Industrial Instrumentation and Controls Technician Skill Standards



Critical Work Function	Key Activity	Key Activity	Key Activity	Key Activity	Key Activity
1. Install and commission new	1.1 Install pneumatic, electronic and digital controllers, and remote telemetry units.	1.2 Install pneumatic, electronic and digital control valves, and self operated pressure regulators.	1.3 Install current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers	1.4 Install pneumatic, electronic and digital transmitters and measuring devices.	1.5 Install pneumatic, electronic and digital relays and alarm panels.
industrial control system equipment in a new application	1.6 Install pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	1.7 Install pneumatic, electronic and digital switches.	1.8 Install electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	1.9 Install DCS, PLC and fieldbus process control networks.	1.10 Install 600-volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.
 Maintain, calibrate, lubricate, clean and tune 	2.1 Maintain pneumatic, electronic and digital controllers, and remote telemetry units.	2.2 Maintain pneumatic, electronic and digital control valves, and self operated pressure regulators.	2.3 Maintain current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers.	2.4 Maintain pneumatic, electronic and digital transmitters and measuring devices.	2.5 Maintain pneumatic, electronic and digital relays and alarm panels.
industrial control system equipment	2.6 Maintain pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	2.7 Maintain pneumatic, electronic and digital switches.	2.8 Maintain electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	2.9 Maintain DCS, PLC and fieldbus process control networks.	2.10 Maintain 600-volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.
Troubleshoot and diagnose malfunctions of	3.1 Troubleshoot pneumatic, electronic and digital controllers, and remote telemetry units	3.2 Troubleshoot pneumatic, electronic and digital control valves, and self operated pressure regulators.	3.3 Troubleshoot current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers.	3.4 Troubleshoot pneumatic, electronic and digital transmitters and measuring devices.	3.5 Troubleshoot pneumatic, electronic and digital relays and alarm panels.
industrial control system equipment	3.6 Troubleshoot pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	3.7 Troubleshoot pneumatic, electronic and digital switches.	3.8 Troubleshoot electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	3.9 Troubleshoot DCS, PLC and fieldbus process control networks.	3.10 Troubleshoot 600-volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.

4. Repair or replace	4.1 Repair or replace pneumatic, electronic and digital controllers, and remote telemetry units.	4.2 Repair or replace pneumatic, electronic and digital control valves, and self operated pressure regulators.	4.3 Repair or replace current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers.	4.4 Repair or replace pneumatic, electronic and digital transmitters and measuring devices.	4.5 Repair or replace pneumatic, electronic and digital relays and alarm panels.
malfunctioning industrial control system equipment	4.6 Repair or replace pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	4.7 Repair or replace pneumatic, electronic and digital switches.	4.8 Repair or replace electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	4.9 Repair or replace DCS, PLC and fieldbus process control networks.	4.10 Repair or replace 600- volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.
5. Maintain, test, clean, verify,	5.1 Maintain Heating Ventilation and Air Conditioning (HVAC) systems including the heater, condenser/evaporator, fans, filters and thermostats that control the temperature and/or humidity in a closed space.	5.2 Maintain lighting systems including the indoor and outdoor lights, changing light bulbs, replacing fluorescent ballasts, checking breakers and switches.	5.3 Maintain backup power generation systems limited to low voltage generators (less than 600 volts) powered by diesel, gasoline or natural gas powered engines.	5.4 Maintain cranes and/or hoists including the electric motors, controls and breakers.	5.5 Maintain instrument air compressors including the compressor drive, compressor, filters, dryers and associated controls.
repair or replace auxiliary systems	5.6 Maintain plant communication systems such as Supervisory Control And Data Acquisition (SCADA) systems, handheld radios and transmitting or repeater stations, and intercom systems.	5.7 Maintain Uninterruptible Power Supplies (UPS) and Inverters.		5.9 Maintain navigation aids including lights and switchgear associated with lighting systems required for navigation aids or warnings.	5.10 Maintain high voltage equipment including equipment that is energized with 600 volts or more.

Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?	
1.1 Install pneumatic, electronic and digital controllers, and remote telemetry units.	 1.1.1 Installation meets the requirements of company/manufacturer/Health, Safety and Environment work practices, area classifications and specific application. 1.1.2 Controller is configured according to the application. 1.1.3 Controller is calibrated to engineering specifications using certified standards when applicable. 1.1.4 Physical inspection meets company/manufacturer/industry standards. 1.1.5 Functional test meets company/manufacturer/industry standards 1.1.6 Known inputs result in expected outputs as specified by the manufacturer 1.1.7 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use ladder diagrams Use of reference material Use or conversion of measurements to the metric system Knowledge of math (trigonometry) Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper tubing and wiring installation Proper use of hand tools Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.)	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Ladder diagrams Reference material Site-specific safety procedures Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Hand tools Digital volt meter Tubing and conduit benders	

Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions	
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?	
1.2 Install	1.2.1 Installation meets the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)	
pneumatic,	company/manufacturer/Health, Safety, and	Read and use instrument loop sheets	P&IDs	
electronic and digital control	Environment work practices, area classifications, and specific application.	Read and use specification sheets Use of	Loop sheets	
valves, and self	alves, and self perated pressure egulators. 1.2.2 Control valve / positioner is configured according to the application.	reference material	Specification sheets	
operated pressure		Knowledge of math	Reference material	
regulators.		Knowledge of basic electrical AC/DC theory	Site-specific safety procedures	
	1.2.3 Control valve / positioner is calibrated to engineering specifications using certified	Ability to learn new technology	Computerized maintenance programs	
	standards when applicable.	programs Knowledge of test equipment Preparation of Job Safety Analysis Safe area Data	Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications	
	1.2.4 Physical inspection meets			
	company/manufacturer/industry standards.		Data forms	
	1.2.5 Functional test meets	Knowledge of permits and area	Hand tools	
	company/manufacturer/industry standards	classifications	Digital volt meter	
	1.2.6 Known inputs result in expected outputs	Proper use of hand tools	Tubing and conduit benders	
	as specified by the manufacturer	Tubing and wiring installation	Protocol communicator	
	1.2.7 Documentation is completed according to company guidelines.	Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.)	Signal simulator	
		Knowledge of piping specifications		
		Basic rigging		

Occupational Title:	Industrial Instrumentation and Controls Technology	nician		
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?	
1.3 Install current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers	1.3.1 Installation meets the requirements of company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.3.2 Transducer is configured according to the application. 1.3.3 Transducer is calibrated to engineering specifications using certified standards when applicable. 1.3.4 Physical inspection meets company/manufacturer/industry standards. 1.3.5 Functional test meets company/manufacturer/industry standards 1.3.6 Known inputs result in expected outputs as specified by the manufacturer 1.3.7 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester Signal simulator	

Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?	
1.4 Install pneumatic, electronic and digital transmitters and measuring devices.	1.4.1 Installation meets the requirements of company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.4.2 Transmitter is configured according to the application. 1.4.3 Transmitter is calibrated to engineering specifications using certified standards when applicable. 1.4.4 Physical inspection meets company/manufacturer/industry standards. 1.4.5 Functional test meets company/manufacturer/industry standards 1.4.6 Known inputs result in expected outputs as specified by the manufacturer 1.4.7 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of math Knowledge of the controlled process Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Knowledge of piping specifications Configuration and calibration knowledge	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Test equipment Tubing and conduit benders Digital volt meter Portable pressure tester Protocol communicator Signal simulator Temperature calibration equipment	

Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions	
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?
1.5 Install pneumatic, electronic and digital relays and alarm panels.	 1.5.1 Installation meets the requirements of company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.5.2 Relay is configured according to the application. 1.5.3 Relay is calibrated to engineering specifications using certified standards when applicable. 1.5.4 Physical inspection meets company/manufacturer/industry standards. 1.5.5 Functional test meets company/manufacturer/industry standards 1.5.6 Known inputs result in expected outputs as specified by the manufacturer 1.5.7 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Proper use of test equipment	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester

Occupational Title:	Industrial Instrumentation and Controls Techn	nician		
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions	
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?	
1.6 Install pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	1.6.1 Installation meets the requirements of company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.6.2 Analyzer is configured according to the application. 1.6.3 Analyzer is calibrated to engineering specifications using certified standards when applicable. 1.6.4 Physical inspection meets company/manufacturer/industry standards. 1.6.5 Functional test meets company/manufacturer/industry standards 1.6.6 Known inputs result in expected outputs as specified by the manufacturer 1.6.7 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use computer control logic Use of reference material Use or conversion of measurements to the metric system Knowledge of the controlled process Knowledge of math (algebra and trig) Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Knowledge of analyzer specific calibration equipment Knowledge of environmental, regulatory, service requirements and consequences of sample release Ability to interpret calibration results Calibration and configuration knowledge Knowledge of standards (i.e. gases, buffers,	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Tubing and conduit benders Analyzer specific calibration standards Screens, filters, and bottles Analyzer specific calibration equipment	
		samples, color charts, etc.) Proper use of hand tools Tubing and wiring installation		

