

QUALIFICATION PACK - OCCUPATIONAL STANDARDS FOR INSTRUMENTATION AUTOMATION SURVEILLANCE AND COMMUNICATION INDUSTRY

What are Occupational Standards(OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualification Pack-PLC Programmer & Troubleshooter

SECTOR: INSTRUMENTATION AUTOMATION SURVEILLANCE & COMMUNICATION

SUB-SECTOR: Automation

OCCUPATION: PLC Programming, Commissioning & troubleshooting

REFERENCE ID: IAS/Q8001

ALIGNED TO: NCO-2015/ NIL

PLC Programmer & Troubleshooter provides solution to Process Industry engineering and later troubleshoots any issues in Plant operations. Industrial automation is used for handling different processes and machineries with the help of PLC programs.

Brief Job Description: The individual is responsible for programming PLC used for the controlling various processes of Industries, finding and fixing errors or faults, if any, during the operation of the plant.

Personal Attributes: The individual must have knowledge of process manufacturing, field instrumentation, control system installation and expertise in the following project phases like documentation, detailed design generation, implementation, system integration, testing and onsite startup. Planning & coordination of project work within deadlines.

Job Details	Qualification Pack Code	IAS/Q8001		
	Job Role	PLC Programmer and Troubleshooter		
	Credits (NSQF)	TBD	Version number	1.0
	Sector	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
	Sub-sector	Automation	Last reviewed on	15/09/2017
	Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019
	NSQC Clearance on*	DD/MM/YYYY		

* only after clearance from NSQC

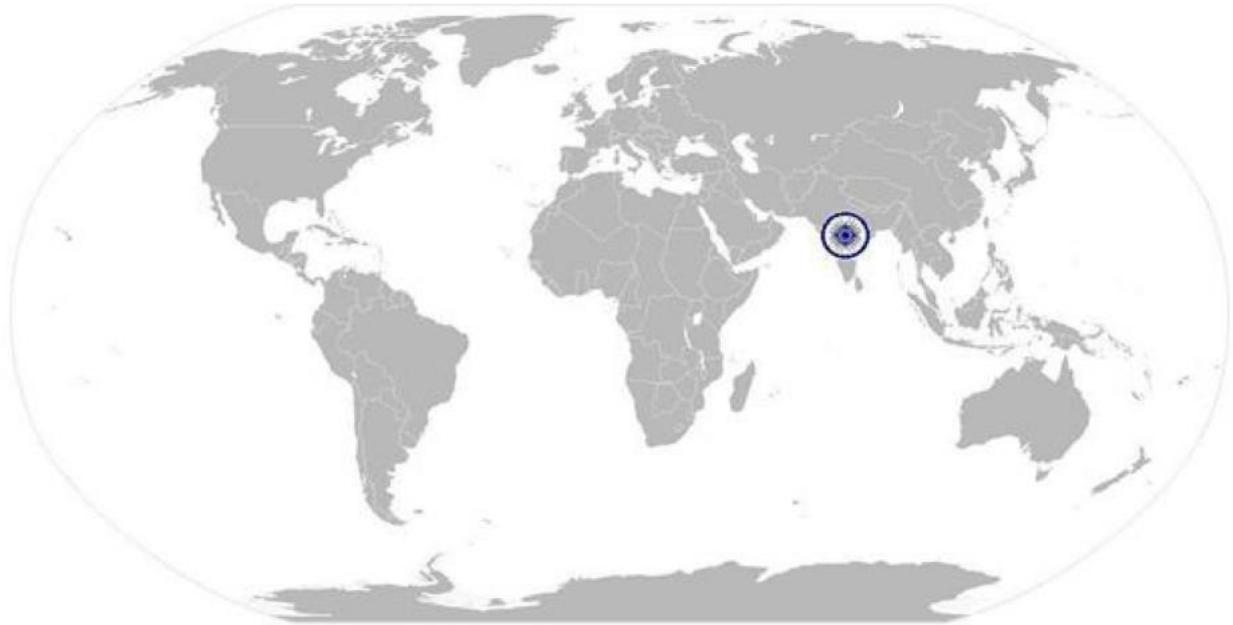
Job Role	PLC Programmer & Troubleshooter
Role Description	a. Programming of PLC system b. Commissioning of PLC system onsite c. Troubleshooting of PLC issues onsite
NSQF level	4
Minimum Educational Qualifications	Diploma in Electrical/Electronics/Instrumentation B.Sc in Electronics
Maximum Educational Qualifications	NA
Training (Suggested but not mandatory)	Training on Basics and Advance PLC.
Minimum Job Entry Age	21 years.
Experience	Minimum 1 year Experience Individual should assist Senior Engineer for commissioning and troubleshooting for six months Perform programming, commissioning and troubleshooting under supervision of Senior Engineer for six months
Applicable National Occupational Standards (NOS)	Compulsory: <ol style="list-style-type: none"> IAS/N2000 Understanding the PLC Control Panel and PLC Module / Equipments IAS/N2001 Developing PLC Program using PLC Software IAS/N2002 Testing the PLC Program using Simulators IAS/N2003 Commissioning and Testing the PLC Program using trial runs Onsite IAS/N2004 Troubleshooting of faults in Machine or Process Plant IAS/N2005 Health and Safety in Workplace Optional: N.A.
Performance Criteria	As described in the relevant OS units

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation or an area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of OS.
Sub-function	Sub-function are sub-activities essential to fulfil in achieving the objectives of the function.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualification Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualification pack code.
Unit Code	Unit code is unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding	Knowledge and understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual needs in order to perform to the required standard.
Organizational Context	Organizational context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.

Acronyms

CoreSkills/Generic Skills	Core skills or generic skills are a group of skills that are the key to learning and working in today’s world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Keywords /Terms	Description
FAT	Factory Acceptance Test
PLC	Programmable Logic Controller
DCS	Distributed Control System
HMI	Human Machine Interface
SCADA	Supervisory Control And Data Acquisition
NOS	National Occupational Standard(s)
NVQF	National Vocational Qualifications Framework
NSQF	National Skill Qualifications Framework
NVEQF	National Vocational Education Qualifications Framework
QP	Qualification Pack
ESD	Electro Static Discharge

National Occupational Standard



Overview

This unit is about understanding the PLC Control Panel and the PLC Modules / Equipments used inside the control panel.

IAS/N2000

Understanding PLC Control Panel and PLC Modules / Equipments

National Occupational Standard	Unit Code	IAS/N2000
	Unit Title (Task)	Understanding the PLC Control Panel and PLC Module / Equipments
	Description	This unit is about to understand the PLC Control panel & PLC Modules / Equipments.
	Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Detailing the PLC Control Panel functional requirements. • Understanding the PLC modules used in the Control Panel. • Understanding the Equipments used in the Control Panel.
	Performance Criteria(PC) w.r.t. the Scope	
	Element	Performance Criteria
	Detailing the PLC Control Panel functional requirements	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Identify the customer requirement of the PLC Control Panel PC2. Understand and examine the onsite location where Control Panel will be placed PC3. Interact with customer & understand number of field equipments helping to analyze the size of control panel PC4. Prepare the dimension of control panel PC5. Interact with customer for Panel HMI mounting & Panel switches and then guiding fabrication team for the cutouts on panel door PC6. Assisting/Understanding the mounting of components on the mounting plate inside the control panel PC7. Interact with technicians to maintain free space inside control panel for mounting components for future expansion PC8. Examine the panel fabrication drawing and internal mounting layout drawings
	Understanding the PLC modules used in the Control Panel	<ul style="list-style-type: none"> PC9. Understand the Mains power supply unit for powering the PLC Control panel PC10. Understanding the power supply unit for powering the PLC, HMI and other components of control panel PC11. Examine the power supply wiring to the CPU in PLC and other components inside the panel PC12. Understand the Digital Input-Output module PC13. Examine the wiring of the Digital IO modules with other components inside the panel PC14. Understand the Analog Input-Output module PC15. Examine the wiring of the Analog IO modules with other components inside the panel PC16. Understand special modules if used in PLC for advance communications. PC17. Examine the wiring of the special modules
	Understanding the Equipments used in the Control Panel	<ul style="list-style-type: none"> PC18. Understand the wiring diagrams between the PLC modules and the equipments/components used in panel PC19. Understand the ferrule numbers used for the wiring in panel

IAS/N2000

Understanding PLC Control Panel and PLC Modules / Equipments

	<p>PC20. Understand the variants of Input equipments like switches, push buttons, Limit switches etc. used in panel</p> <p>PC21. Understand the variants of Output equipment like LED, lamps, hooters, exhaust fans etc. used in the panel</p> <p>PC22. Understand the equipments like relays, contactors etc used in panel</p> <p>PC23. Understand the terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc.</p>
Knowledge & Understanding (K)	
<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. Company's code of conduct, organization culture and reporting structure</p> <p>KA2. Company's documentation policy</p> <p>KA3. Company's line of business and production policy</p> <p>KA4. Departments involved with installation and commissioning</p> <p>KA5. Quality and standards system followed in the company</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Electrical, electronics and instrumentation</p> <p>KB2. Standard operating procedure (SOP) of the organization for control panel development process</p> <p>KB3. Basics of machine safety and normal safety processes</p> <p>KB4. Quality, standards and guidelines to be followed during panel design development</p> <p>KB5. PLC module and equipments used in the automation process</p> <p>KB6. PLC programming software</p> <p>KB7. General arrangement drawing</p> <p>KB8. Electrical load calculations</p> <p>KB9. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process</p> <p>KB10. Safety aspects to be inbuilt in the control panel system as per the process requirement</p> <p>KB11. Instrumentation used in the factory and its wiring concept</p> <p>KB12. PLC Control panel and wiring knowledge</p> <p>KB13. Testing process and parameters involved in the panel testing</p> <p>KB14. Electronics indicators, switchgear and panel accessories</p> <p>KB15. Sources and methods for obtaining required technical information for the control panel being developed</p> <p>KB16. IEC Standards</p> <p>KB17. Relevant regulations, standards and codes of practice and their implications on the panel</p> <p>KB18. Relevant documents and procedures used in the process</p>
Skills (S)	
<p>A. Core Skills/ Generic</p>	<p>Writing Skills</p>

