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

Contents

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-HMI/SCADA Programmer & Troubleshooter

SECTOR: INSTRUMENTATION AUTOMATION SURVEILLANCE & COMMUNICATION

SUB-SECTOR: Automation

OCCUPATION: HMI/SCADA Programming, Commissioning & troubleshooting

REFERENCE ID: IAS/Q8002

ALIGNED TO: NCO-2015/ NIL

HMI/SCADA Programmer & Troubleshooter provides solution to Process Industry engineering and later troubleshoots any issues in Plant operations. HMI/SCADA is used for Controlling and Monitoring of different processes in a plant, store data and messages for specific duration and to generate reports.

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

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

Qualifications Pack Code	**IAS/Q8002**		
Job Role	**HMI/SCADA 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	**HMI/SCADA Programming, Comissioning & troubleshooting**	**Next review date**	**15/09/2019**
NSQC Clearance on*	**DD/MM/YYYY**		

*** only after clearance from NSQC**

Job Role	**HMI/SCADA Programmer and Troubleshooter**
Role Description	a. Programming of HMI/SCADA Software b. Commissioning of HMI/SCADA system onsite c. Troubleshooting of HMI/SCADA project 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 HMI/SCADA
Minimum Job Entry Age	21 years.
Experience	Minimum 1 year Experience Individual should assist Senior Engineer for commissioning and troubleshooting for atleast six months Perform programming, commissioning and troubleshooting under supervision of Senior Engineer for six months
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. IAS/N2100 Collect information related to HMI/SCADA system and architectures 2. IAS/N2101 Develop HMI/SCADA Project using relevant Software 3. IAS/N2102 Commissioning and Testing the HMI/SCADA project onsite 4. IAS/N2103 Troubleshooting of faults in HMI/SCADA project during runtime 5. IAS/N2005 Health and Safety in Workplace **Optional:** N.A.
Performance Criteria	As described in the relevant OS units

Definitions

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.
Qualifications 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 qualifications pack code.
Unit Code	Unit codeis 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 varialbles 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 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.
Techinical Knowledge	Techinical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.

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.

Acronyms

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
PC	Personal Computer or Desktop
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

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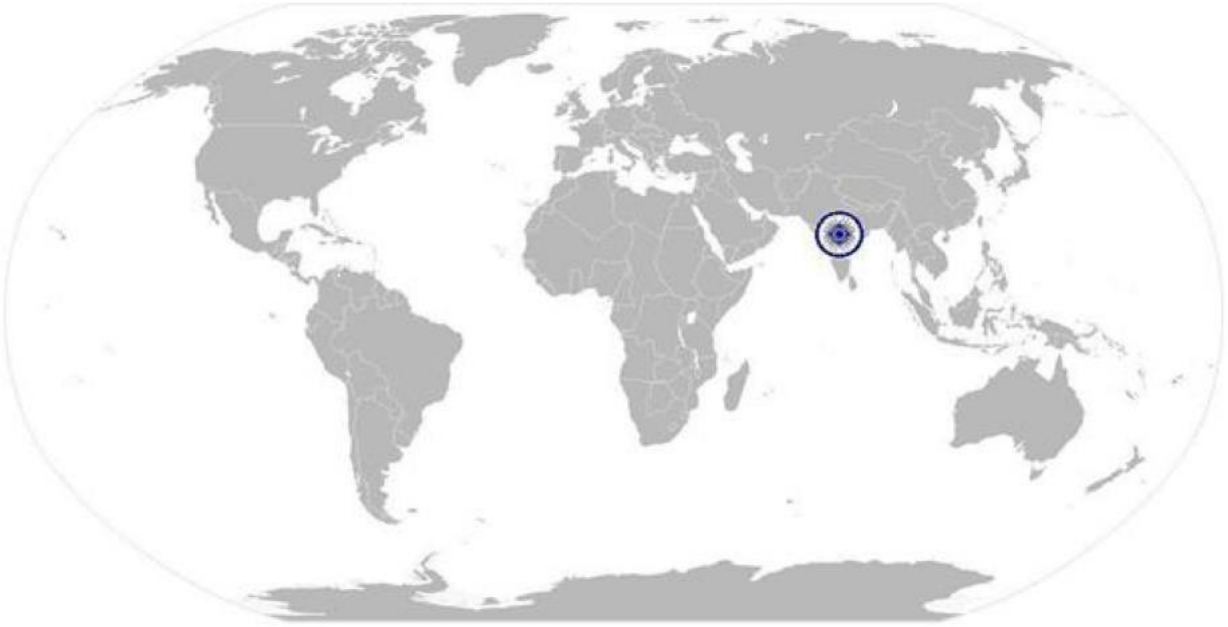
National Occupational Standard