Occupational Title	Occupational Title: Industrial Instrumentation and Controls Technician				
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions			
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions		
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?		
1.7 Install	1.7.1 Installation meets the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)		
pneumatic,	company/manufacturer/Health, Safety, and	Read and use instrument loop sheets	P&IDs		
electronic and digital switches.	Environment work practices, area classifications, and specific application.	Read and use specification sheets	Loop sheets		
algital eliticites		Use of reference material	Specification sheets		
	1.7.2 Switch is configured according to the application.	Knowledge of basic electrical AC/DC theory	Reference material		
		Ability to learn new technology	Site-specific safety procedures		
	1.7.3 Switch is calibrated to engineering specifications using certified standards when	Knowledge of test equipment	Computerized maintenance programs		
	applicable.	Preparation of Job Safety Analysis	Job Safety Analysis (JSA)		
	1.7.4 Physical inspection meets	Knowledge of permits and area	Material Safety Data Sheets (MSDS)		
	company/manufacturer/industry standards.	classifications	Permits and area classifications		
	1.7.5 Functional test meets	Proper use of hand tools	Data forms		
	company/manufacturer/industry standards	Tubing and wiring installation	Hand tools		
	1.7.6 Known inputs result in expected outputs	Proper use of test equipment	Digital volt meter		
	as specified by the manufacturer		Portable pressure tester		
	1.7.7 Documentation is completed according to company guidelines.				

Occupational Title:	Industrial Instrumentation and Controls Techn	nician		
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions		
Key Activity 1.8 Install	Performance Criteria How do we know when the key activity is performed well or performed successfully? 1.8.1 Installation meets the requirements of	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity? Read and redline P&IDs	Conditions What tools must the technician use in order to do the activity? Personal Protective Equipment (PPE)	
electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.8.2 Motor controller is configured according to the application. 1.8.3 Motor controller is calibrated to engineering specifications using certified standards when applicable. 1.8.4 Physical inspection meets company/manufacturer/industry standards. 1.8.5 Functional test meets company/manufacturer/industry standards 1.8.6 Known inputs result in expected outputs as specified by the manufacturer 1.8.7 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use instrument loop sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Knowledge of math Electrical knowledge Motor control circuit knowledge Knowledge of gated power devices (SCR, triacs, etc.) Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of electrical wiring Knowledge of electrical test equipment Knowledge of configuration requirements	Personal Protective Equipment (PPE) P&IDs Electrical drawings Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Hot sticks Digital volt meter Oscilloscope Tubing and conduit benders Hypot tester Protocol communicator Megohm meter Amp probe Phase comparison tester Signal simulator Non-contact voltage tester	

Occupational Title:	Occupational Title: Industrial Instrumentation and Controls Technician				
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions			
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?		
1.9 Install DCS, PLC and fieldbus process control networks.	1.9.1 Installation meets the requirements of company/manufacturer/Health, Safety, and Environment work practices, area classifications, and specific application. 1.9.2 Process control network is configured according to the application. 1.9.3 Process control network is calibrated to engineering specifications using certified standards when applicable. 1.9.4 Physical inspection meets company/manufacturer/industry standards. 1.9.5 Functional test meets company/manufacturer/industry standards 1.9.6 Known inputs result in expected outputs as specified by the manufacturer 1.9.7 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and redline PC network drawings Read and use specification sheets Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of industrial communication protocols Knowledge of cable connector requirements	Personal Protective Equipment (PPE) P&IDs Network drawings Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Data forms Hand tools Cable testers Digital volt meter Oscilloscope Protocol analyzer		

Occupational Title:	Occupational Title: Industrial Instrumentation and Controls Technician					
Critical Work Function 1. Install and commission new industrial control system equipment in a new application		Occupational Skills, Knowledge & Conditions				
Key Activity	Performance Criteria How do we know when the key activity is performed	Occupational Skills & Knowledge What should the technician know and what skills	Conditions What tools must the technician use in order to			
	well or performed successfully?	should the technician have in order to do the activity?	do the activity?			
1.10 Install 600- volt or less motors	1.10.1 Installation meets the requirements of company/manufacturer/Health, Safety, and	Read and redline electrical drawings Read and use specification sheets	Personal Protective Equipment (PPE) Electrical drawings			
and rotating equipment	Environment work practices, area classifications, and specific application.	Read and use motor control logic diagrams Use of reference material	Specification sheets Motor control logic diagrams			
protection devices such as vibration monitoring and	1.10.2 Motor is configured according to the application.	Use or conversion of electric circuit measurements	Reference material Site-specific safety procedures			
motor control relays. 1.10.3 Physical inspection meets company/manufacturer/industry standards. 1.10.4 Functional test meets company/manufacturer/industry standards 1.10.5 Known inputs result in expected outputs as specified by the manufacturer 1.10.6 Documentation is completed according to company guidelines.	Knowledge of math (trigonometry) Knowledge of physics (length and leverage) Electrical knowledge Motor control circuit knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of national electric code Knowledge of phasing and motor rotation Read and use nameplate data	Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Digital volt meter Oscilloscope Tubing and conduit benders Wobulator				
			Calibrating vibration monitors Basic rigging	Hypot tester Megohm meter Amp probe		
						Phase comparison tester Non-contact voltage tester

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 1

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occup	ational T	itle: Industria	l Instrume	ntation a	nd Contro	ls Technic	cian									
CWF 1	CWF 1 Install and commission new industrial control system equipment in a new application															
Listening	Speaking	Using Information and Communication Technology		Solving	Decisions and		Using Social Skills	Adaptability	Working in Teams		Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	3	4	4	3	3	2	3	4	4	1	1	3	2	5	3	3

Statement of Assessment for Critical Work Function 1

Tools: The assessment process should include the following:

Written tests that include:

- 1) True-false, multiple choice and essay questions that rely on extended responses to further clarify an understanding of the knowledge being assessed.
- 2) Graphic representations (e.g. P&IDs, loop drawings and one-line electrical drawings) that reveals an understanding of symbology and connections between processes and devices.
- 3) Preparation and justification of a reasonable solution to a problem scenario.

Hands-on demonstrations of knowledge, skills and attitudes that:

- 1) Represents a problematic or challenging situation in the context of a career-technical perspective.
- 2) Involves a real life scenario, problem or situation to solve.
- 3) Applies relevant knowledge or skills.
- 4) Focuses on the application of knowledge and skills learned in one situation as it connects to a new and different one.
- 5) Reveals an ability to plan, organize and create a product or an event.
- 6) Requires study to analyze or evaluate the problem or situation.
- 7) Illustrates by individual performance the attained levels of knowledge, skills and attitudes.
- 8) Includes observation of events, groups and individuals that focuses on the salient traits of the skill or attitude being observed.

	ction 2. Maintain, calibrate, lubricate, clean and tune system equipment.	Occupational Skills, Knowledge & Conditions					
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?				
2.1 Maintain pneumatic,	2.1.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment	Read and redline P&IDs Read and use instrument loop sheets	Personal Protective Equipment (PPE) P&IDs				
pneumatic, electronic and digital controllers, and remote telemetry units.	company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.1.2 Routine maintenance is performed according to job scope. 2.1.3 Physical inspection meets company/manufacturer/industry parameters. 2.1.4 Configuration is verified according to the application. 2.1.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.1.6 Functional test meets company/manufacturer/industry standards. 2.1.7 Known inputs result in expected outputs as specified by the manufacturer. 2.1.8 Documentation is completed according to company guidelines.	Read and use instrument loop sheets Read and use specification sheets Read and use ladder logic diagrams Use of reference material Knowledge of math Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward,	P&IDs Loop sheets Specification sheets Ladder logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Protocol communicator Signal simulator				
		etc.) Understand consequences of changes Knowledge of preventive maintenance schedules					