IAS/N2000

Understanding PLC Control Panel and PLC Modules / Equipments

Skills	The individual on the job needs to know and understand how to: SA1. Compose E-mails, letters and other official documents clearly SA2. Write user requirements SA3. Write test reports SA4. Write technical documentation SA5. Write schedules and timelines
	Reading Skills
	The individual on the job needs to know and understand how to: SA6. Read user requirements SA7. Read technical specifications and documentation SA8. Read standards and regulatory compliance documents SA9. Read schedules and timelines SA10. Read drawings
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA11. Question customers appropriately in order to understand the application and the requirements SA12. Discuss task lists, schedules and work-loads with co-workers SA13. Keep customers informed about progress SA14. Use simple and clear language when communicating with a customer SA15. Report issues and problems to managers in clear terms
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to readiness of the panel for supply SB3. Make decisions pertaining to readiness of customer site for panel installation SB4. Make decisions pertaining to changes in panel onsite
	Plan and Organise
	The user/individual on the job needs to know and understand: SB5. Plan and organize panel installation - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and feedback SB6. Anticipate issues and have alternate strategy
	Customer Centricity
The user/individual on the job needs to know and understand how to: SB7. Understand real needs of the customer and suggest most appropriate solution SB8. Support customer when they need help SB9. Build customer relationships and rapport which promotes two way business	

IAS/N2000

Understanding PLC Control Panel and PLC Modules / Equipments

	Problem Solving
	The user/individual on the job needs to know and understand how to: SB10. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB11. Solve issues of clients lacking the technical background SB12. Identify and implement solutions to resolve delays
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB13. Use the existing information to arrive at actionable decision points SB14. Use the existing information for improving the customer satisfaction SB15. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB16. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB17. Anticipate problems, risks and opportunities and utilize these for mitigation and business optimization

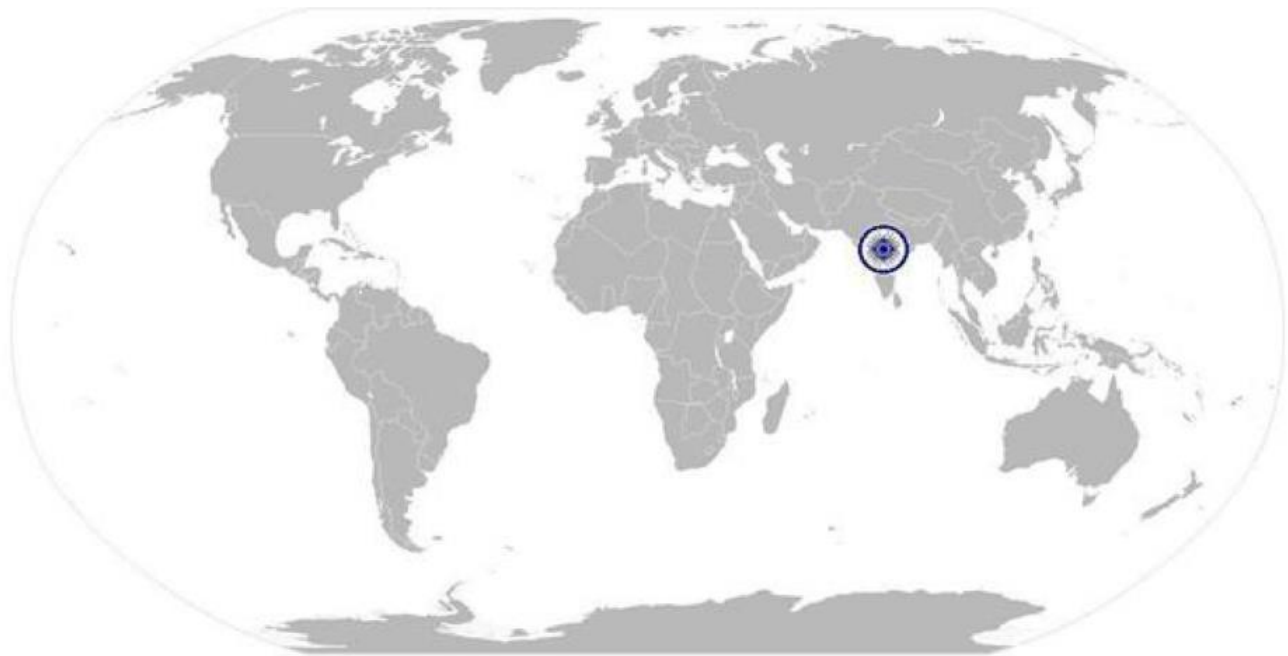


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Understanding PLC Control Panel and PLC Modules / Equipments

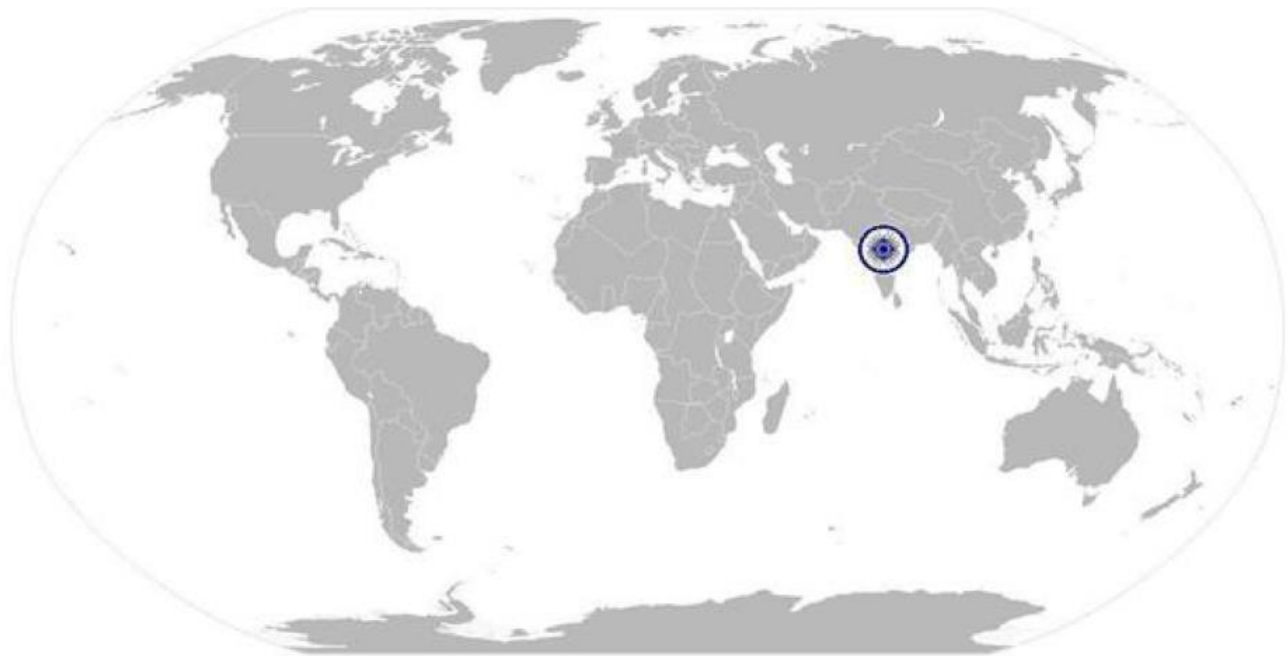
NOS Version Control

NOS Code	IAS/N2000		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about developing PLC Program using PLC programming software.

IAS/N2001

Developing PLC Program using PLC Software

National Occupational Standard

Unit Code	IAS/N2001
Unit Title (Task)	Developing PLC Program using PLC Software
Description	This unit is about to develop PLC program using the PLC programming software.
Scope	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Detailing the PLC programming software & its pre-requisites • Analyzing the utilization of Instruction set from PLC programming software • Developing the program / logic / code for the PLC
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Detailing the PLC programming software & its pre-requisites	<p>To be competent, the user/individual on the job must be able to</p> <p>PC1. Identify the Organization/Customer approved Software and use it for developing the process logics</p> <p>PC2. Collect information related to pre-requisites for software installation on PC/Laptops for programming</p> <p>PC3. Ensure availability of others software's like Office, Adobe reader, Windows features etc. which are required for the PLC programming software.</p> <p>PC4. Ensure the communication protocol to be used for communicating between programming software and PLC</p> <p>PC5. Check the availability of the communication port on PC/Laptop</p> <p>PC6. Gather basic knowledge on different types of programming language available within the software</p>
Analyzing the utilization of Instruction set from PLC Programming software	<p>PC7. Acquire & collect information of normally open (NO) and normally closed (NC) contacts in field</p> <p>PC8. Gather detailed information about the Bit instructions, Mathematical instructions, Conversion instruction & Compare instructions to be used in the program</p> <p>PC9. Utilization of Timer & Counter logics blocks along with Move Data blocks which is required extensively in process logics</p> <p>PC10. Analyzing the requirement of special blocks like PID, High Speed counters etc</p> <p>PC11. Get detail information on communication program blocks used specially for communication between different components in panel</p> <p>PC12. Using appropriate programming language as per standards</p>
Developing the program / logic / code for the PLC	<p>PC13. Discuss & collect information from customer regarding the equipments and instruments used in the plant</p> <p>PC14. Prepare IO list from the inputs given by customer and guide the Control Panel makers to incorporate the desired number of IO's in panel</p> <p>PC15. Collect information about configuring the PLC hardware details in the programming software</p>

IAS/N2001

Developing PLC Program using PLC Software

	<p>PC16. Adding PLC DI, DO, AI, AO, Special modules and set parameters in these modules for better performance in the plant</p> <p>PC17. Find out the address of the signal modules to be later used in the programming logic developed for process execution</p> <p>PC18. Discuss with customer to understand the automation required in the process plant</p> <p>PC19. Explain the customer about the possible outcomes of the program which will be written in the PLC</p> <p>PC20. Develop the program as per customer inputs and process flow using appropriate programming language on programming device like PC/Laptop</p>
Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. Company's code of conduct, organization culture and reporting structure</p> <p>KA2. Company's documentation policy</p> <p>KA3. Company's line of business and production policy</p> <p>KA4. Departments involved with installation and commissioning</p> <p>KA5. Quality and standards system followed in the company</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Electrical, electronics and instrumentation</p> <p>KB2. Basics of computer and operating systems</p> <p>KB3. Standard operating procedure (SOP) of the organization for process automation logic development</p> <p>KB4. Basics of machine safety and normal safety processes</p> <p>KB5. Quality, standards and guidelines to be followed during program development</p> <p>KB6. Control system module and technologies used in the automation process</p> <p>KB7. PLC programming software</p> <p>KB8. Application software, Installation and debugging</p> <p>KB9. Piping and instrumentation diagram (P&ID)</p> <p>KB10. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process</p> <p>KB11. Basics on infrastructure process involved in the industry (example: water treatment plant, chilling units etc.)</p> <p>KB12. Safety aspects to be inbuilt in the PLC programming as per the process requirement</p> <p>KB13. Sources and methods for obtaining required technical information for the PLC program to be developed</p> <p>KB14. IEC Standards in PLC programming language</p> <p>KB15. Relevant documents to be referred for optimized PLC programming</p>
Skills (S)	