Overview

This unit is about collecting information related to HMI/SCADA system and architecture.

IAS/N2100 **Collect information related to HMI/SCADA system and architecture**

National Occupational Standard

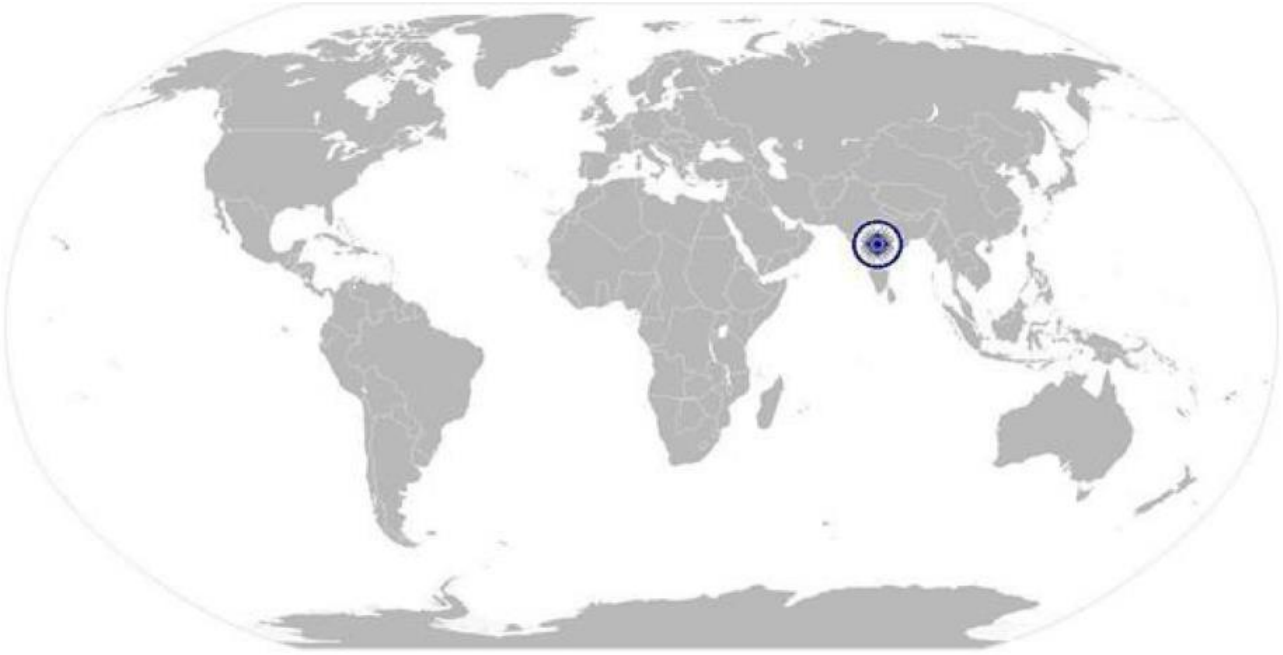
Unit Code	IAS/N2100
Unit Title (Task)	**Collect information related to HMI/SCADA system and architecture**
Description	This unit is collecting information related to HMI/SCADA system and architecture.
Scope	This unit/task covers the following: • Collect details about the Plant for HMI/SCADA project development • Analyze and understand the requirement of HMI/SCADA system • Discuss the HMI/SCADA layout and distribution with customer
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Collect details about the Plant for HMI/SCADA project development	To be competent, the user/individual on the job must be able to PC1. Collect the information from customer regarding the type of HMI/SCADA PC2. Collect the information from customer regarding the number of tags license required for SCADA softwares PC3. Collect the information from customer regarding the communication protocol between SCADA and PLC system PC4. Collect the details like Input/ Output list and P&ID from the plant engineer PC5. Collect information regarding the type and make of the PLC used in the Control Panel PC6. Analyze and check the cutout for HMI panel on the door of control panel PC7. Discuss and understand the detailed Plant layout
Analyze and understand the requirement of HMI/SCADA system	PC8. Understand the plant architecture and its complexity PC9. Discuss the benefits of HMI Panel and SCADA system PC10. Understand and analyze the requirements of customer form the HMI/SCADA system PC11. Suggest customer for HMI Panel or SCADA system
Discuss the HMI/SCADA layout and distribution with customer	PC12. Gather information from customer regarding distribution of the process pictures on HMI/SCADA project PC13. Discuss the possible solutions regarding the distribution of pictures PC14. Identify customer needs for standard or customized layout of HMI/SCADA project
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 code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Company's line of business and production policy KA4. Departments involved with installation and commissioning