Critical Work Functindustrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions					
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?				
2.2 Maintain	2.2.1 Work is performed to meet the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)				
pneumatic, electronic and	company/manufacturer/Health, Safety and Environment work practices, specific application and area	Read and use instrument loop sheets	P&IDs				
digital control	classification.	Read and use specification sheets	Loop sheets				
valves, and self	2.2.2 Routine maintenance is performed according to	Use of reference material	Specification sheets				
operated pressure	job scope.	Knowledge of basic electrical AC/DC	Reference material				
regulators.	2.2.3 Physical inspection meets	theory	Site-specific safety procedures				
	company/manufacturer/industry parameters.	Ability to learn new technology	Computerized maintenance programs				
	2.2.4 Configuration is verified according to the	Knowledge of computerized	Job Safety Analysis (JSA)				
	application.	maintenance programs	Material Safety Data Sheets (MSDS)				
	2.2.5 Calibration is verified according to engineering	Knowledge of test equipment	Permits and area classifications				
	specifications and certified standards when applicable.	Preparation of Job Safety Analysis	Data forms				
	2.2.6 Functional test meets company/manufacturer/industry standards.	Knowledge of permits and area classifications	Hand tools				
	2.2.7 Known inputs result in expected outputs as	Proper use of hand tools	Digital volt meter				
	specified by the manufacturer.	Tubing and wiring installation	Protocol communicator				
	2.2.8 Documentation is completed according to company guidelines.	Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.)	Signal simulator				
		Understand consequences of changes					
		Knowledge of preventive maintenance schedules					

Critical Work Funct industrial control sy	ion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?				
2.3 Maintain current to pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers.	 2.3.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.3.2 Routine maintenance is performed according to job scope. 2.3.3 Physical inspection meets company/manufacturer/industry parameters. 2.3.4 Configuration is verified according to the application. 2.3.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.3.6 Functional test meets company/manufacturer/industry standards. 2.3.7 Known inputs result in expected outputs as specified by the manufacturer. 2.3.8 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester Signal simulator				

Critical Work Functindustrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions						
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?					
2.4 Maintain pneumatic, electronic and digital transmitters and measuring devices.	 2.4.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.4.2 Routine maintenance is performed according to job scope. 2.4.3 Physical inspection meets company/manufacturer/industry parameters. 2.4.4 Configuration is verified according to the application. 2.4.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.4.6 Functional test meets company/manufacturer/industry standards. 2.4.7 Known inputs result in expected outputs as specified by the manufacturer. 2.4.8 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester Signal simulator					

Critical Work Functindustrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune system equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?				
2.5 Maintain pneumatic, electronic and digital relays and alarm panels.	 2.5.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.5.2 Routine maintenance is performed according to job scope. 2.5.3 Physical inspection meets company/manufacturer/industry parameters. 2.5.4 Configuration is verified according to the application. 2.5.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.5.6 Functional test meets company/manufacturer/industry standards. 2.5.7 Known inputs result in expected outputs as specified by the manufacturer. 2.5.8 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of the controlled process Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Configuration and calibration knowledge Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Test equipment Digital volt meter Portable pressure tester Protocol communicator Signal simulator Temperature calibration equipment				

Critical Work Funct industrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions					
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?				
2.6 Maintain pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	2.6.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.6.2 Routine maintenance is performed according to job scope. 2.6.3 Physical inspection meets company/manufacturer/industry parameters. 2.6.4 Configuration is verified according to the application. 2.6.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.6.6 Functional test meets company/manufacturer/industry standards. 2.6.7 Known inputs result in expected outputs as specified by the manufacturer. 2.6.8 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Use or conversion of measurements to the metric system Knowledge of math Knowledge of chemistry Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of analyzer specific calibration equipment Knowledge of environmental, regulatory, service requirements and consequences of sample release Ability to interpret calibration results Calibration and configuration knowledge Knowledge of standards (i.e. gases, buffers, samples, color charts, etc.) Proper use of hand tools Tubing and wiring installation Knowledge of legal requirements for in service reporting and custody transfer Knowledge of system interactions (e.g. interlocks and trips) Understand consequences of changes Knowledge of preventive maintenance	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Protocol communicator Tubing and conduit benders Analyzer specific calibration equipment Analyzer specific calibration standards Screens, filters, and bottles Analyzer specific calibration equipment				

	ction 2. Maintain, calibrate, lubricate, clean and tune system equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?				
2.7 Maintain pneumatic, electronic and digital switches.	 2.7.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.7.2 Routine maintenance is performed according to job scope. 2.7.3 Physical inspection meets company/manufacturer/industry parameters. 2.7.4 Configuration is verified according to the application. 2.7.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.7.6 Functional test meets company/manufacturer/industry standards. 2.7.7 Known inputs result in expected outputs as specified by the manufacturer. 2.7.8 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester				

Critical Work Functindustrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order	Conditions What tools must the technician use in order to do the activity?				
2.8 Maintain electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	2.8.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.8.2 Routine maintenance is performed according to job scope. 2.8.3 Physical inspection meets company/manufacturer/industry parameters. 2.8.4 Configuration is verified according to the application. 2.8.5 Calibration is verified according to engineering specifications and certified standards when applicable. 2.8.6 Functional test meets company/manufacturer/industry standards. 2.8.7 Known inputs result in expected outputs as specified by the manufacturer. 2.8.8 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use electrical drawings Read and use specification sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Knowledge of math Electrical knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Basic mechanical knowledge Motor control circuit knowledge Knowledge of gated power devices (SCR, triacs, etc.) Knowledge of electrical wiring Knowledge of electrical test equipment Knowledge of configuration requirements Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) P&IDs Electrical drawings Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meters Hot sticks Digital volt meter Oscilloscope Multi-amp tester Protocol communicator Amp probe Infrared camera Non-contact voltage tester				

Critical Work Functindustrial control s	tion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions				
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?			
2.9 Maintain DCS, PLC and fieldbus process control networks.	 2.9.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.9.2 Process control network is adjusted according to the application. 2.9.3 Process control network is calibrated to engineering specifications with certified standards when applicable. 2.9.4 Physical inspection meets company/manufacturer/industry parameters. 2.9.5 Functional test meets company/manufacturer/industry standards. 2.9.6 Known inputs result in expected outputs as specified by the manufacturer. 2.9.7 Documentation is completed according to company guidelines. 	Read and use process control network drawings Read and use specification sheets Use of reference material Ability to learn new technology Knowledge of equipment diagnostic indicators Understand consequences of changes Knowledge of preventive maintenance schedules	Process control network drawings Specification sheets Reference material			

Critical Work Funct industrial control s	ion 2. Maintain, calibrate, lubricate, clean and tune ystem equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?				
2.10 Maintain 600- volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.	2.10.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 2.10.2 Physical inspection meets company/manufacturer/industry parameters. 2.10.3 Functional test meets company/manufacturer/industry standards. 2.10.4 Known inputs result in expected outputs as specified by the manufacturer. 2.10.5 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use specification sheets Read and use control logic diagrams Use of reference material Use or conversion of electrical measurements Knowledge of math Electrical knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Read and use nameplate data Calibrating vibration monitors Understand consequences of changes Knowledge of preventive maintenance schedules	Personal Protective Equipment (PPE) Electrical drawings Control logic diagrams Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meters Digital volt meter Oscilloscope Wobulator Amp probe				

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 2

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occup	ational T	itle: Industria	l Instrume	ntation a	nd Contro	ls Technic	cian									
CWF 2	WF 2: Maintain, calibrate, lubricate, clean and tune industrial control system equipment.															
Listening	Speaking	Information and Communication		Solving	Decisions and	and Planning	Using Social Skills	Adaptability	Working in Teams		Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	3	5	4	4	3	4	3	4	4	1	4	3	3	5	4	4

Statement of Assessment for Critical Work Function 2:

Tools: The assessment process should include the following.

Written tests that include:

- 1) True-false, multiple choice and essay questions that rely on extended responses to further clarify an understanding of the knowledge being assessed.
- 2) Graphic representations (e.g. P&IDs, loop drawings and one-line electrical drawings) that reveals an understanding of symbology and connections between processes and devices.
- 3) Preparation and justification of a reasonable solution to a problem scenario.

Hands-on demonstrations of knowledge, skills and attitudes that:

- 1) Represents a problematic or challenging situation in the context of a career-technical perspective.
- 2) Involves a real life scenario, problem or situation to solve.
- 3) Applies relevant knowledge or skills.
- 4) Focuses on the application of knowledge and skills learned in one situation as it connects to a new and different one.
- 5) Reveals an ability to plan, organize and create a product or an event.
- 6) Requires study to analyze or evaluate the problem or situation.
- 7) Illustrates by individual performance the attained levels of knowledge, skills and attitudes.
- 8) Includes observation of events, groups and individuals that focuses on the salient traits of the skill or attitude being observed.
- 9) Documentation of the development process from initial steps to final preparation.