IAS/N2001

Developing PLC Program using PLC Software

A. Core Skills/ Generic Skills	Writing Skills
	The individual on the job needs to know and understand how to: SA1. Compose E-mails, letters and other official documents clearly SA2. Write user requirements SA3. Write test reports SA4. Write technical documentation SA5. Write schedules and timelines
	Reading Skills
	The individual on the job needs to know and understand how to: SA6. Read user requirements SA7. Read technical specifications SA8. Read standards and regulatory compliance documents SA9. Read schedules and timelines SA10. Read drawings
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA11. Question customers appropriately in order to understand the application and the requirements SA12. Discuss task lists, schedules, and work-loads with customers SA13. Keep customers informed about progress of logic development SA14. Use simple and clear language when communicating with a customer
	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to use of relevant PLC programming software and programming language SB3. Make decisions pertaining to optimize logic development
B. Professional Skills	Plan and Organise
	The user/individual on the job needs to know and understand: SB4. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback SB5. Anticipate issues and have alternate strategy
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. Understand real needs of the customer and suggest most appropriate solution SB7. Make customer happy and make them want to work with the company SB8. Manage relationships and maintain good rapport with customers to get detail inputs on logic

IAS/N2001

Developing PLC Program using PLC Software

	Problem Solving
	The user/individual on the job needs to know and understand how to: SB9. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB10. Solve issues of co-workers, lacking the technical know how SB11. Identify immediate or temporary solutions to resolve delays
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB12. Use the existing information to arrive at actionable decision points SB13. Use the existing information for improving the PLC program SB14. Use the existing information to optimize the logic SB15. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB16. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB17. Anticipate problems, risks and opportunities and utilize these for optimization of PLC program

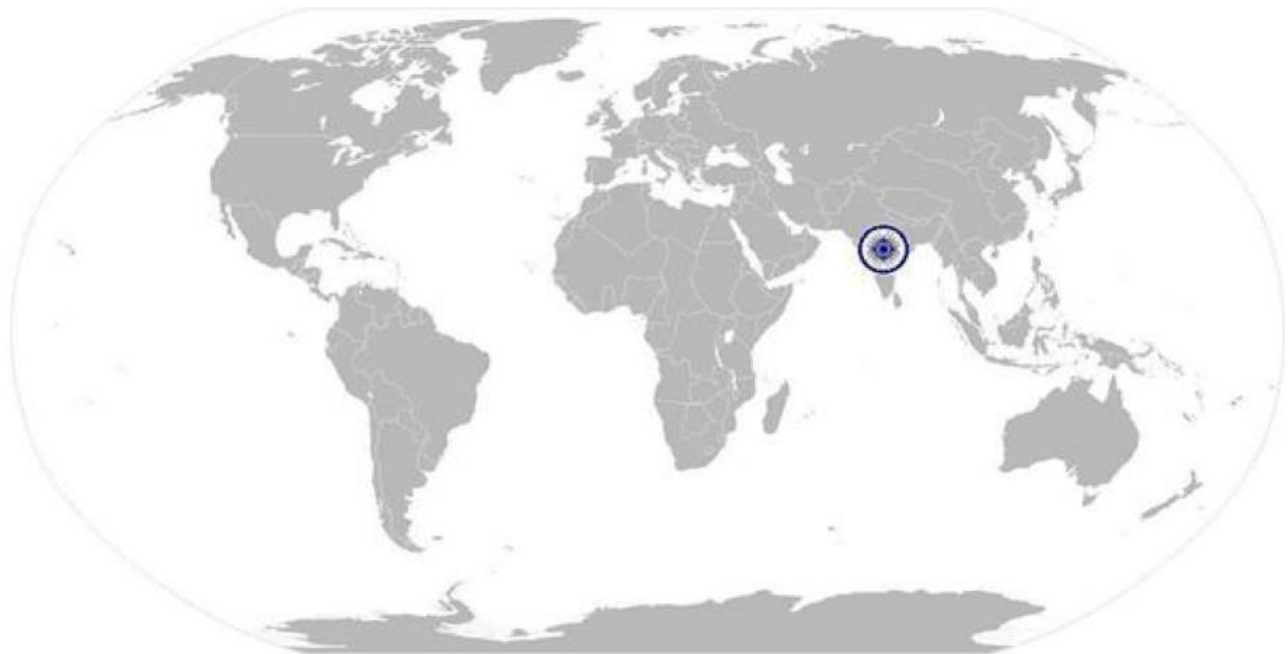


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Developing PLC Program using PLC Software

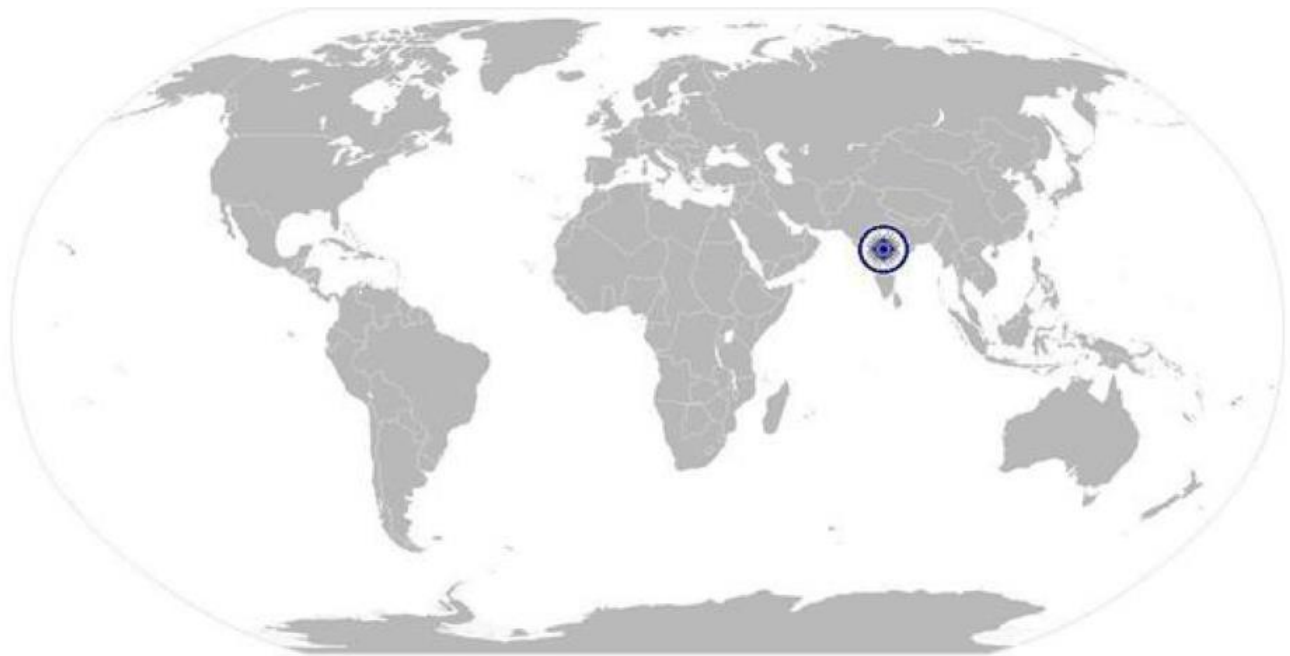
NOS Version Control

NOS Code	IAS/N2001		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about testing the PLC Program using Simulators.

IAS/N2002

Testing the PLC Program using Simulators

National Occupational Standard

Unit Code	IAS/N2002
Unit Title (Task)	Testing the PLC Program using Simulators
Description	This unit is about to understand the testing of PLC program using various simulator options available.
Scope	<p>This unit/task covers the following:</p> <ul style="list-style-type: none"> • Downloading / transferring the PLC program in PC-based software simulators • Testing the program using hardware simulators • Developing the error handling program for the PLC & testing it.
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Downloading / transferring the PLC program in PC-based software simulators	<p>To be competent, the user/individual on the job must be able to</p> <p>PC1. Complete the automation program and examine it using software checks like compilation before downloading</p> <p>PC2. Download the compilation error free program to the Computer based internal software simulator for further checks</p> <p>PC3. Activate the respective Inputs in software simulator to check the automation logic and thereby identify any error</p> <p>PC4. Modify and edit the logical error, data address overlap & wrong IO address access to maximize program stability</p> <p>PC5. Continue with further checks to eliminate the logical & address errors</p>
Testing the program using hardware simulators	<p>PC6. Download the modified, software simulated logic to PLC hardware available in office test bench</p> <p>PC7. Connect actual DI, DO, AI, AO modules to check the hardware loading on PLC</p> <p>PC8. Connect hardware toggle switches to test program reaction via virtual field inputs</p> <p>PC9. Connect hardware LED/Lamps to check output generated from PLC program</p> <p>PC10. Connect hardware analog simulators to check analog behavior of PLC program</p> <p>PC11. Identify and examine hardware related error which may occur during testing PLC program</p>
Developing the error handling program for the PLC & testing it	<p>PC12. Identify PLC hardware related errors</p> <p>PC13. Ensure use of appropriate programming logics to avoid non functionality of CPU due to hardware errors</p> <p>PC14. Generate outputs from error handling PLC program for error monitoring on HMI devices like Display Panels or SCADA systems</p> <p>PC15. Examine these error handling programs by physically creating faults like supply failure, communication break, IO channel error, module failure etc</p> <p>PC16. Ensure completion of Factory Acceptance Test (FAT) and send report to customer</p>

IAS/N2002

Testing the PLC Program using Simulators

Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. Company's reporting structure KA2. Company's documentation policy KA3. Company's line of business and product offerings KA4. Company's departments involved with engineering KA5. Quality and standards followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Electrical, electronics and instrumentation KB2. Basics of computer and operating systems KB3. Standard operating procedure (SOP) of the organization for process automation logic testing KB4. Control system module and technologies used in the automation process KB5. Application software, Installation, testing and debugging KB6. General arrangement drawing KB7. Piping and instrumentation diagram (P&ID) KB8. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process KB9. Basics on infrastructure process involved in the industry (example: water treatment plant, chilling units etc.) KB10. Safety aspects to be inbuilt in the PLC program testing as per the process requirement KB11. Testing process and parameters involved in the testing KB12. Sources and methods for obtaining required technical information for the PLC program to be tested KB13. IEC Standards in PLC programming language KB14. Relevant documents to be referred for testing PLC program
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The individual on the job needs to know and understand how to: SA1. Compose E-mails, letters and other official documents clearly SA2. Write technical documentation SA3. Write test reports SA4. Write schedules and timelines
	Reading Skills
	The individual on the job needs to know and understand how to: SA5. Read user requirements SA6. Read technical specifications SA7. Read standards and regulatory compliance documents SA8. Read schedules and timelines SA9. Read drawings