	KA5. Quality and standards system followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Basics of electrical, electronics and instrumentation KB2. Standard operating procedure (SOP) of the organization for HMI/SCADA design and layout KB3. Quality, standards and guidelines to be followed during HMI/SCADA design and layout development KB4. HMI/SCADA Panel and equipments used in the automation process KB5. HMI/SCADA programming software KB6. General P&ID arrangement drawing KB7. Instrumentation used in the factory and its layout details KB8. PLC Control panel and wiring knowledge KB9. Sources and methods for obtaining required technical information for the HMI/SCADA being developed KB10. Relevant regulations, standards and codes of practice and their implications on the design KB11. Relevant documents and procedures used in the process
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 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 of project development 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 project SB3. Make decisions pertaining to readiness of customer site for HMI/SCADA project installation SB4. Make decisions pertaining to changes in project onsite
	Plan and Organise
	The user/individual on the job needs to know and understand: SB5. Plan and organize 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
	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

NOS Version Control

NOS Code	**IAS/N2100**		
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	**HMI/SCADA Programming, Comissioning & troubleshooting**	**Next review date**	**15/09/2019**



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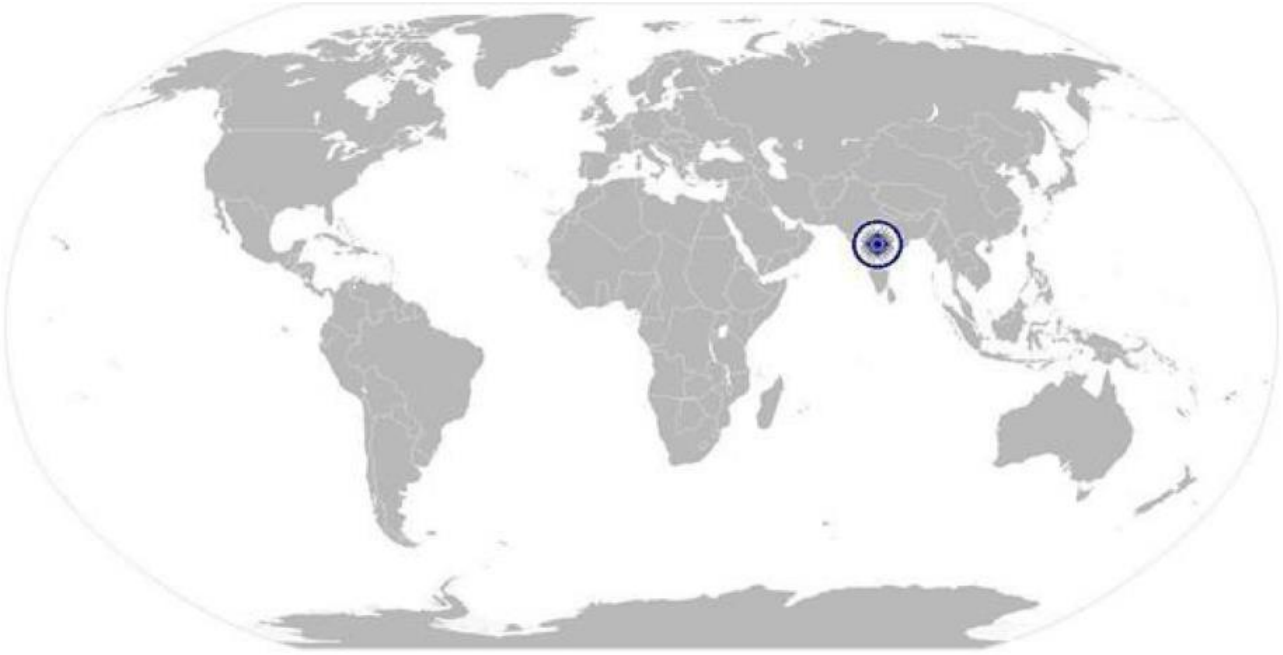