Critical Work Functindustrial control s	tion 3. Troubleshoot and diagnose malfunctions of system equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	How do we know when the key activity is performed well or What should the technician know and what					
3.1 Troubleshoot pneumatic, electronic and digital controllers, and remote telemetry units	3.1.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 3.1.2 The point of deviation is identified where the known inputs result in unexpected outputs. 3.1.3 Source of malfunction is isolated. 3.1.4 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use ladder diagrams Use of reference material Knowledge of the controlled process Knowledge of math Knowledge of physics Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.)	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Ladder diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Protocol communicator Digital volt meter Signal simulator				

Critical Work Functindustrial control s	tion 3. Troubleshoot and diagnose malfunctions of ystem equipment.	Occupational Skills, K	nowledge & Conditions
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do	Conditions What tools must the technician use in order to do the activity?
3.2 Troubleshoot pneumatic, electronic and digital control valves, and self operated pressure regulators.	3.2.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 3.2.2 The point of deviation is identified where the known inputs result in unexpected outputs. 3.2.3 Source of malfunction is isolated. 3.2.4 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Use of reference material Knowledge of math Knowledge of the controlled process Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.)	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Tubing and conduit benders Protocol communicator Signal simulator

Critical Work Function	ion 3. Troubleshoot and diagnose malfunctions of stem equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do	Conditions What tools must the technician use in order to do the activity?				
3.3 Troubleshoot current to	3.3.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and	the activity? Read and redline P&IDs Read and use instrument loop sheets	Personal Protective Equipment (PPE) P&IDs				
pneumatic (I/P), pneumatic to current (P/I), voltage to current (E/I), current to voltage (I/E), digital to analog, (D/A), and analog to digital (A/D) transducers.	Environment work practices, specific application and area classification. 3.3.2 The point of deviation is identified where the known inputs result in unexpected outputs. 3.3.3 Source of malfunction is isolated. 3.3.4 Documentation is completed according to company guidelines.	Read and use specification sheets Use of reference material Knowledge of the controlled process Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation	Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Portable pressure tester Signal simulator				

Critical Work Funct industrial control s	ion 3. Troubleshoot and diagnose malfunctions of ystem equipment.	Occupational Skills, Ki	nowledge & Conditions		
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions		
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?		
3.4 Troubleshoot	3.4.1 Work is performed to meet the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)		
pneumatic,	company/manufacturer/Health, Safety and	Read and use instrument loop sheets	P&IDs		
electronic and digital transmitters	Environment work practices, specific application and area classification.	Read and use specification sheets	Loop sheets		
and measuring	3.4.2 The point of deviation is identified where the	Use of reference material	Specification sheets		
devices.	known inputs result in unexpected outputs.	Knowledge of the controlled process	Reference material		
	3.4.3 Source of malfunction is isolated.	Knowledge of math	Site-specific safety procedures		
	3.4.4 Documentation is completed according to	Knowledge of physics	Computerized maintenance programs		
	company guidelines.	Knowledge of basic electrical AC/DC	Job Safety Analysis (JSA)		
		theory	Material Safety Data Sheets (MSDS)		
		Ability to learn new technology	Permits and area classifications		
		Knowledge of computerized maintenance	Data forms		
		programs	Hand tools		
		Knowledge of test equipment	Test equipment		
		Preparation of Job Safety Analysis	Tubing and conduit benders		
		Knowledge of permits and area	Digital volt meter		
		classifications Proper use of hand tools	Portable pressure tester		
		Tubing and wiring installation	Protocol communicator		
		Knowledge of piping specifications	Signal simulator		
		Configuration and calibration knowledge	Temperature calibration equipment		

	etion 3. Troubleshoot and diagnose malfunctions of system equipment.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or	Occupational Skills & Knowledge What should the technician know and what	Conditions What tools must the technician use in order				
Activity	performed successfully?	skills should the technician have in order to do the activity?	do the activity?				
3.5 Troubleshoot	3.5.1 Work is performed to meet the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)				
oneumatic, electronic and	company/manufacturer/Health, Safety and Environment work practices, specific application and	Read and use instrument loop sheets	P&IDs				
digital relays and	area classification.	Read and use specification sheets	Loop sheets				
alarm panels.	3.5.2 The point of deviation is identified where the	Use of reference material	Specification sheets				
	known inputs result in unexpected outputs.	Knowledge of the controlled process	Reference material				
	3.5.3 Source of malfunction is isolated.	Knowledge of basic electrical AC/DC	Site-specific safety procedures				
	3.5.4 Documentation is completed according to	theory Ability to learn new technology	Computerized maintenance programs				
	company guidelines.	Knowledge of computerized maintenance	Job Safety Analysis (JSA)				
		programs	Material Safety Data Sheets (MSDS)				
		Knowledge of test equipment	Permits and area classifications				
		Preparation of Job Safety Analysis	Data forms				
		Knowledge of permits and area classifications Proper use of hand tools	Hand tools				
		Tubing and wiring installation	Digital volt meter				
			Portable pressure tester				

Critical Work Functindustrial control s	tion 3. Troubleshoot and diagnose malfunctions of ystem equipment.	Occupational Skills, Kr	nowledge & Conditions
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?
3.6 Troubleshoot	3.6.1 Work is performed to meet the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)
pH, conductivity,	company/manufacturer/Health, Safety and	Read and use instrument loop sheets	P&IDs
gas chromatograph,	Environment work practices, specific application and area classification.	Read and use specification sheets	Loop sheets
turbidity, infrared,	3.6.2 The point of deviation is identified where the	Read and use control logic diagrams	Specification sheets
combustible,	known inputs result in unexpected outputs.	Use of reference material	Control logic diagrams
ultraviolet, oxygen, lower explosive limit and other	3.6.3 Source of malfunction is isolated.3.6.4 Documentation is completed according to	Use or conversion of measurements to the metric system	Reference material Site-specific safety procedures
analyzers and	company guidelines.	Knowledge of the controlled process	Computerized maintenance programs
sample systems.		Knowledge of math	Job Safety Analysis (JSA)
		Knowledge of chemistry	Material Safety Data Sheets (MSDS) Permits and area classifications
		Knowledge of physics	
		Knowledge of basic electrical AC/DC theory	Data forms
		Ability to learn new technology	Hand tools
		Knowledge of computerized maintenance programs	Tubing and conduit benders Protocol communicator
		Preparation of Job Safety Analysis	Analyzer specific calibration standards
		Knowledge of permits and area	Screens, filters, and bottles
		classifications	Analyzer specific calibration equipment
		Proper use of hand tools	
		Knowledge of analyzer specific calibration equipment	
		Knowledge of environmental, regulatory, service requirements and consequences of sample release	
		Ability to interpret calibration results	
		Calibration and configuration knowledge	
		Knowledge of standards (I.e. gases, buffers, samples, color charts, etc.)	
		Tubing and wiring installation	

	: Industrial Instrumentation and Controls Technician						
	tion 3. Troubleshoot and diagnose malfunctions of system equipment.	Occupational Skills, Knowledge & Conditions					
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?				
3.7 Troubleshoot	3.7.1 Work is performed to meet the requirements of	Read and redline P&IDs	Personal Protective Equipment (PPE)				
pneumatic,	company/manufacturer/Health, Safety and	Read and use instrument loop sheets	P&IDs				
electronic and digital switches.	Environment work practices, specific application and area classification.	Read and use specification sheets	Loop sheets				
3	3.7.2 The point of deviation is identified where the	Use of reference material	Specification sheets				
k	known inputs result in unexpected outputs.	Knowledge of the controlled process	Reference material				
	3.7.3 Source of malfunction is isolated.	Knowledge of basic electrical AC/DC	Site-specific safety procedures				
	3.7.4 Documentation is completed according to	theory	Computerized maintenance programs				
	company guidelines.	Ability to learn new technology	Job Safety Analysis (JSA)				
		Knowledge of computerized maintenance	Material Safety Data Sheets (MSDS)				
		programs Knowledge of test equipment	Permits and area classifications				
		Knowledge of test equipment Preparation of Job Safety Analysis	Data forms				
		, , , , , , , , , , , , , , , , , , , ,	Hand tools				
		Knowledge of permits and area classifications	Digital volt meter				
		Proper use of hand tools	Portable pressure tester				
		Tubing and wiring installation					