IAS/N2002

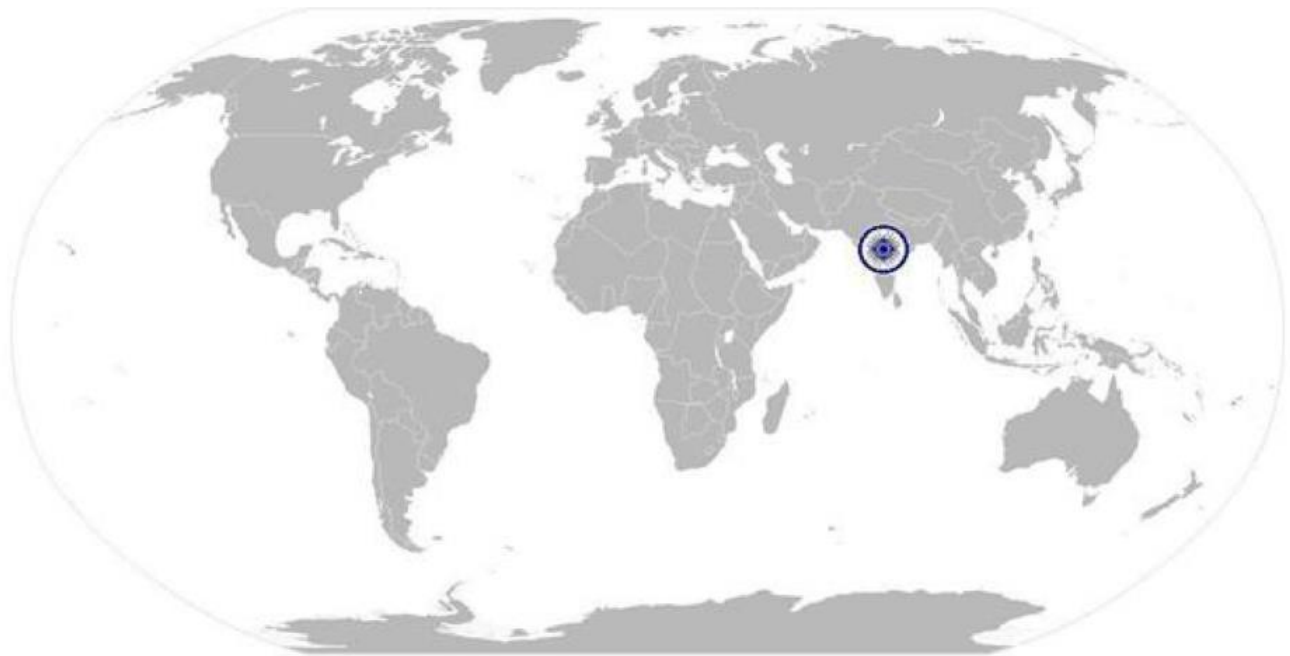
Testing the PLC Program using Simulators

	<p>Oral Communication (Listening and Speaking skills)</p>
	<p>The user/individual on the job needs to know and understand how to: SA10. Discuss task lists, schedules and work-loads with colleagues SA11. Keep colleagues informed about progress of logic testing SA12. Discuss with colleagues appropriately in order to understand the nature of the problem and make a diagnosis SA13. Report issues and problems to managers in clear terms</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>
	<p>The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to the appropriate solution to faults in programming SB3. Make decisions pertaining to readiness of PLC program for installation SB4. Make decisions pertaining to installation of program onsite</p>
	<p>Plan and Organise</p>
	<p>The user/individual on the job needs to know and understand: SB5. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback SB6. Anticipate issues and have alternate strategy</p>
	<p>Customer Centricity</p>
	<p>The user/individual on the job needs to know and understand how to: SB7. Understand real needs of the customer and deliver most appropriate solution SB8. Build good relationships and rapport with customers which will help in inputs related to program testing</p>
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to: SB9. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB10. Solve problems of colleagues lacking the technical background SB11. Identify immediate or temporary solutions to resolve faults and implement the proper solution immediately</p>
	<p>Analytical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to: SB12. Use the existing information to arrive at actionable decision points SB13. Use the existing information to optimize PLC program SB14. Analyze problems and identify causes and possible solutions</p>
	<p>Critical Thinking</p>

IAS/N2002

Testing the PLC Program using Simulators

	<p>The user/individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none">SB15. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take actionSB16. Anticipate problems, risks and opportunities and utilize these for optimizing PLC Program
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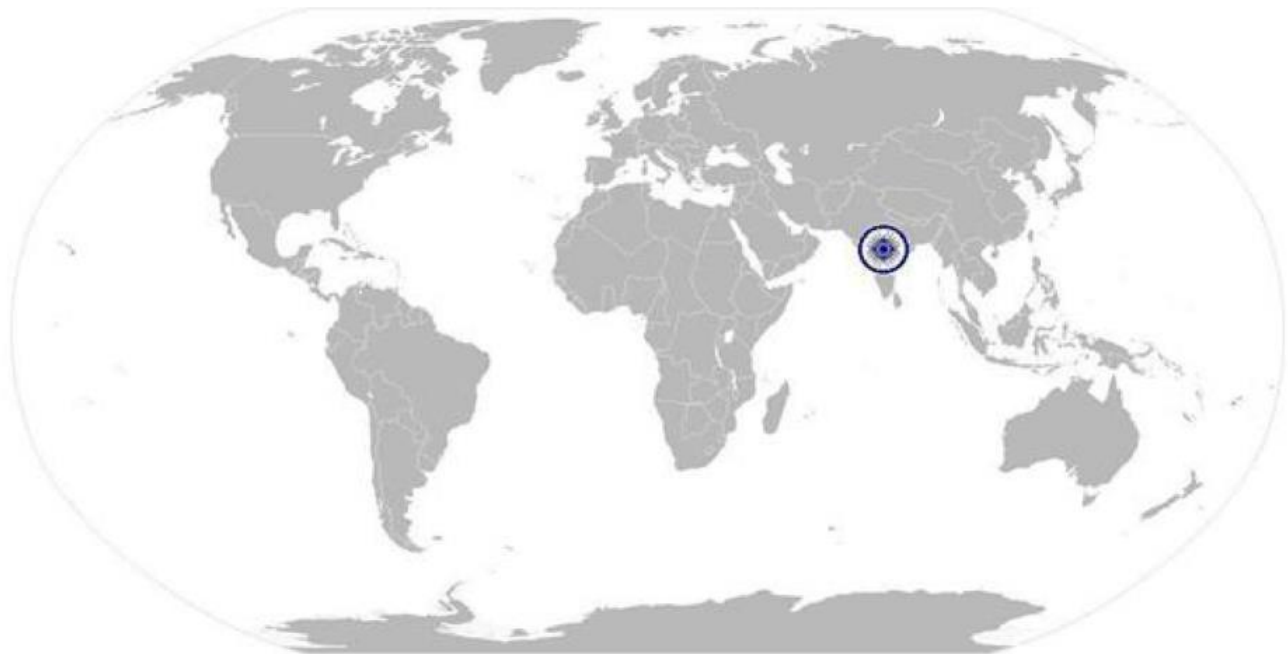


IAS/N2002

Testing the PLC Program using Simulators

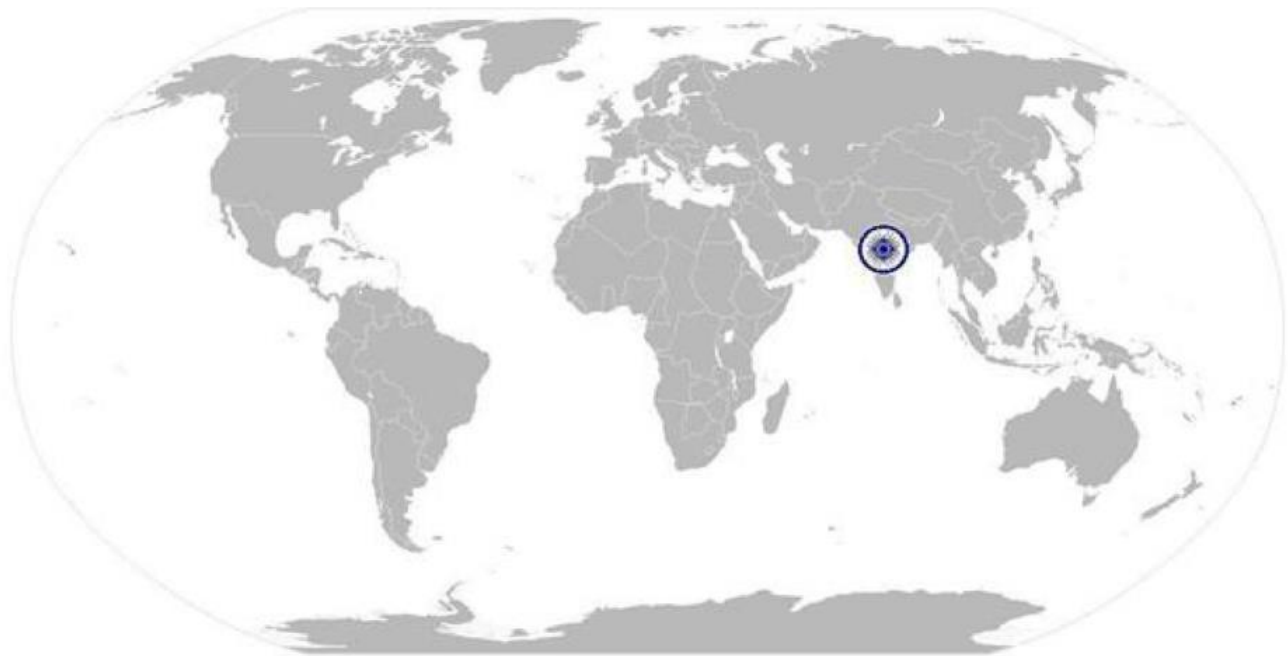
NOS Version Control

NOS Code	IAS/N2002		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about understanding the PLC Control Panel and the PLC Modules / Equipments used inside the control panel.