Overview

This unit is about developing HMI/SCADA project using programming software.

IAS/N2101 **Develop HMI/SCADA project using relevant Software**

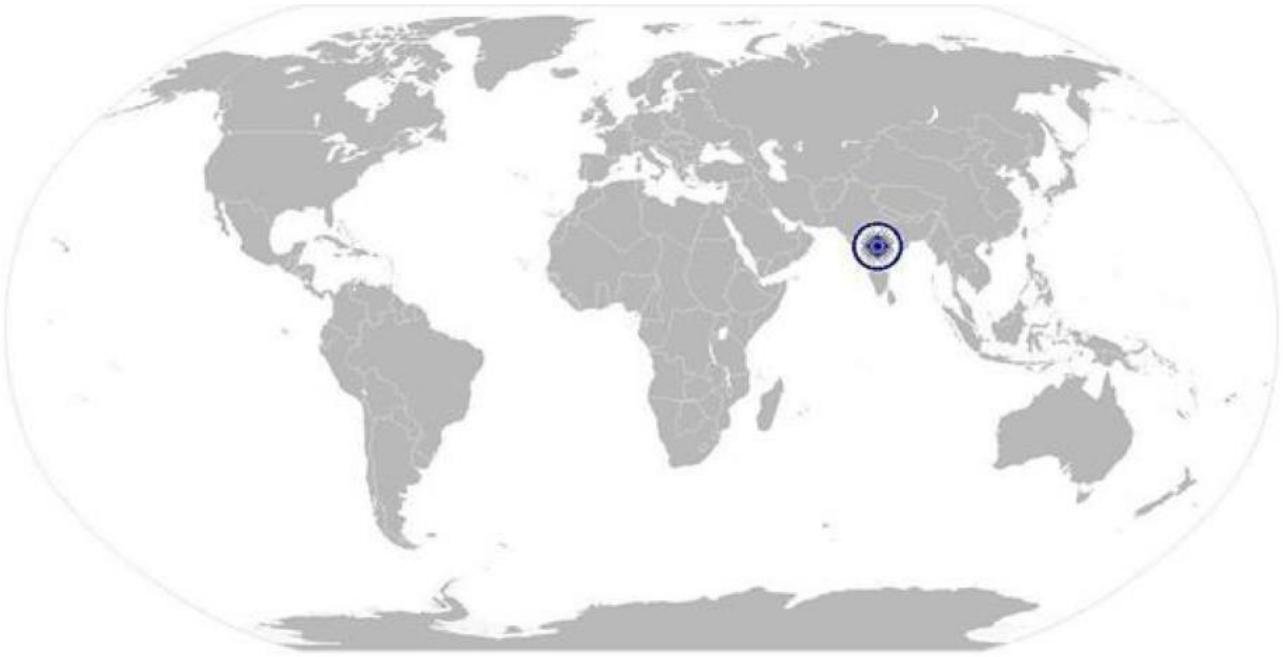
National Occupational Standard

Unit Code	IAS/N2101
Unit Title (Task)	**Develop HMI/SCADA project using relevant Software**
Description	This unit is about to develop HMI/SCADA project using the programming software.
Scope	This unit/task covers the following: • Understand the pre-requisite of the HMI/SCADA software • Collect necessary module/ equipment for communication with software • Develop the HMI/SCADA program
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Understand the pre-requisite of the HMI/SCADA software	To be competent, the user/individual on the job must be able to PC1. Identify the Organization/Customer approved Software and use it for developing the HMI/SCADA project PC2. Collect information related to pre-requisites for software installation on PC/Laptops for programming PC3. Ensure availability of others software's like Office, Adobe reader, Windows features etc. which are required for the HMI/SCADA programming software. PC4. Ensure the communication protocol to be used for communication PC5. Gather basic knowledge on HMI/SCADA software for developing project PC6. Understand the requirement of Operating System of computer to install SCADA Software
Collect necessary module/ equipment for communication with software	PC7. Check the availability and type of communication port on HMI Panel or PC/Laptop PC8. Check the availability of communication port on PLC for communication with HMI/SCADA system PC9. Ensure the communication protocol compatibility between PLC and HMI/SCADA PC10. Check availability of protocol convertor, if communication protocol is not compatible PC11. Arrange protocol compatible cable for communication between PLC and HMI/SCADA
Develop the HMI/SCADA program	PC12. Create a HMI/SCADA project and establish a connection with the PLC PC13. Develop the I/O tag list in the HMI/SCADA project PC14. Develop pictures on HMI/SCADA software as per the approved distribution PC15. Create objects on the pictures as per the final P&ID and connect them with tags PC16. Develop value and alarm storage system in the software and create backup for the same PC17. Provide security level for different users of the project.