Critical Work Functindustrial control s	tion 3. Troubleshoot and diagnose malfunctions of ystem equipment.	Occupational Skills, K	nowledge & Conditions
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?
electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	 3.8.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 3.8.2 The point of deviation is identified where the known inputs result in unexpected outputs. 3.8.3 Source of malfunction is isolated. 3.8.4 Documentation is completed according to company guidelines. 	Read and use electrical drawings Read and use instrument loop sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Knowledge of the controlled process Knowledge of math Electrical knowledge	Personal Protective Equipment (PPE) P&IDs Electrical drawings Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs
		Motor control circuit knowledge Knowledge of gated power devices (SCR, triacs, etc.) Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of electrical wiring Knowledge of electrical test equipment Knowledge of configuration requirements	Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Hot sticks Digital volt meter Oscilloscope Hypot tester Multi-amp tester Protocol communicator Megohm meter Amp probe Infrared camera Signal simulator Non-contact voltage tester Power quality monitor

Critical Work Func	: Industrial Instrumentation and Controls Technician tion 3. Troubleshoot and diagnose malfunctions of						
Key Activity 3.9 Troubleshoot DCS, PLC and fieldbus process control networks.		Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity? Read and use process control network drawings Read and use specification sheets Use of reference material Knowledge of the controlled process Knowledge of basic electrical AC/DC theory	Conditions What tools must the technician use in order to do the activity? Personal Protective Equipment (PPE) Process control network drawings Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA)				
	company guidelines.	Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of industrial communication protocols Knowledge of cable connector requirements Knowledge of equipment diagnostic indicators	Data forms Hand tools Digital volt meter Oscilloscope Protocol analyzer Cable testers				

Critical Work Functi industrial control sy	on 3. Troubleshoot and diagnose malfunctions of vstem equipment.	Occupational Skills, Ki	nowledge & Conditions
Key Activity	Performance Criteria How do we know when the key activity is performed well or	Occupational Skills & Knowledge What should the technician know and what	Conditions What tools must the technician use in order to
3.10 Troubleshoot	performed successfully? 3.10.1 Work is performed to meet the requirements	skills should the technician have in order to do the activity? Read and redline electrical drawings	do the activity? Personal Protective Equipment (PPE)
600-volt or less motors and rotating equipment protection devices such as vibration monitoring and motor control relays.	of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 3.10.2 The point of deviation is identified where the known inputs result in unexpected outputs. 3.10.3 Source of malfunction is isolated. 3.10.4 Documentation is completed according to company guidelines.	Read and use specification sheets Read and use control logic diagrams Use of reference material Use or conversion of electrical measurements Knowledge of the controlled process Knowledge of math Knowledge of physics (force and power) Electrical knowledge Motor control circuit knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of national electric code Knowledge of phasing and motor rotation Read and use nameplate data Calibrating vibration monitors Knowledge of megger tests	Electrical drawings Specification sheets Motor control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Digital volt meter Oscilloscope Wobulator Hypot tester Multi-amp tester Megohm meter
		Knowledge of megger tests Knowledge of bridge tests knowledge of power quality	Amp probe Infrared camera Non-contact voltage tester

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 3

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occup	Occupational Title: Industrial Instrumentation and Controls Technician															
CWF 3	CWF 3 Troubleshoot and diagnose malfunctions of industrial control system equipment															
Listening	Speaking	Information and Communication		Solving	Decisions and	and	Using Social Skills	Adaptability			Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	4	4	5	5	4	5	4	4	5	1	5	3	3	5	4	5

Statement of Assessment for Critical Work Function 3

Tools: The assessment process should include the following.

Written tests that include:

- 1) True-false, multiple choice and essay questions that rely on extended responses to further clarify an understanding of the knowledge being assessed.
- 2) Graphic representations (e.g. P&IDs, loop drawings and one-line electrical drawings) that reveals an understanding of symbology and connections between processes and devices.
- 3) Preparation and justification of a reasonable solution to a problem scenario.

Hands-on demonstrations of knowledge, skills and attitudes that:

- 1) Represents a problematic or challenging situation in the context of a career-technical perspective.
- 2) Involves a real life scenario, problem or situation to solve.
- 3) Applies relevant knowledge or skills.
- 4) Focuses on the application of knowledge and skills learned in one situation as it connects to a new and different one.
- 5) Reveals an ability to plan, organize and create a product or an event.
- 6) Requires study to analyze or evaluate the problem or situation.
- 7) Illustrates by individual performance the attained levels of knowledge, skills and attitudes.
- 8) Includes observation of events, groups and individuals that focuses on the salient traits of the skill or attitude being observed.

Occupational Title:	Industrial Instrumentation and Controls Techn	ician				
Critical Work Functi industrial control sy	ion 4. Repair or replace malfunctioning stem equipment.	Occupational Skills, Knowledge & Conditions				
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?			
4.1 Repair or replace pneumatic, electronic and digital controllers, and remote telemetry units.	4.1.1 Corrective repairs are performed according to job scope, company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 4.1.2 Physical inspection meets company/manufacturer/industry parameters. 4.1.3 Configuration is verified according to the application. 4.1.4 Calibration is verified according to engineering specifications with certified standards when applicable. 4.1.5 Functional test meets company/manufacturer/industry standards. 4.1.6 Known inputs result in expected outputs as specified by the manufacturer. 4.1.7 Documentation is completed according to company guidelines.	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use ladder logic diagrams Use of reference material Knowledge of math Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Tubing and wiring installation Knowledge of controller schemes (e.g. PID, ratio, cascade, feedforward, etc.) Knowledge of management of change process	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Ladder logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Digital volt meter Tubing and conduit benders Protocol communicator Hand tools			

	Industrial Instrumentation and Controls Techn	Occupational Skills, Knowledge & Conditions				
industrial control s	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions				
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions			
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?			
4.2 Repair or	4.2.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)			
replace pneumatic,	according to job scope,	Read and use instrument loop sheets	P&IDs			
electronic and digital control	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use specification sheets	Loop sheets			
valves, and self	application and area classification.	Use of reference material	Specification sheets			
operated pressure	4.2.2 Physical inspection meets	Knowledge of math	Reference material			
regulators.	company/manufacturer/industry parameters.	Knowledge of chemistry	Site-specific safety procedures			
	4.2.3 Configuration is verified according to the	Knowledge of basic electrical AC/DC theory	Computerized maintenance programs			
	application.	Ability to learn new technology	Job Safety Analysis (JSA)			
	4.2.4 Calibration is verified according to	Knowledge of computerized maintenance programs	Material Safety Data Sheets (MSDS)			
	engineering specifications with certified	Knowledge of test equipment	Permits and area classifications			
	standards when applicable.	Preparation of Job Safety Analysis	Data forms			
	4.2.5 Functional test meets	Knowledge of permits and area classifications	Hand tools			
	company/manufacturer/industry standards.	Proper use of hand tools	Digital volt meter			
	4.2.6 Known inputs result in expected outputs	Tubing and wiring installation	Tubing and conduit benders			
	as specified by the manufacturer.	Knowledge of controller schemes (e.g. PID, ratio,	Protocol communicator			
	4.2.7 Documentation is completed according to	cascade, feedforward, etc.)	Signal simulator			
	company guidelines.	Knowledge of management of change process				
		Knowledge of piping specifications				

Occupational Title:	Occupational Title: Industrial Instrumentation and Controls Technician							
Critical Work Functi industrial control sy	on 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions						
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions					
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?					
4.3 Repair or	4.3.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)					
replace current to	according to job scope,	Read and use instrument loop sheets	P&IDs Loop sheets					
pneumatic (I/P), pneumatic to	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use specification sheets	Specification sheets					
current (P/I),	application and area classification.	Use of reference material	Reference material					
voltage to current	4.3.2 Physical inspection meets company/manufacturer/industry parameters.4.3.3 Configuration is verified according to the application.4.3.4 Calibration is verified according to	Knowledge of basic electrical AC/DC theory	Site-specific safety procedures					
(E/I), current to voltage (I/E), digital		Ability to learn new technology	Computerized maintenance programs					
to analog, (D/A),		Knowledge of computerized maintenance programs	Job Safety Analysis (JSA)					
and analog to		Knowledge of test equipment	Material Safety Data Sheets (MSDS)					
digital (A/D) transducers.		Preparation of Job Safety Analysis	Permits and area classifications					
transducers.	engineering specifications with certified	Knowledge of permits and area classifications	Data forms					
	standards when applicable.	Proper use of hand tools	Hand tools					
	4.3.5 Functional test meets	Tubing and wiring installation	Digital volt meter					
	company/manufacturer/industry standards.	Knowledge of management of change process	Portable pressure tester signal					
	4.3.6 Known inputs result in expected outputs as specified by the manufacturer.		simulator					
	4.3.7 Documentation is completed according to company guidelines.							