IAS/N2003

Commissioning and Testing the PLC Program using trial runs Onsite

National Occupational Standard

Unit Code	IAS/N2003
Unit Title (Task)	Commissioning and Testing the PLC Program using trial runs Onsite
Description	This unit is about to understand the commissioning & testing the PLC program using trial runs onsite.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Checking the functionality of physical Inputs & Outputs by forcing PLC IO's • Downloading / transferring the tested program to the PLC in the control panel • Commissioning the program using trail runs for the process/application
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Checking the functionality of physical Inputs & Outputs by forcing PLC IO's	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Collect information from customer for availability of resources and tools for Installation of PLC Control panel. Define a time period for completion of this task PC2. Ensure the wiring between the Terminal base of PLC panel & the field devices is completed PC3. Check the cable numbering and the ensure continuity test is done PC4. Examine the Power supply input to PLC panel and turn it on PC5. Activate the field sensors, limit switches etc. to verify them on input module PC6. Activate the PLC outputs to check working of field outputs like actuators, contactors, relays etc. PC7. Discuss and report to customer if any issues in physical IO check
Downloading / transferring the tested program to the PLC in the control panel	<ul style="list-style-type: none"> PC8. Ensure the wiring and physical IO check is completed PC9. Discuss and get permission from customer for downloading the program to PLC PC10. Transfer the PLC program in the CPU PC11. Check the PLC program by activating sensors, switches or push buttons and examine the function of outputs
Commissioning the program using trail runs for the process/application	<ul style="list-style-type: none"> PC12. Inform customer about the preliminary check of IO's and gather information about availability of resources for trial runs PC13. Get permissions from customer for execution of process through PLC program PC14. Identify errors in program and redo the logic after customer suggestion and maintain the standards PC15. Ensure during trial runs error handling program works correctly to avoid sudden loss of productivity and attain a smooth shutdown if necessary PC16. Train the operators to educate them the sequence of operation in case of emergency PC17. Prepare a standard operating procedure (SOP) for the automation logic developed for the customer

IAS/N2003

Commissioning and Testing the PLC Program using trial runs Onsite

	<p>PC18. Collect the backup of the final automation program and submit a copy to the plant head for future reference</p> <p>PC19. Sign a report (MOM) for correctly completing the installation & commissioning of the plant.</p>
Knowledge & Understanding (K)	
<p>A. Organizational Context (Knowledge of the company / organization and its processes)</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. Company's code of conduct, organization culture and reporting structure</p> <p>KA2. Company's documentation policy</p> <p>KA3. Company's line of business and production policy</p> <p>KA4. Departments involved with installation and commissioning</p> <p>KA5. Quality and standards system followed in the company</p>
<p>B. Technical Knowledge</p>	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. Electrical, electronics and instrumentation</p> <p>KB2. Basics of computer and operating systems</p> <p>KB3. Standard operating procedure (SOP) of the organization for commissioning of process plant</p> <p>KB4. Basics of machine safety and normal safety processes</p> <p>KB5. Quality, standards and guidelines to be followed during installation and commissioning</p> <p>KB6. PLC module and technologies used in the automation process</p> <p>KB7. PLC programming software used for commissioning</p> <p>KB8. Application software, Installation and debugging</p> <p>KB9. Piping and instrumentation diagram (P&ID)</p> <p>KB10. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process</p> <p>KB11. Basics on infrastructure process involved in the industry (example: water treatment plant, chilling units etc.)</p> <p>KB12. Safety aspects to be inbuilt in the control panel system as per the process requirement</p> <p>KB13. Instrumentation used in the factory and its wiring concept</p> <p>KB14. Electrical panel and wiring knowledge</p> <p>KB15. Testing process and parameters involved in the testing</p> <p>KB16. Electronics indicators, switchgear and panel accessories</p> <p>KB17. Sources and methods for obtaining required technical information for the installation and commissioning</p> <p>KB18. IEC Standards</p> <p>KB19. Relevant regulations, standards and codes of practice for commissioning process</p> <p>KB20. How to communicate with shop floor technicians in order to resolve any discrepancies during commissioning</p> <p>KB21. Basic power systems, motor fundamentals, drive systems fundamentals</p> <p>KB22. Relevant documents and documentation procedures used in the process</p>

IAS/N2003

Commissioning and Testing the PLC Program using trial runs Onsite

Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The individual on the job needs to know and understand how to: SA1. Compose e mails, letters and other official documents clearly SA2. Write user requirements SA3. Write technical documentation SA4. Write test reports SA5. Write schedules and timelines
	Reading Skills
	The individual on the job needs to know and understand how to: SA6. Read user requirements SA7. Read technical specifications SA8. Read standards and regulatory compliance documents SA9. Read schedules and timelines SA10. Read drawings
	Oral Communication (Listening and Speaking skills)
The user/individual on the job needs to know and understand how to: SA11. Question customers appropriately in order to understand the application and the requirements SA12. Discuss task lists, schedules, and work-loads with co-workers SA13. Give clear directions to co workers SA14. Keep customers informed about progress SA15. Use simple and clear language when communicating with a customer SA16. Question customers appropriately in order to understand the nature of the problem and make a diagnosis SA17. Report issues and problems to managers in clear terms	
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to the appropriate solution to customer problem SB3. Make decisions pertaining to readiness of customer site for commissioning and testing
	Plan and Organise
	The user/individual on the job needs to know and understand: SB4. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback SB5. Anticipate issues and have alternate strategy
Customer Centricity	

IAS/N2003

Commissioning and Testing the PLC Program using trial runs Onsite

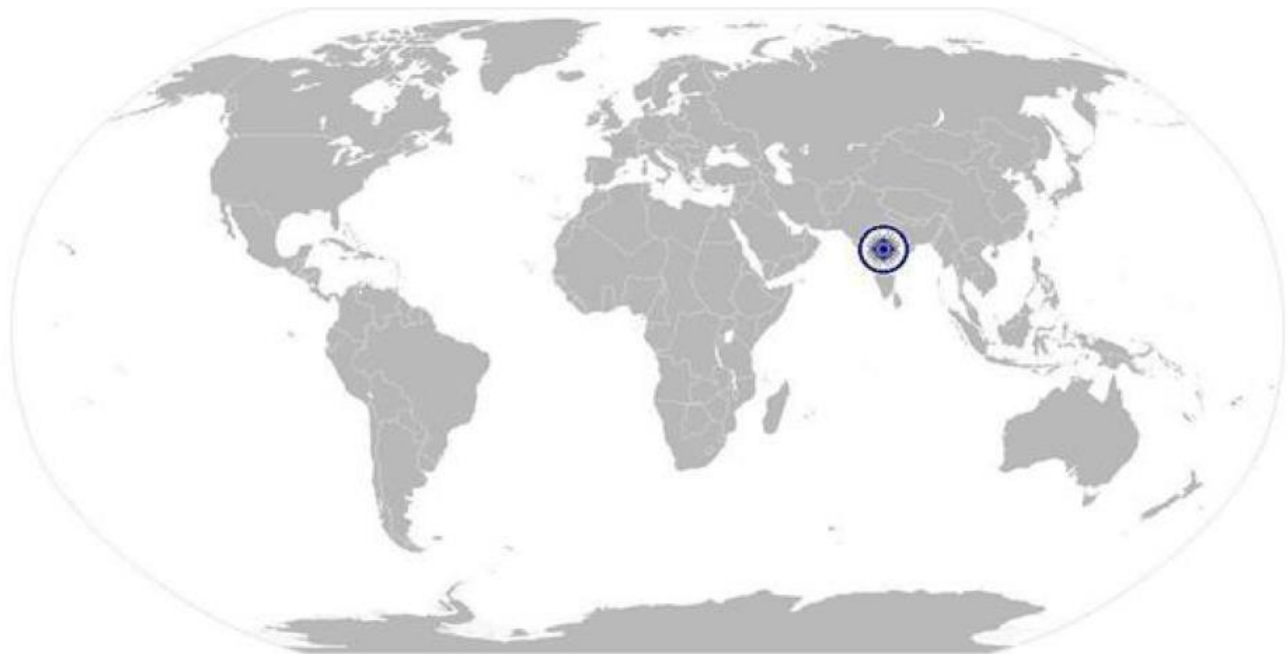
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB6. Understand real needs of the customer and suggest most appropriate solution</p> <p>SB7. Support customer when they need help</p> <p>SB8. Make customer happy and make them want to work with the company</p> <p>SB9. Manage relationships with customers who may be stressed, frustrated, confused or angry</p> <p>SB10. Build customer relationships and rapport which will speed up commissioning</p>
	<p>Problem Solving</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB11. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p> <p>SB12. Solve problems of co workers during commissioning</p> <p>SB13. Identify immediate or temporary solutions to resolve delays and implement the proper solution when possible</p>
	<p>Analytical Thinking</p>
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB14. Use the existing information to arrive at actionable decision points</p> <p>SB15. Use the existing information for improving the customer satisfaction by optimizing solution</p> <p>SB16. Analyze problems and identify causes and possible solutions</p>
	<p>Critical Thinking</p>
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB17. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action</p> <p>SB18. Anticipate problems, risks and opportunities and utilize these for optimizing the commissioning</p>	

IAS/N2003

Commissioning and Testing the PLC Program using trial runs Onsite

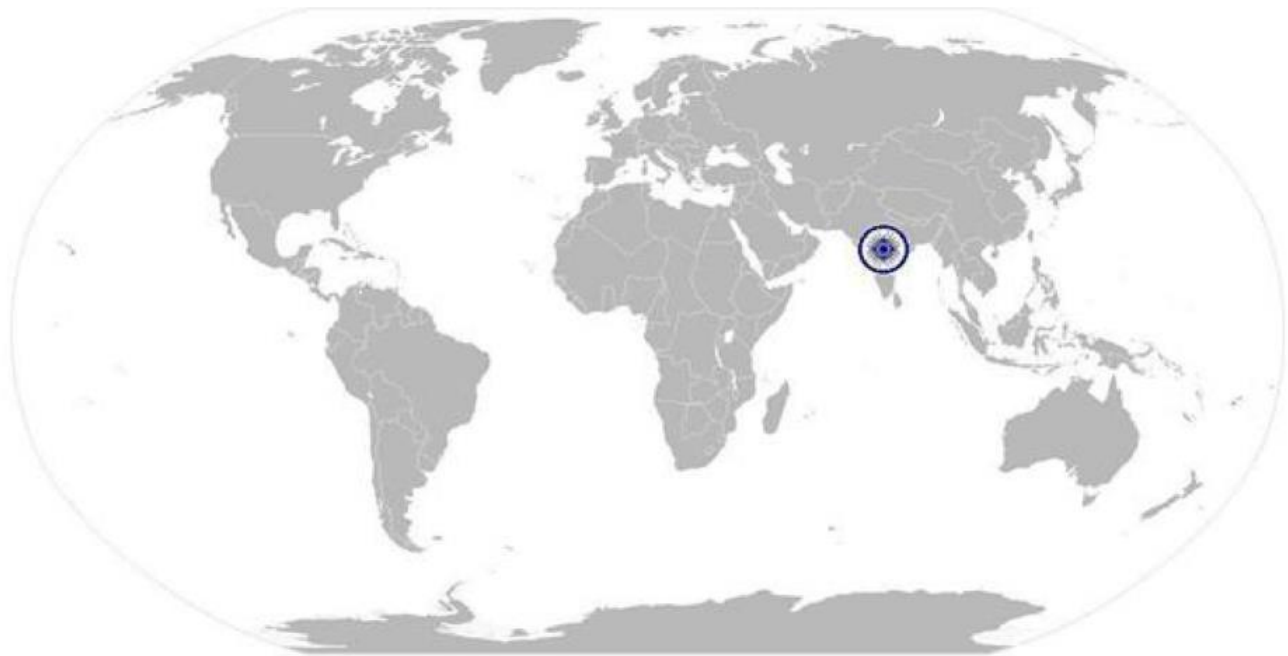
NOS Version Control

NOS Code	IAS/N2003		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about understanding the events of troubleshooting a fault in a machine or a process plant.