	PC18. Create report templates for generation of the timely reports
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 code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Company's line of business and production policy KA4. Departments involved with installation and commissioning KA5. Quality and standards system followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Basics of computer and operating systems KB2. Standard operating procedure (SOP) of the organization for HMI/SCADA pictures and layout development KB3. Quality, standards and guidelines to be followed during project development KB4. Detailed information about panels and equipments used in the HMI/SCADA project KB5. HMI/SCADA programming software KB6. Application software, Installation and debugging 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. Sources and methods for obtaining required technical information for the HMI/SCADA project to be developed KB11. Relevant documents to be referred for optimized project development
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 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

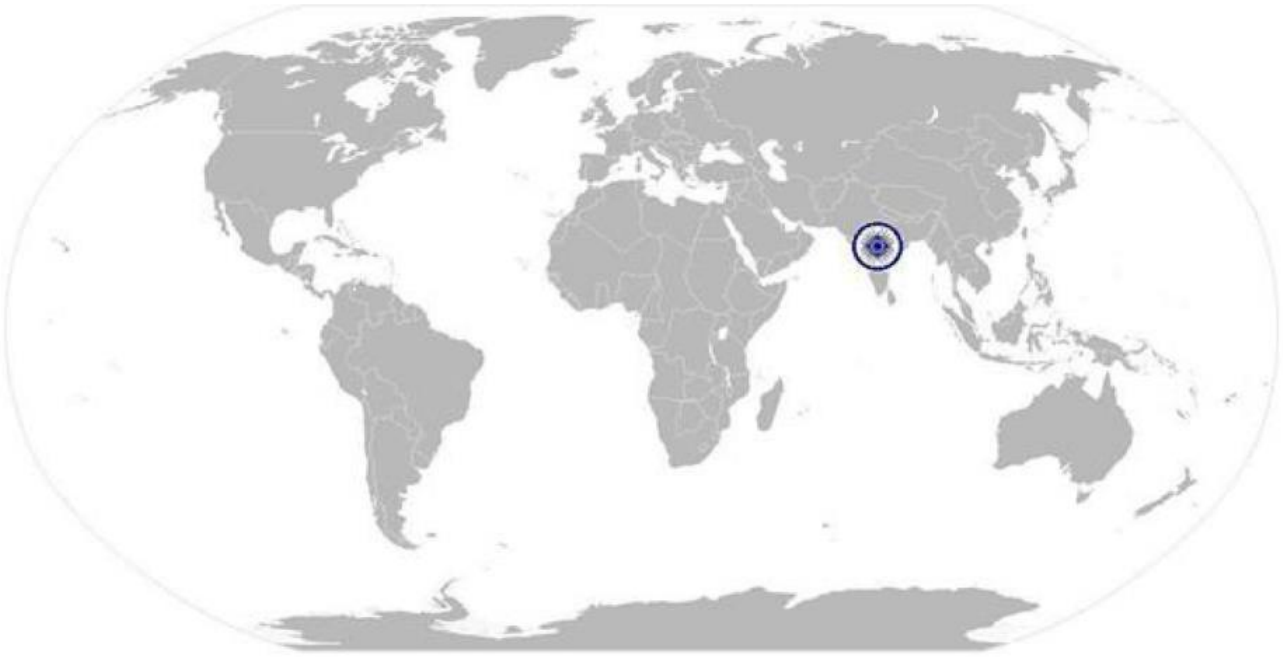
	SA9. Read schedules and timelines SA10. Read drawings
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA11. Question customers appropriately in order to understand the application and the requirements SA12. Discuss task lists, schedules, and work-loads with customers SA13. Keep customers informed about progress of project development SA14. Use simple and clear language when communicating with a customer
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 use of relevant HMI/SCADA programming software SB3. Make decisions pertaining to optimize project development
	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
	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 project SB14. Use the existing information to optimize the project 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 HMI/SCADA program