Occupational Title:	Occupational Title: Industrial Instrumentation and Controls Technician							
Critical Work Functi	ion 4. Repair or replace malfunctioning stem equipment.	Occupational Skills, Knowledge & Conditions						
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions					
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?					
4.4 Repair or	4.4.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)					
replace pneumatic, electronic and	according to job scope, company/manufacturer/Health, Safety and	Read and use instrument loop sheets	P&IDs					
digital transmitters	Environment work practices, specific	Read and use specification sheets	Loop sheets					
and measuring	application and area classification.	Use of reference material	Specification sheets					
devices.	4.4.2 Physical inspection meets	Use or conversion of measurements to the metric	Reference material					
	company/manufacturer/industry parameters.	system	Site-specific safety procedures					
	4.4.3 Configuration is verified according to the application.4.4.4 Calibration is verified according to engineering specifications with certified	Knowledge of math	Computerized maintenance programs					
		Knowledge of physics	Job Safety Analysis (JSA)					
		Knowledge of basic electrical AC/DC theory	Material Safety Data Sheets (MSDS)					
		Ability to learn new technology	Permits and area classifications					
	standards when applicable.	Knowledge of computerized maintenance programs	Data forms					
	4.4.5 Functional test meets	Knowledge of test equipment	Hand tools					
	company/manufacturer/industry standards.	Preparation of Job Safety Analysis	Test equipment					
	4.4.6 Known inputs result in expected outputs	Knowledge of permits and area classifications	Tubing and conduit benders					
	as specified by the manufacturer.	Proper use of hand tools	Digital volt meter					
	4.4.7 Documentation is completed according to	Knowledge of management of change process	Portable pressure tester					
	company guidelines.	Tubing and wiring installation	Protocol communicator					
		Knowledge of piping specifications	Signal simulator					
		Configuration and calibration knowledge	Temperature calibration equipment					

Occupational Title:	Industrial Instrumentation and Controls Techn	ician			
Critical Work Functi industrial control sy	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions			
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions		
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?		
4.5 Repair or	4.5.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)		
replace pneumatic,	according to job scope,	Read and use instrument loop sheets	P&IDs		
electronic and digital relays and	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use specification sheets	Loop sheets		
alarm panels.	application and area classification.	Use of reference material	Specification sheets		
	4.5.2 Physical inspection meets	Knowledge of solid state electronics	Reference material		
	company/manufacturer/industry parameters.	Knowledge of basic electrical AC/DC theory	Site-specific safety procedures		
	4.5.3 Configuration is verified according to the	Ability to learn new technology	Computerized maintenance programs		
	application.	Knowledge of computerized maintenance programs	Job Safety Analysis (JSA)		
	4.5.4 Calibration is verified according to	Knowledge of test equipment	Material Safety Data Sheets (MSDS)		
	engineering specifications with certified	Preparation of Job Safety Analysis	Permits and area classifications		
	standards when applicable.	Knowledge of permits and area classifications	Data forms		
	4.5.5 Functional test meets	Proper use of hand tools	Hand tools		
	company/manufacturer/industry standards.	Tubing and wiring installation	Digital volt meter		
	4.5.6 Known inputs result in expected outputs as specified by the manufacturer.	Knowledge of management of change process	Portable pressure tester		
	4.5.7 Documentation is completed according to company guidelines.				

	Industrial Instrumentation and Controls Techn			
Critical Work Funct industrial control sy	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions		
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions	
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?	
4.6 Repair or replace pH, conductivity, gas chromatograph, turbidity, infrared, combustible, ultraviolet, oxygen, lower explosive limit and other analyzers and sample systems.	 4.6.1 Corrective repairs are performed according to job scope, company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 4.6.2 Physical inspection meets company/manufacturer/industry parameters. 4.6.3 Configuration is verified according to the application. 4.6.4 Calibration is verified according to engineering specifications with certified standards when applicable. 4.6.5 Functional test meets company/manufacturer/industry standards. 4.6.6 Known inputs result in expected outputs as specified by the manufacturer. 4.6.7 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and use instrument loop sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Use or conversion of measurements to the metric system Knowledge of the controlled process Knowledge of physics Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Knowledge of test equipment Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of management of change process Knowledge of analyzer specific calibration equipment Knowledge of environmental, regulatory, service requirements and consequences of sample release Ability to interpret calibration results Calibration and configuration knowledge Knowledge of standards (I.e. gases, buffers, samples, color charts, etc.) Tubing and wiring installation	Personal Protective Equipment (PPE) P&IDs Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Protocol communicator Tubing and conduit benders Analyzer specific calibration standards Screens, filters, and bottles Analyzer specific calibration equipment	

Occupational Title:	Industrial Instrumentation and Controls Techn	ician			
Critical Work Funct industrial control sy	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions			
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions		
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?		
4.7 Repair or	4.7.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)		
replace pneumatic,	according to job scope,	Read and use instrument loop sheets	P&IDs		
electronic and digital switches.	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use specification sheets	Loop sheets		
digital evitorios.	application and area classification.	Use of reference material	Specification sheets		
	4.7.2 Physical inspection meets	Knowledge of solid state electronics	Reference material		
	company/manufacturer/industry parameters.	Knowledge of basic electrical AC/DC theory	Site-specific safety procedures		
	4.7.3 Configuration is verified according to the	Ability to learn new technology	Computerized maintenance programs		
	application.	Knowledge of computerized maintenance programs	Job Safety Analysis (JSA)		
	4.7.4 Calibration is verified according to	Knowledge of test equipment	Material Safety Data Sheets (MSDS)		
	engineering specifications with certified	Preparation of Job Safety Analysis	Permits and area classifications		
	standards when applicable.	Knowledge of permits and area classifications	Data forms		
	4.7.5 Functional test meets	Proper use of hand tools	Hand tools Digital volt meter		
	company/manufacturer/industry standards.	Tubing and wiring installation	Portable pressure tester		
	4.7.6 Known inputs result in expected outputs as specified by the manufacturer.	Knowledge of management of change process			
	4.7.7 Documentation is completed according to company guidelines.				

Occupational Title:	Industrial Instrumentation and Controls Techn	ician	
Critical Work Funct industrial control sy	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowle	dge & Conditions
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?
4.8 Repair or replace electronic, digital and variable frequency drive (VFD) or variable speed drive (VSD) motor controllers.	 4.8.1 Corrective repairs are performed according to job scope, company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 4.8.2 Physical inspection meets company/manufacturer/industry parameters. 4.8.3 Configuration is verified according to the application. 4.8.4 Calibration is verified according to engineering specifications with certified standards when applicable. 4.8.5 Functional test meets company/manufacturer/industry standards. 4.8.6 Known inputs result in expected outputs as specified by the manufacturer. 4.8.7 Documentation is completed according to company guidelines. 	Read and redline P&IDs Read and redline electrical drawings Read and use instrument loop sheets Read and use specification sheets Read and use control logic diagrams Use of reference material Knowledge of math Electrical knowledge Motor control circuit knowledge Knowledge of gated power devices (SCR, triacs, etc.) Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of electrical wiring Knowledge of electrical test equipment Knowledge of management of change process	Personal Protective Equipment (PPE) P&IDs Electrical drawings Loop sheets Specification sheets Control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Hot sticks Digital volt meter Oscilloscope Tubing and conduit benders Hypot tester Multi-amp tester Protocol communicator Megohm meter Amp probe Phase comparison tester Signal simulator Non-contact voltage tester

Occupational Title:	Industrial Instrumentation and Controls Techn	ician			
Critical Work Funct industrial control s	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions			
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions		
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?		
4.9 Repair or	4.9.1 Corrective repairs are performed	Read and redline P&IDs	Personal Protective Equipment (PPE)		
replace DCS, PLC	according to job scope,	Read and redline PC network drawings	P&IDs		
and fieldbus process control	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use specification sheets	PC network drawings		
networks.	application and area classification.	Use of reference material	Specification sheets		
	4.9.2 Physical inspection meets company/manufacturer/industry parameters.4.9.3 Configuration is verified according to the	Knowledge of basic electrical AC/DC theory	Reference material Site-specific safety procedures		
		Ability to learn new technology			
		Knowledge of computerized maintenance programs	Computerized maintenance programs		
	application.	Knowledge of test equipment	Job Safety Analysis (JSA)		
	4.9.4 Calibration is verified according to	Preparation of Job Safety Analysis	Data forms		
	engineering specifications with certified	Knowledge of industrial communication protocols	Hand tools		
	standards when applicable.	Knowledge of cable connector requirements	Digital volt meter		
	4.9.5 Functional test meets	Knowledge of management of change process	Oscilloscope		
	company/manufacturer/industry standards.		Protocol analyzer		
	4.9.6 Known inputs result in expected outputs as specified by the manufacturer.		Cable tester		
	4.9.7 Documentation is completed according to company guidelines.				