IAS/N2004

Troubleshooting of faults in Machine or Process Plant

National Occupational Standard

Unit Code	IAS/N2004
Unit Title (Task)	Troubleshooting of faults in Machine or Process Plant
Description	This unit is about to understand the troubleshooting of faults in a machine or process plant.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Gathering Information of Products, Hardware and Software Support • Testing • Installation of Replaced Products & schedule tasks
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Gathering Information of Products, Hardware and Software Support	To be competent, the user/individual on the job must be able to <ul style="list-style-type: none"> PC1. Ask the problem in the machine/plant to the Supervisor/Engineer PC2. Prepare document before using a PLC to rectify the problem PC3. Prepare a flow chart before troubleshooting any machine/plant PC4. Check the control drawing of the machine/plant connected with the PLC and the different modules PC5. Check the availability of modules, equipment and electrical components on site PC6. Refer the settings of Instruments and installation guidelines PC7. Providing the module replacement to the customer according to PLC PC8. Check the availability of software & program backup in plant
Testing	<ul style="list-style-type: none"> PC9. Test the panel and modules which is recommended PC10. Check earthing and power supply properly before troubleshooting PC11. Cross check whether the PLC and its module is attached at right place PC12. Communication cable is supporting the protocol or not PC13. Add the other required connecting devices PC14. Make changes in running project if it is required to rectify the faults
Installation of Replaced Products & schedule tasks	<ul style="list-style-type: none"> PC15. Match the product according to the catalog no. with the drawing and material List PC16. At the time of troubleshooting check the connected devices are in operation or in stop PC17. Parameter of the connected load must be entered accurately in PLC PC18. Replace the module/equipment if it is found faulty PC19. Take a program backup before and after troubleshooting PC20. Get the parameter reading according to schedule PC21. Install, test and start-up machine/plant on-site PC22. Prepare a site report after troubleshooting and mention the remedy

IAS/N2004

Troubleshooting of faults in Machine or Process Plant

Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KA1. Company's code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Departments involved with maintenance KA4. Quality and standards system followed in the company
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <ul style="list-style-type: none"> KB1. Electrical, electronics and instrumentation KB2. Basics of computer and operating systems KB3. Standard operating procedure (SOP) of the organization for control panel development process KB4. Basics of machine safety and normal safety processes KB5. Quality, standards and guidelines to be followed during design development KB6. PLC module and equipments used in the automation process KB7. PLC programming software KB8. Application software, Installation and debugging KB9. General arrangement drawing KB10. Piping and instrumentation diagram (P&ID) KB11. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process KB12. Basics on infrastructure process involved in the industry (example: water treatment plant, chilling units etc.) KB13. Safety aspects to be inbuilt in the control panel system as per the process requirement KB14. Instrumentation used in the factory and its wiring concept KB15. Electrical panel and wiring knowledge KB16. Testing process and parameters involved in the testing KB17. Electronics indicators, switchgear and panel accessories KB18. IEC Standards KB19. Relevant regulations, standards and codes of practice and their implications on the troubleshooting KB20. How to communicate with shop floor technicians in order to resolve any discrepancies during troubleshooting KB21. Basic power systems, motor fundamentals, drive systems fundamentals
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The individual on the job needs to know and understand how to:</p> <ul style="list-style-type: none"> SA1. Compose e mails, letters and other official documents clearly SA2. Write user requirements SA3. Write technical documentation

IAS/N2004

Troubleshooting of faults in Machine or Process Plant

	SA4. Write test reports SA5. Write schedules and timelines
	Reading Skills
	The individual on the job needs to know and understand how to: SA6. Read user requirements SA7. Read technical specifications SA8. Read standards and regulatory compliance documents SA9. Read schedules and timelines SA10. Read drawings
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA11. Question customers appropriately in order to understand the faults and to analyse the solution SA12. Discuss task lists, schedules and work-loads with co-workers SA13. Give clear directions to customers SA14. Keep customers informed about progress SA15. Use simple and clear language when communicating with a customer SA16. Report issues and problems to managers in clear terms
B. Professional Skills	Decision Making
	The user/individual on the job needs to know and understand how to: SB1. Make decisions pertaining to the scope of work SB2. Make decisions pertaining to the appropriate solution to customer problem SB3. Make decisions pertaining to readiness of the system after solving the issues SB4. Make decisions pertaining to start the machine/plant
	Plan and Organise
	The user/individual on the job needs to know and understand: SB5. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Customer Acceptance Test and customer feedback SB6. Anticipate issues and have alternate strategy
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB7. Understand real needs of the customer and suggest most appropriate solution SB8. Support customer when they need help SB9. Make customer happy and teach them to handle issues and troubleshoot the plant if necessary SB10. Manage relationships with customers who may be stressed,

IAS/N2004

Troubleshooting of faults in Machine or Process Plant

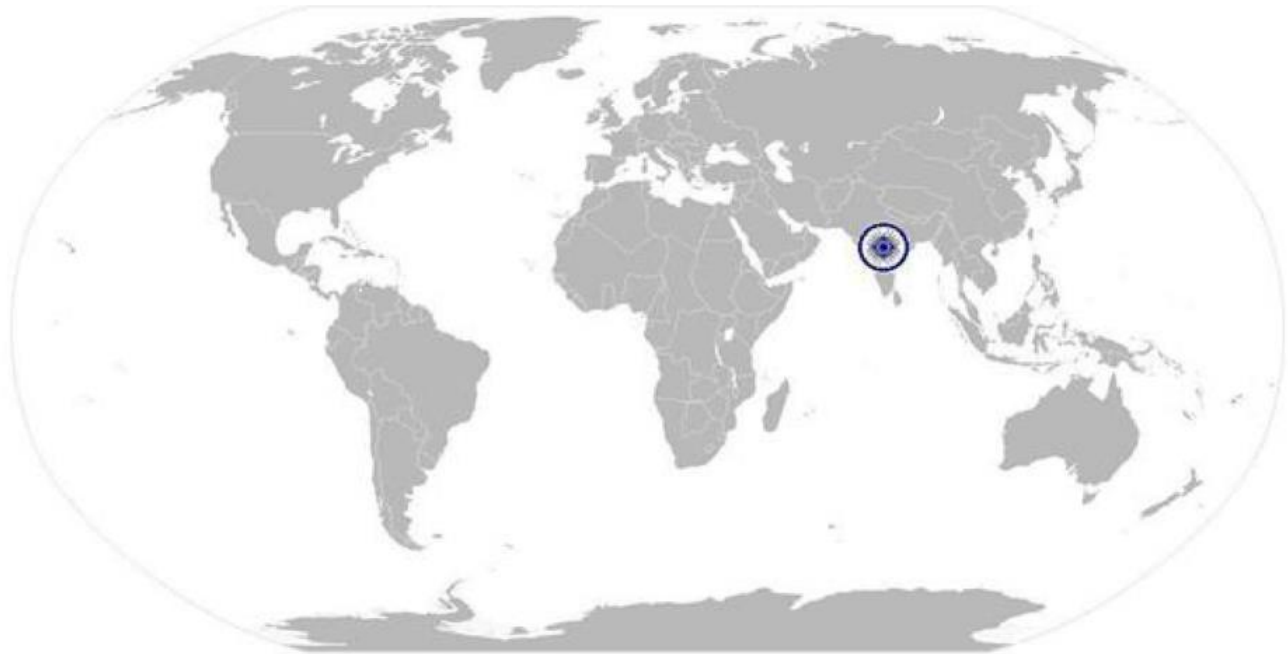
	<p>frustrated, confused or angry</p> <p>SB11. Build and maintain good relationships with customer for self troubleshooting the plant by assisting online</p>
	<p>Problem Solving</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB12. Think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s)</p> <p>SB13. Deal with clients lacking the technical background to solve the problem on their behalf</p> <p>SB14. Identify immediate or temporary solutions to resolve delays - and implement the proper solution when possible</p>
	<p>Analytical Thinking</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB15. Use the existing information to arrive at actionable decision points</p> <p>SB16. Use the existing information for improving the customer satisfaction</p> <p>SB17. Use the existing information to optimize solution and bring machine/plant in running state</p> <p>SB18. Analyze problems and identify causes and possible solutions</p>
	<p>Critical Thinking</p> <p>The user/individual on the job needs to know and understand how to:</p> <p>SB19. Apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action</p> <p>SB20. Anticipate problems, risks and opportunities and utilize these for further troubleshooting of the process</p>

IAS/N2004

Troubleshooting of faults in Machine or Process Plant

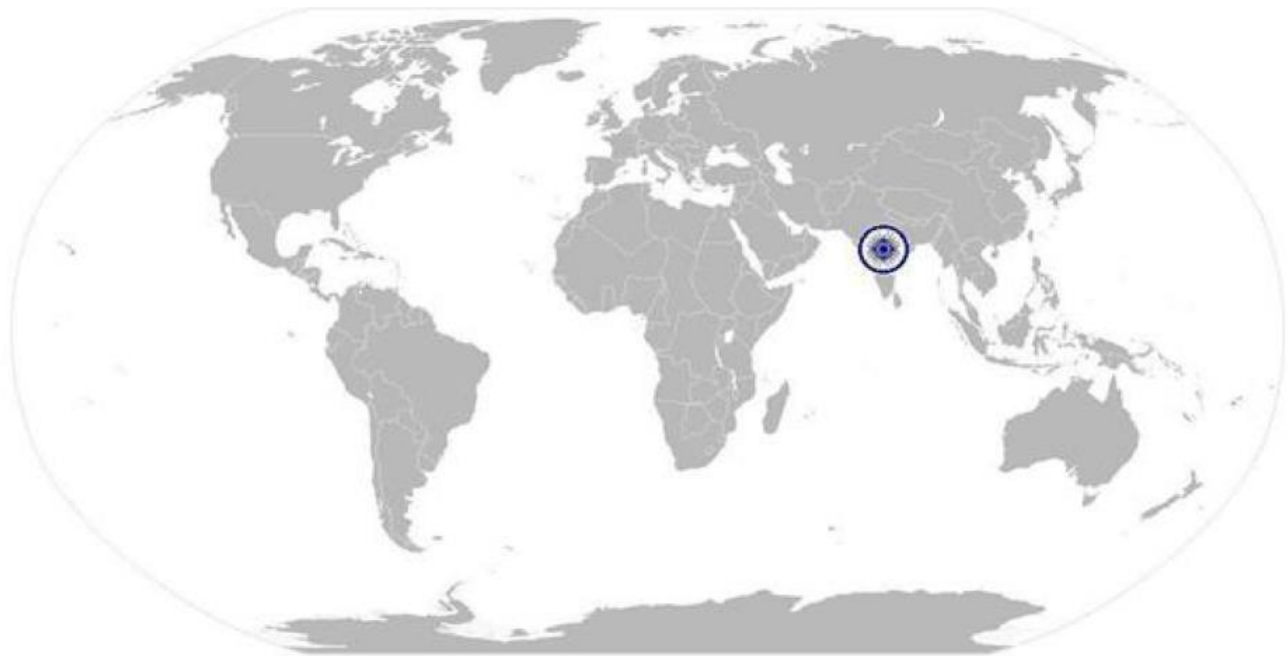
NOS Version Control

NOS Code	IAS/N2004		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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National Occupational Standard



Overview

This unit is about the individual's responsibility to maintain a safe, healthy and secure working environment.