NOS Version Control

NOS Code	**IAS/N2101**		
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	**HMI/SCADA Programming, Comissioning & troubleshooting**	**Next review date**	**15/09/2019**



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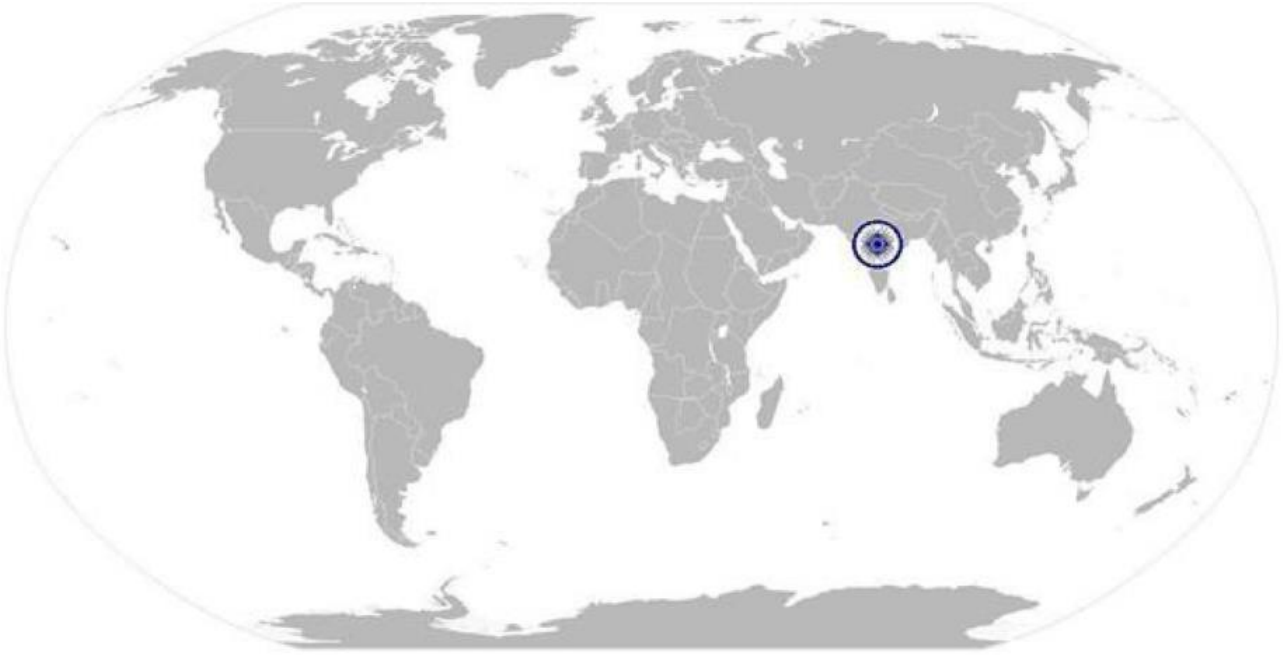


Overview

This unit is about commissioning and testing the HMI/SCADA project onsite.

