIES

Russia,  
India,  
Kazakhstan,  
Kyrgyzstan,  
Pakistan,  
Uzbekistan,  
Tajikistan,  
Belarus,  
Armenia,  
Azerbaijan,  
Moldova,  
Turkmenistan,  
Turkey,  
Egypt,  
Bangladesh,  
Hungary.

#### TEAM MEMBERS

Two (2) workers:

- I&C mechanic — 1 person, and
- manual electric welder or electric/gas welder — 1 person.

#### 1. I&C Mechanic

#### GENERAL DESCRIPTION

The mechanic produces and installs racks with inlet/outlet nozzles and instrumentation impulse line (pipe bundles) sections for welding using pipes with the diameter of 14x2, 08X18H10T.

#### QUALIFICATION CRITERIA REQUIREMENTS

- marking out the components for making the racks with nozzles;
- marking out, fabrication, and assembly of racks with nozzles simulating the inlet/outlet of the impulse line;
- marking out, fabrication, and installation of racks for mounting pipe bundles (sections of impulse lines);
- marking out, fabrication, and installation of the pipe bundles to be welded.

## **REQUIREMENTS FOR EDUCATION AND AVAILABILITY OF SPECIAL PERMITS**

### **For currently employed specialists**

- The qualification of an I&C mechanic of at least Grade 4/a document confirming the right to carry out this type of work;
- proof of health and safety training, which is in force in the participant's country (copy).

### **For students:**

People of 18 or over who are students in a technical area.

Documents:

- document confirming the qualification grade/or a document confirming the right to carry out this type of work.
- copy of the document certifying that the person is a student; and
- proof of occupational health and safety training, which is in force in the participant's country.

## **SKILLS REQUIREMENTS**

Need to be able to:

- comply with the applicable regulations, technical specifications, and documents for the installation of I&C equipment;
- read working drawings, sketches of instrument piping installations, operation manuals, flow charts, and production instructions;
- calculate the absolute and relative errors while inspecting and testing instruments;
- make defect lists and fill out passports and certificates for devices and automatic machines;
- use measuring and marking bench tools, make plane and spatial markings;
- use bench tools required for installation of instrument piping, know how to cut and bend pipes to adjust to different installation conditions (including use hand-operated and motorised pipe benders);
- prepare the assembled piping sections for welding;
- install instruments and fittings (with the use of assembly stands and benches if needed);
- perform defect inspections of instrument piping connections (e.g., welded joints) and have the skills to eliminate the defects detected; and
- comply with the applicable health and safety, fire safety, and environmental protection requirements.

## **KNOWLEDGE REQUIREMENTS**

Need to know:

- how to use technical specifications, design, detailed design, and production documents, and I&C installation instructions;
- the basics of electrical engineering, electronics, and mechanics within the scope of the work to be performed;
- equipment and devices used in automation; how to install and apply them;
- rules for drawing and installing of connections for special control equipment;
- symbols on drawings and diagrams;
- methods of calculating the route and drawing up sketches of instrument piping;
- theory of pipe cutting and bending; technical requirements for bending and its results;
- basics of welding theory, requirements for welded elements;
- control principles for joints and elements of the assembled instrument piping;
- tolerance and fits systems, accuracy grades and roughness parameters;
- assortment and characteristics of used pipes, auxiliary profiles, and other products and materials used during assembly;
- electrical properties of conductive and insulating materials; and
- regulatory requirements in health and safety, fire safety, environmental protection; occupational health and safety requirements at hazardous production facilities; and rules of sanitary and personal hygiene.

## **JOB RESPONSIBILITY REQUIREMENTS**

- applying the applicable instructions, drawings, diagrams, and flow charts;
- reading drawings and making calculations and sketches when laying instrument piping routes;
- receiving products and materials from the warehouse in accordance with the specification, checking, and taking stock of the warehouse (if necessary);
- marking, cutting, and bending pipes (and ancillary profiles);
- installing instrument piping according to the routes marked out;
- performing finishing treatment of pipe ends and preparing them for welding; and
- preparing a list of defects with respect to the installed piping and eliminating the defects.

## **2. MANUAL ELECTRIC WELDER**

### **GENERAL DESCRIPTION**

The welder performs manual argon arc welding of pipe ends.

### **QUALIFICATION CRITERIA REQUIREMENTS**

- study the welding flow chart;
- inspect and adjust the welding machine;
- setting the welding clamp;
- gripping the nozzles;
- root welding;
- filling welding; and
- measure the geometry of the weld to verify its compliance with the applicable requirements.

### **REQUIREMENTS FOR EDUCATION AND AVAILABILITY OF SPECIAL PERMITS**

#### **For currently employed specialists:**

The qualification (grade 4 or higher) of a manual electric welder or an electric and gas welder.

Documents:

- document confirming the qualification/or a document confirming the right to carry out this type of work.
- proof of health and safety training, which is in force in the participant's country (copy).

#### **For students:**

People of 18 or over who are students in a technical area.

Documents:

- document confirming the qualification grade/or a document confirming the right to carry out this type of work.
- copy of the document certifying that the person is a student;
- proof of occupational health and safety training, which is in force in the participant's country.

### **SKILLS REQUIREMENTS**

Need to be able to:

- read drawings and flow charts;
- use assembly jigs to assemble structural elements (products, sub-assemblies, components) for welding;
- use manual and mechanised tools to prepare structural elements (products, sub-assemblies, components) for welding, deburring of welds, and removal of surface defects after welding;
- use measuring tools to check the assembled elements (products, sub-assemblies, components) for compliance with the geometric dimensions in accordance with the welding design and manufacturing documentation;
- use design, manufacturing, and regulatory documentation to carry out preparatory and assembly operations prior to welding and to clean welds after welding;

- check that the welding equipment is working and in good order;

- set up the welding equipment for welding;
- set up the gas apparatus for quality shielding of welded joints;
- master the technique of manual argon arc welding of non-swiveling pipe joints, with welds in any spatial position;
- check the geometry of the weld with a measuring tool against the requirements of the welding design and production documentation;
- correct surface defects; and
- check the quality of the welding consumables.

### **KNOWLEDGE REQUIREMENTS**

Need to know:

- the design of the applicable welding equipment;
- the design of the applicable gas appliances;
- the physical properties of the shielding gases;
- the specifics of argon arc welding of steels;
- argon arc welding technology;
- the basics of electrical engineering within the scope of the work to be performed;
- methods of inspection and testing of welds;
- types of defects in welds, their causes, methods of prevention and elimination;
- the principle of selecting a welding regime by instrumentation;
- most frequently used materials (grades, types, classification, chemical composition and properties);
- grades and types of welding (filler) wire and electrodes, grades and types of non-consumable (tungsten) electrodes, and rules of quality control and preparation for welding; and
- regulatory requirements for welding operations.

### **JOB RESPONSIBILITY REQUIREMENTS**

- checking the quality of the welding consumables;
- preparing the welder's workplace before welding;
- performing incoming inspection and preparing all necessary welding materials;
- performing manual argon arc welding with a non-consumable electrode and with filler metal of the nozzles prepared for welding; and
- welding the pipe bundle as per the sketch of the instrument piping.