IAS/N2005

Health and Safety in Workplace

National Occupational Standard

Unit Code	IAS/N2005
Unit Title (Task)	Health and Safety in Workplace
Description	This unit is about following adequate safety procedures to make work environment safe and healthy.
Scope	This unit/task covers the following: <ul style="list-style-type: none"> • Following safety measures and standards • Maintaining good health and posture
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Following safety measures and standards	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Comply with general and special safety procedures followed in the Company PC2. Follow specified safety procedures while handling an equipment, hazardous material or tool PC3. Remove ties, finger rings, or any other metal objects which may interfere with the work PC4. Use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc. PC5. Escalate about any hazardous materials or things found in the premises PC6. Report about any breach of safety procedure in the company PC7. Ensure zero accidents at work PC8. Avoid damage of components due to negligence in ESD procedures PC9. Regularly participate in fire drills or other safety related workshops organized by the company PC10. Ensure no loss for company due to safety negligence
Maintaining good health and posture	<ul style="list-style-type: none"> PC11. Maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials PC12. Participate in company organized health sessions such as yoga, physiotherapy or games PC13. Handle heavy and hazardous materials with care and using appropriate tools and handling equipment such as trolleys, jacks and ladders
Knowledge & Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The individual on the job needs to know and understand: <ul style="list-style-type: none"> KA1. Company's policies on: incentives, delivery standards, and personnel management KA2. Company occupational safety and health policies KA3. Company emergency evacuation procedure KA4. Company's medical policy

IAS/N2005

Health and Safety in Workplace

B. Technical Knowledge	<p>The individual on the job needs to know and understand:</p> <p>KB1. How to maintain the work area safe and secure</p> <p>KB2. How to handle hazardous materials, tools and equipment</p> <p>KB3. Emergency procedures to be followed such as fire accidents, electrocution etc.</p> <p>KB4. Long term value of good posture and use of appropriate handling equipment</p> <p>KB5. Safety regulations and standards and how to apply these</p> <p>KB6. Electrical grounding practices</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The individual on the job needs to know and understand:</p> <p>SA1. Compose E-mails, letters, memos, reminders, and other documents clearly</p> <p>SA2. Share knowledge, issues, problems and resolutions relating to safety and health</p>
	Reading Skills
	<p>The individual on the job needs to know and understand:</p> <p>SA3. Read mails, messages, alerts</p> <p>SA4. Read pictures, drawings, notes relating to safety and health</p>
	Oral Communication (Listening and Speaking skills)
	<p>The individual on the job needs to know and understand:</p> <p>SA5. Question co-workers in order to understand the safety and health issues</p> <p>SA6. Inform co-workers about safety and health issues</p> <p>SA7. Report issues and problems relating to safety and health to managers in clear terms</p>
B. Professional Skills	Decision Making
	<p>The user/individual on the job needs to know and understand how to:</p> <p>SB1. Make decisions pertaining to safety and health issues at workplace</p> <p>SB2. Make decisions about escalating safety and health issues at workplace to managers</p>
	Plan and Organise
	<p>The user/individual on the job needs to know and understand:</p> <p>SB3. Plan and organize work conforming to the safety and health norms of the company</p>
	Customer Centricity
<p>The user/individual on the job needs to know and understand how to:</p> <p>SB4. Discuss customer needs with co-workers and identify most appropriate solution make customer happy and make them want</p>	

IAS/N2005

Health and Safety in Workplace

	to work with the company
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. Discuss problems relating to the safety and health, evaluate the possible solution(s) and arrive at optimum /best possible solution(s)in consultation with concerned people
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB6. Discuss use the available information with co-workers to arrive at actionable decision points SB7. Analyze problems in team and identify causes and possible solutions
Critical Thinking	
The user/individual on the job needs to know and understand how to: SB8. Collaborate with co-workers to analyze, and evaluate the information gathered from collective observation, experience, reasoning, or communication, as a guide to teamwork	

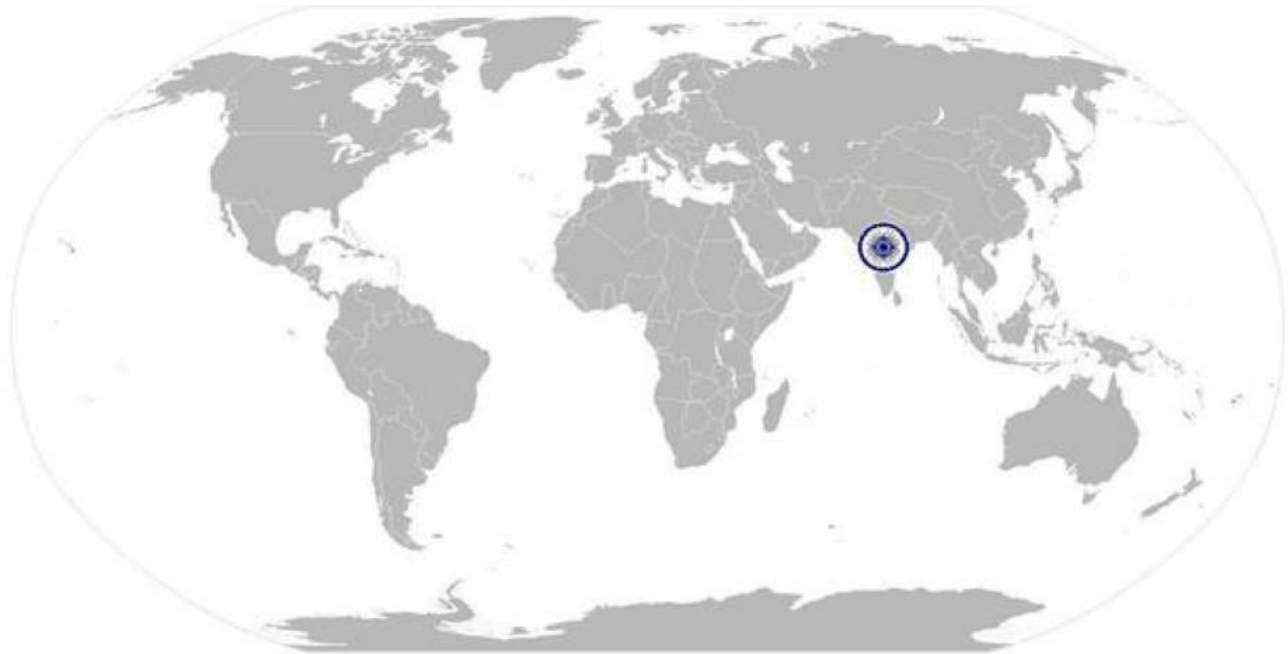


IAS/N2005

Health and Safety in Workplace

NOS Version Control

NOS Code	IAS/N2005		
Credits (NSQF)	TBD	Version number	1.0
Industry	Instrumentation Automation Surveillance & Communication	Drafted on	15/09/2017
Industry Sub-sector	Automation	Last reviewed on	15/09/2017
Occupation	PLC Programming, Comissioning & troubleshooting	Next review date	15/09/2019

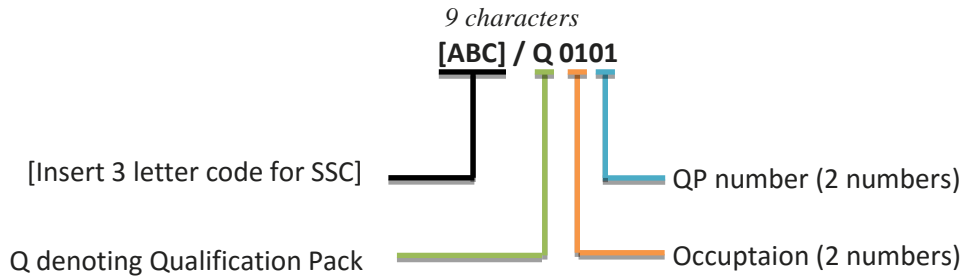


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Annexure

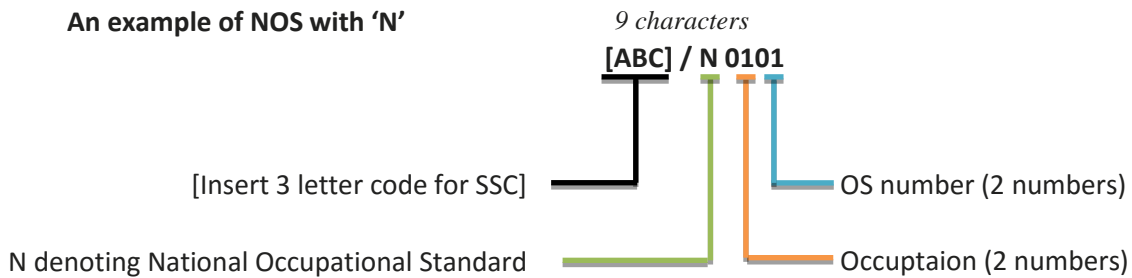
Nomenclature for QP and NOS

Qualification Pack



Occupational Standard

An example of NOS with 'N'



The following acronyms/codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Installation & Commissioning	00-29
Operation & Maintenance	30-49
Calibration	50-55
Design, Fabrication / Manufacturing	56-79
Design, Fabrication, Installation & commissioning	80-89
General	90-99

Sequence	Description	Example
Three letters	Industry name	[ABC, Font: Calibri (Body), size 11]
Slash	/	/
Next letter	Whether QP or NOS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role PLC Programmer and Troubleshooter

Qualification Pack IAS/Q8001

Sector Skill Council Instrumentation Automation Surveillance & Communication

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criteria.
5. To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