Occupational Title:	Industrial Instrumentation and Controls Techn	ician				
Critical Work Funct industrial control sy	ion 4. Repair or replace malfunctioning ystem equipment.	Occupational Skills, Knowledge & Conditions				
Key	Performance Criteria	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?			
4.10 Repair or	4.10.1 Corrective repairs are performed	Read and redline electrical drawings	Personal Protective Equipment (PPE)			
replace 600-volt or less motors and	according to job scope, company/manufacturer/Health, Safety and	Read and use specification sheets	Electrical drawings			
rotating equipment	Environment work practices, specific	Read and use motor control logic diagrams	Specification sheets			
protection devices	application and area classification.	Use of reference material	Motor control logic diagrams			
such as vibration	4.10.2 Physical inspection meets	Use or conversion of electric circuit measurements	Reference material			
monitoring and motor control	company/manufacturer/industry parameters.	Knowledge of math	Site-specific safety procedures			
relays.	4.10.3 Functional test meets	Electrical knowledge	Computerized maintenance programs			
	company/manufacturer/industry standards.	Motor control circuit knowledge	Job Safety Analysis (JSA)			
	4.10.4 Known inputs result in expected outputs	Ability to learn new technology	Material Safety Data Sheets (MSDS)			
	as specified by the manufacturer.	Knowledge of computerized maintenance programs	Permits and area classifications			
	4.10.5 Documentation is completed according	Preparation of Job Safety Analysis	Data forms			
	to company guidelines.	Knowledge of national electric code	Hand tools			
		Knowledge of phasing and motor rotation	Volt-ohm meter			
		Knowledge of megger tests	Digital volt meter			
		Read and use nameplate data	Oscilloscope			
		Calibrating vibration monitors	Tubing and conduit benders			
		Basic rigging	Wobulator			
		Knowledge of management of change process	Hypot tester			
			Multi-amp tester			
			Megohm meter			
			Amp probe			
			Phase comparison tester			
			Non-contact voltage tester			

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 4:

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occup	Occupational Title: Industrial Instrumentation and Controls Technician															
CWF 4	CWF 4 Repair or replace malfunctioning industrial control system equipment															
Listening	Speaking	Using Information and Communication Technology	and	Solving	Decisions and		Using Social Skills	Adaptability	Working in Teams		Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	4	4	4	4	3	4	3	4	4	1	4	3	3	5	3	3

Statement of Assessment for Critical Work Function 4:

Tools: The assessment process should include the following.

Written tests that include:

- 1) True-false, multiple choice and essay questions that rely on extended responses to further clarify an understanding of the knowledge being assessed.
- 2) Graphic representations (e.g. P&IDs, loop drawings and one-line electrical drawings) that reveals an understanding of symbology and connections between processes and devices.
- 3) Preparation and justification of a reasonable solution to a problem scenario.

Hands-on demonstrations of knowledge, skills and attitudes that:

- 1) Represents a problematic or challenging situation in the context of a career-technical perspective.
- 2) Involves a real life scenario, problem or situation to solve.
- 3) Applies relevant knowledge or skills.
- 4) Focuses on the application of knowledge and skills learned in one situation as it connects to a new and different one.
- 5) Reveals an ability to plan, organize and create a product or an event.
- 6) Requires study to analyze or evaluate the problem or situation.
- 7) Illustrates by individual performance the attained levels of knowledge, skills and attitudes.
- 8) Includes observation of events, groups and individuals that focuses on the salient traits of the skill or attitude being observed.

Occupational Title: In	dustrial Instrumentation and Controls Technic	ian			
Critical Work Function replace auxiliary system	n 5. Maintain, test, clean, verify, repair or ems.	Occupational Skills, Knowledge & Conditions			
Key Activity	•		Conditions What tools must the technician use in order to do the activity?		
5.1 Maintain Heating Ventilation and Air Conditioning (HVAC) systems including the heater, condenser/evaporator, fans, filters and thermostats that control the temperature and/or humidity in a closed space.	5.1.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.1.2 Routine maintenance is performed according to job scope. 5.1.3 Physical inspection meets company/manufacturer/industry parameters. 5.1.4 Functional test meets company/manufacturer/industry standards. 5.1.5 Documentation is completed according to company guidelines.	Read and use specification sheets Read and use ladder logic diagrams Use of reference material Knowledge of math Knowledge of physics Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Proper use of hand tools Basic mechanical knowledge Knowledge of refrigeration principles	Personal Protective Equipment (PPE) Ladder logic diagrams Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Data forms Hand tools Volt-ohm meter Digital volt meter Megohm meter Amp probe		
5.2 Maintain lighting systems including the indoor and outdoor lights, changing light bulbs, replacing fluorescent ballasts, checking breakers and switches.	5.2.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.2.2 Routine maintenance is performed according to job scope. 5.2.3 Physical inspection meets company/manufacturer/industry parameters. 5.2.4 Functional test meets company/manufacturer/industry standards. 5.2.5 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Proper use of hand tools	Personal Protective Equipment (PPE) Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Data forms Hand tools Volt-ohm meter Digital volt meter Amp probe		

Occupational Title: In	dustrial Instrumentation and Controls Technic	ian					
Critical Work Function replace auxiliary system	n 5. Maintain, test, clean, verify, repair or ems.	Occupational Skills, Knowledge & Conditions					
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?				
5.3 Maintain backup power generation systems limited to low voltage generators (less than 600 volts) powered by diesel, gasoline or natural gas powered engines.	5.3.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.3.2 Routine maintenance is performed according to job scope. 5.3.3 Physical inspection meets company/manufacturer/industry parameters. 5.3.4 Functional test meets company/manufacturer/industry standards. 5.3.5 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use specification sheets Read and use motor control logic diagrams Use of reference material Use or conversion of electric circuit measurements Knowledge of math Knowledge of physics (length and leverage) Electrical knowledge Motor control circuit knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Proper use of hand tools Knowledge of phasing and motor rotation Read and use nameplate data Calibrating vibration monitors Basic rigging	Personal Protective Equipment (PPE) Electrical drawings Specification sheets Motor control logic diagrams Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Digital volt meter Megohm meter Amp probe Phase comparison tester Non-contact voltage tester				

Occupational Title: In	dustrial Instrumentation and Controls Technic	ian					
Critical Work Function replace auxiliary syste	5. Maintain, test, clean, verify, repair or ems.	Occupational Skills, Knowledge & Conditions					
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions				
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?				
5.4 Maintain cranes	5.4.1 Work is performed to meet the	Read and redline electrical drawings	Personal Protective Equipment (PPE)				
and/or hoists including	requirements of	Read and use specification sheets	Electrical drawings				
the electric motors, controls and breakers.	company/manufacturer/Health, Safety and Environment work practices, specific	Read and use motor control logic diagrams	Specification sheets				
controlo ana broakere.	application and area classification.	Use of reference material	Motor control logic diagrams				
	5.4.2 Routine maintenance is performed	Knowledge of math	Reference material				
accord 5.4.3 F	according to job scope.	Electrical knowledge	Site-specific safety procedures				
	5.4.3 Physical inspection meets	Motor control circuit knowledge	Computerized maintenance programs				
	company/manufacturer/industry parameters.	Ability to learn new technology	Job Safety Analysis (JSA)				
	5.4.4 Functional test meets company/manufacturer/industry standards.	Knowledge of computerized maintenance	Material Safety Data Sheets (MSDS)				
	5.4.5 Documentation is completed according to	programs	Permits and area classifications				
	company guidelines.	Preparation of Job Safety Analysis	Data forms				
	, , , , , , , , , , , , , , , , , , , ,	Proper use of hand tools	Hand tools				
		Knowledge of national electric code	Volt-ohm meter				
		Knowledge of phasing and motor rotation	Digital volt meter				
		Read and use nameplate data	Megohm meter				
		Calibrating vibration monitors	Amp probe				
		Basic rigging	Phase comparison tester				
			Non-contact voltage tester				

Occupational Title: In	dustrial Instrumentation and Controls Technic	ian						
Critical Work Function replace auxiliary syste	5. Maintain, test, clean, verify, repair or ms.	Occupational Skills, Knowledge & Conditions						
Key Activity	Performance Criteria How do we know when the key activity is performed well or performed successfully?	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity?	Conditions What tools must the technician use in order to do the activity?					
5.5 Maintain instrument air compressors including the compressor drive, compressor, filters, dryers and associated controls.	5.5.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.5.2 Routine maintenance is performed according to job scope. 5.5.3 Physical inspection meets company/manufacturer/industry parameters. 5.5.4 Functional test meets company/manufacturer/industry standards. 5.5.5 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use instrument loop sheets Read and use specification sheets Read and use programmable logic diagrams Use of reference material Electrical knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Proper use of hand tools Knowledge of national electric code Knowledge of phasing and motor rotation Read and use nameplate data Calibrating vibration monitors Basic rigging	Personal Protective Equipment (PPE) Electrical drawings Programmable logic diagrams Loop sheets Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Digital volt meter Megohm meter Amp probe Phase comparison tester Non-contact voltage tester					

Occupational Title: In	dustrial Instrumentation and Controls Technic	ian						
Critical Work Function replace auxiliary system	n 5. Maintain, test, clean, verify, repair or ems.	Occupational Skills, Knowledge & Conditions						
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions					
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?					
5.6 Maintain plant communication systems such as Supervisory Control And Data Acquisition (SCADA) systems, handheld radios and transmitting or repeater stations, and intercom systems.	5.6.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.6.2 Routine maintenance is performed according to job scope. 5.6.3 Physical inspection meets company/manufacturer/industry parameters. 5.6.4 Functional test meets company/manufacturer/industry standards. 5.6.5 Documentation is completed according to company guidelines.	Read and redline communication network drawings Read and use specification sheets Use of reference material Knowledge of basic electrical AC/DC theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Proper use of hand tools Knowledge of industrial communication protocols Knowledge of cable connector requirements Knowledge of radio frequency repeater technology Knowledge of diagnostic indicators	Personal Protective Equipment (PPE) Communication network drawings Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Data forms Hand tools Digital volt meter Protocol communicator Frequency analyzer					
5.7 Maintain Uninterruptible Power Supplies (UPS) and Inverters.	5.7.1 Work is performed to meet the requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.7.2 Routine maintenance is performed according to job scope. 5.7.3 Physical inspection meets company/manufacturer/industry parameters. 5.7.4 Functional test meets company/manufacturer/industry standards. 5.7.5 Documentation is completed according to company guidelines.	Read and redline electrical drawings Read and use specification sheets Use of reference material Knowledge of math Knowledge of physics (specific gravity) Electrical knowledge Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of permits and area classifications Proper use of hand tools Knowledge of gated power devices (SCR, triacs, thyristors, etc.)	Personal Protective Equipment (PPE) Electrical drawings Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Permits and area classifications Data forms Hand tools Volt-ohm meter Digital volt meter Hydrometer					

<u> </u>	dustrial Instrumentation and Controls Technic 1 5. Maintain, test, clean, verify, repair or	Occupational Skills, Knowledge & Conditions							
replace auxiliary syste	ems.	-							
Key	Performance Criteria	Occupational Skills & Knowledge	Conditions						
Activity	How do we know when the key activity is performed well or performed successfully?	What should the technician know and what skills should the technician have in order to do the activity?	What tools must the technician use in order to do the activity?						
5.8 Maintain cathodic	5.8.1 Work is performed to meet the	Read and redline electrical drawings	Personal Protective Equipment (PPE)						
protection systems.	requirements of company/manufacturer/Health, Safety and	Read and use specification sheets	Electrical drawings						
	Environment work practices, specific	Use of reference material	Specification sheets						
	application and area classification.	Knowledge of basic electrical AC/DC theory	Reference material						
	5.8.2 Routine maintenance is performed	Ability to learn new technology	Site-specific safety procedures						
	according to job scope.	Knowledge of computerized maintenance	Computerized maintenance programs						
	5.8.3 Physical inspection meets	programs	Job Safety Analysis (JSA)						
	company/manufacturer/industry parameters. 5.8.4 Functional test meets company/manufacturer/industry standards. 5.8.5 Documentation is completed according to	Preparation of Job Safety Analysis	Data forms						
		Proper use of hand tools	Hand tools						
		Knowledge of national electric code	Digital volt meter						
	company guidelines.		Amp probe						
	. , ,		Non-contact voltage tester						
5.9 Maintain	5.9.1 Work is performed to meet the	Read and redline electrical drawings	Personal Protective Equipment (PPE)						
navigation aids	requirements of	Read and use specification sheets	Electrical drawings						
including lights and switchgear associated	company/manufacturer/Health, Safety and Environment work practices, specific	Use of reference material	Specification sheets						
with lighting systems	application and area classification.	Knowledge of basic electrical AC/DC theory	Reference material						
required for navigation	5.9.2 Routine maintenance is performed	Ability to learn new technology	Site-specific safety procedures						
aids or warnings.	according to job scope.	Knowledge of computerized maintenance	Computerized maintenance programs						
	5.9.3 Physical inspection meets	programs	Job Safety Analysis (JSA)						
	company/manufacturer/industry parameters.	Preparation of Job Safety Analysis	Data forms						
	5.9.4 Functional test meets company/manufacturer/industry standards.	Proper use of hand tools	Hand tools						
	5.9.5 Documentation is completed according to		Volt-ohm meter						
	company guidelines.		Digital volt meter						
			Amp probe						

	ndustrial Instrumentation and Controls Technic on 5. Maintain, test, clean, verify, repair or nems.	Occupational Skills, Knowledge & Conditions						
Key Activity 5.10 Maintain high	Performance Criteria How do we know when the key activity is performed well or performed successfully? 5.9.1 Work is performed to meet the	Occupational Skills & Knowledge What should the technician know and what skills should the technician have in order to do the activity? Read and redline electrical drawings	Conditions What tools must the technician use in order to do the activity? Personal Protective Equipment (PPE)					
voltage equipment including equipment that is energized with 600 volts or more.	requirements of company/manufacturer/Health, Safety and Environment work practices, specific application and area classification. 5.9.2 Routine maintenance is performed according to job scope. 5.9.3 Physical inspection meets company/manufacturer/industry parameters. 5.9.4 Functional test meets company/manufacturer/industry standards. 5.9.5 Documentation is completed according to company guidelines.	Read and use specification sheets Read and use motor control diagrams Use of reference material Use or conversion of electrical measurements Knowledge of math Knowledge of high-voltage electrical theory Ability to learn new technology Knowledge of computerized maintenance programs Preparation of Job Safety Analysis Knowledge of high-voltage tools and equipment Knowledge of terminating medium and high- voltage wiring Knowledge of national electric code Knowledge of OSHA 1910.269 and 1910.331-335	Electrical drawings Specification sheets Reference material Site-specific safety procedures Computerized maintenance programs Job Safety Analysis (JSA) Material Safety Data Sheets (MSDS) Data forms High-voltage tools and equipment Volt-ohm meter Hot sticks Digital volt meter Hypot tester Multi-amp tester Megohm meter Amp probe Phase comparison tester Infrared camera Non-contact high-voltage tester					

Academic and Employability Knowledge and Skill Matrix for Critical Work Function 5

On a scale of 1 (lowest) to 5 (highest), identify the level of complexity required in each of these skills for the worker to perform the critical work function. Keep in mind that this scale is not for rating an individual's proficiency. It is intended only for rating the level of complexity required to do the work.

Occup	Occupational Title: Industrial Instrumentation and Controls Technician															
CWF 5	CWF 5 Maintain, test, clean, verify, repair or replace auxiliary systems.															
Listening	Speaking	Information and Communication		Solving	Decisions and	and	Using Social Skills	Adaptability			Building Consensus	Self and Career Development	Writing	Reading	Mathematics	Science
4	3	4	4	4	3	4	3	4	4	1	4	3	3	5	4	4

Statement of Assessment for Critical Work Function 5

Tools: The assessment process should include the following.

Written tests that include:

- 1) True-false, multiple choice and essay questions that rely on extended responses to further clarify an understanding of the knowledge being assessed.
- 2) Graphic representations (e.g. P&IDs, loop drawings and one-line electrical drawings) that reveals an understanding of symbology and connections between processes and devices.
- 3) Preparation and justification of a reasonable solution to a problem scenario.

Hands-on demonstrations of knowledge, skills and attitudes that:

- 1) Represents a problematic or challenging situation in the context of a career-technical perspective.
- 2) Involves a real life scenario, problem or situation to solve.
- 3) Applies relevant knowledge or skills.
- 4) Focuses on the application of knowledge and skills learned in one situation as it connects to a new and different one.
- 5) Reveals an ability to plan, organize and create a product or an event.
- 6) Requires study to analyze or evaluate the problem or situation.
- 7) Illustrates by individual performance the attained levels of knowledge, skills and attitudes.
- 8) Includes observation of events, groups and individuals that focuses on the salient traits of the skill or attitude being observed.