Assessment outcomes	Assessment Criteria for outcomes	Marks Allocation			
		Total Mark (600)	Out Of	Theory	Skills Practical
1. IAS/N2000 Understanding the PLC Control Panel & PLC Module / Equipments	PC1. Identify the customer requirement of the PLC Control Panel	170	10	10	0
	PC2. Understand and examine the onsite location where Control Panel will be placed		10	5	5
	PC3. Interact with customer & understand number of field equipments helping to analyze the size of control panel		10	10	0
	PC4. Prepare the dimension of control panel		20	10	10
	PC5. Interact with customer for Panel HMI mounting & Panel switches and then guiding fabrication team for the cutouts on panel door		10	10	0
	PC6. Assisting/Understanding the mounting of components on the mounting plate inside the control panel		10	5	5
	PC7. Interact with technicians to maintain free space inside control panel for mounting components for future expansion		10	5	5
	PC8. Examine the panel fabrication drawing and internal mounting layout drawings		10	5	5

	PC9. Understand the Mains power supply unit for powering the PLC Control panel		5	5	0
	PC10. Understanding the power supply unit for powering the PLC, HMI and other components of control panel		5	5	0
	PC11. Examine the power supply wiring to the CPU in PLC and other components inside the panel		10	5	5
	PC12. Understand the Digital Input-Output module		5	5	0
	PC13. Examine the wiring of the Digital IO modules with other components inside the panel		5	0	5
	PC14. Understand the Analog Input-Output module		5	5	0
	PC15. Examine the wiring of the Analog IO modules with other components inside the panel		5	0	5
	PC16. Understand special modules if used in PLC for advance communications.		5	0	5
	PC17. Examine the wiring of the special modules		5	5	0
	PC18. Understand the wiring diagrams between the PLC modules and the equipments/ components used in panel		5	5	0
	PC19. Understand the ferrule numbers used for the wiring in panel		5	5	0
	PC20. Understand the variants of Input equipments like switches, push buttons, Limit switches etc. used in panel		5	5	0
	PC21. Understand the variants of Output equipment like LED, lamps, hooters, exhaust fans etc. used in the panel		5	5	0
	PC22. Understand the equipments like relays, contactors etc used in panel		5	5	0
	PC23. Understand the terminal base along with the numbering used in panel to connect the field devices sensors, actuators, transmitters etc.		5	5	0
		Total	170	120	50
2.IAS/N2001 Developing PLC Program using PLC Software	PC1. Identify the Organization/Customer approved Software and use it for developing the process logics	140	20	10	10
	PC2. Collect information related to pre-requisites for software installation on PC/Laptops for programming		5	5	0
	PC3. Ensure availability of others software's like Office, Adobe reader, Windows features etc. which are required for the PLC programming software.		5	5	0

PC4. Ensure the communication protocol to be used for communicating between programming software and PLC	5	5	0
PC5. Check the availability of the communication port on PC/Laptop	5	5	0
PC6. Gather basic knowledge on different types of programming language available within the software	5	5	0
PC7. Acquire & collect information of normally open (NO) and normally closed (NC) contacts in field	5	5	0
PC8. Gather detailed information about the Bit instructions, Mathematical instructions, Conversion instruction & Compare instructions to be used in the program	10	5	5
PC9. Utilization of Timer & Counter logics blocks along with Move Data blocks which is required extensively in process logics	10	5	5
PC10. Analyzing the requirement of special blocks like PID, High Speed counters etc	10	5	5
PC11. Get detail information on communication program blocks used specially for communication between different components in panel	10	5	5
PC12. Using appropriate programming language as per standards	5	0	5
PC13. Discuss & collect information from customer regarding the equipments and instruments used in the plant	5	5	0
PC14. Prepare IO list from the inputs given by customer and guide the Control Panel makers to incorporate the desired number of IO's in panel	5	0	5
PC15. Collect information about configuring the PLC hardware details in the programming software	5	0	5
PC16. Adding PLC DI, DO, AI, AO, Special modules and set parameters in these modules for better performance in the plant	5	0	5
PC17. Find out the address of the signal modules to be later used in the programming logic developed for process execution	5	5	0
PC18. Discuss with customer to understand the automation required in the process plant	5	5	0
PC19. Explain the customer about the possible outcomes of the program which will be written in the PLC	5	5	0

	PC20. Develop the program as per customer inputs and process flow using appropriate programming language on programming device like PC/Laptop		10	0	10
		Total	140	80	60
3.IAS/N2002 Testing the PLC Program using Simulators	PC1. Complete the automation program and examine it using software checks like compilation before downloading	120	10	0	10
	PC2. Download the compilation error free program to the Computer based internal software simulator for further checks		10	0	10
	PC3. Activate the respective Inputs in software simulator to check the automation logic and thereby identify any error		10	0	10
	PC4. Modify and edit the logical error, data address overlap & wrong IO address access to maximize program stability		10	0	10
	PC5. Continue with further checks to eliminate the logical & address errors		5	0	5
	PC6. Download the modified, software simulated logic to PLC hardware available in office test bench		5	0	5
	PC7. Connect actual DI, DO, AI, AO modules to check the hardware loading on PLC		5	0	5
	PC8. Connect hardware toggle switches to test program reaction via virtual field inputs		5	0	5
	PC9. Connect hardware LED/Lamps to check output generated from PLC program		5	0	5
	PC10. Connect hardware analog simulators to check analog behavior of PLC program		5	0	5
	PC11. Identify and examine hardware related error which may occur during testing PLC program		10	5	5
	PC12. Identify PLC hardware related errors		5	5	0
	PC13. Ensure use of appropriate programming logics to avoid non functionality of CPU due to hardware errors		10	10	0
	PC14. Generate outputs from error handling PLC program for error monitoring on HMI devices like Display Panels or SCADA systems		10	0	10
	PC15. Examine these error handling programs by physically creating faults like supply failure, communication break, IO channel error, module failure etc		5	0	5
	PC16. Ensure completion of Factory Acceptance Test (FAT) and send report to customer		10	10	0
		Total	120	30	90
4.IAS/N2003	PC1. Collect information from customer for availability of resources and tools for	100	5	5	0

Commissioning & Testing the PLC Program using trial runs Onsite	Installation of PLC Control panel. Define a time period for completion of this task				
	PC2. Ensure the wiring between the Terminal base of PLC panel & the field devices is completed	5	5	0	
	PC3. Check the cable numbering and the ensure continuity test is done	5	5	0	
	PC4. Examine the Power supply input to PLC panel and turn it on	5	0	5	
	PC5. Activate the field sensors, limit switches etc. to verify them on input module	5	0	5	
	PC6. Activate the PLC outputs to check working of field outputs like actuators, contactors, relays etc.	5	0	5	
	PC7. Discuss and report to customer if any issues in physical IO check	5	5	0	
	PC8. Ensure the wiring and physical IO check is completed	5	5	0	
	PC9. Discuss and get permission from customer for downloading the program to PLC	5	5	0	
	PC10. Transfer the PLC program in the CPU	5	0	5	
	PC11. Check the PLC program by activating sensors, switches or push buttons and examine the function of outputs	5	0	5	
	PC12. Inform customer about the preliminary check of IO's and gather information about availability of resources for trial runs	5	5	0	
	PC13. Get permissions from customer for execution of process through PLC program	5	5	0	
	PC14. Identify errors in program and redo the logic after customer suggestion and maintain the standards	10	5	5	
	PC15. Ensure during trial runs error handling program works correctly to avoid sudden loss of productivity and attain a smooth shutdown if necessary	5	0	5	
	PC16. Train the operators to educate them the sequence of operation in case of emergency	5	5	0	
	PC17. Prepare a standard operating procedure (SOP) for the automation logic developed for the customer	5	0	5	
	PC18. Collect the backup of the final automation program and submit a copy to the plant head for future reference	5	0	5	
	PC19. Sign a report (MOM) for correctly completing the installation & commissioning of the plant.	5	5	0	
	Total	100	55	45	
5.IAS/N2004	PC1. Ask the problem in the machine/plant to the Supervisor/Engineer	110	5	5	0

Troubleshooting of faults in Machine or Process Plant	PC2. Prepare document before using a PLC to rectify the problem	5	5	0	
	PC3. Prepare a flow chart before troubleshooting any machine/plant	5	5	0	
	PC4. Check the control drawing of the machine/plant connected with the PLC and the different modules	5	5	0	
	PC5. Check the availability of modules, equipment and electrical components on site	5	5	0	
	PC6. Refer the settings of Instruments and installation guidelines	5	0	5	
	PC7. Providing the module replacement to the customer according to PLC	5	5	0	
	PC8. Check the availability of software & program backup in plant	5	5	0	
	PC9. Test the panel and modules which is recommended	5	0	5	
	PC10. Check earthing and power supply properly before troubleshooting	5	0	5	
	PC11. Cross check whether the PLC and its module is attached at right place	5	0	5	
	PC12. Communication cable is supporting the protocol or not	5	5	0	
	PC13. Add the other required connecting devices	5	0	5	
	PC14. Make changes in running project if it is required to rectify the faults	5	0	5	
	PC15. Match the product according to the catalog no. with the drawing and material List	5	5	0	
	PC16. At the time of troubleshooting check the connected devices are in operation or in stop	5	5	0	
	PC17. Parameter of the connected load must be entered accurately in PLC	5	0	5	
	PC18. Replace the module/equipment if it is found faulty	5	0	5	
	PC19. Take a program backup before and after troubleshooting	5	0	5	
	PC20. Get the parameter reading according to schedule	5	5	0	
	PC21. Install, test and start-up machine/plant on-site	5	0	5	
	PC22. Prepare a site report after troubleshooting and mention the remedy	5	5	0	
	Total		110	60	50
6.IAS/N2005 Health and Safety in	PC1. Comply with general and special safety procedures followed in the Company	70	10	10	0
	PC2. Follow specified safety procedures while handling an equipment, hazardous material or tool		5	0	5

Workplace	PC3. Remove ties, finger rings, or any other metal objects which may interfere with the work	5	0	5
	PC4. Use safety materials such as goggles, gloves, ear plugs, caps, ESD pins, covers, shoes, etc.	5	5	5
	PC5. Escalate about any hazardous materials or things found in the premises	5	5	0
	PC6. Report about any breach of safety procedure in the company	5	5	0
	PC7. Ensure zero accidents at work	5	5	0
	PC8. Avoid damage of components due to negligence in ESD procedures	5	0	5
	PC9. Regularly participate in fire drills or other safety related workshops organized by the company	5	0	5
	PC10. Ensure no loss for company due to safety negligence	5	5	0
	PC11. Maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials	5	0	5
	PC12. Participate in company organized health sessions such as yoga, physiotherapy or games	5	0	5
	PC13. Handle heavy and hazardous materials with care and using appropriate tools and handling equipment such as trolleys, jacks and ladders	5	0	5
	Total	70	30	40

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