IAS/N2102 **Commissioning and Testing the HMI/SCADA project onsite**

National Occupational Standard

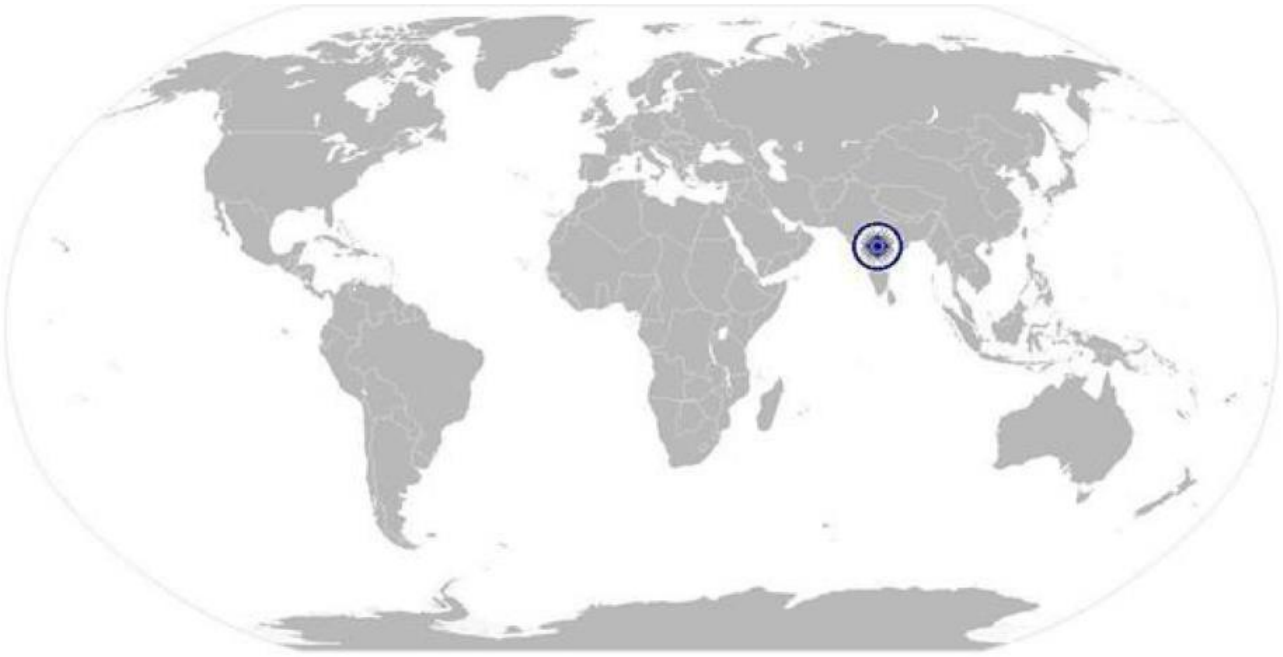
Unit Code	IAS/N2102
Unit Title (Task)	**Commissioning and Testing the HMI/SCADA project onsite**
Description	This unit is about to commission and testing of HMI/SCADA project onsite location.
Scope	This unit/task covers the following: • Transferring the project to the plant HMI Panel or PC system • Testing the HMI/SCADA program using actual field devices • Developing the fault monitoring program in the HMI/SCADA project
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Transferring the project to the plant HMI Panel or PC system	To be competent, the user/individual on the job must be able to PC1. Configure IP address for HMI PC2. Configure IP address for SCADA system PC3. Transfer the HMI project from laptop to the HMI panel PC4. Copy the SCADA project to plant PC in an appropriate location PC5. Examine the plant Operator PC is equipped with approved software and licenses
Testing the HMI/SCADA program using actual field devices	PC6. Activate the HMI/SCADA project in run mode PC7. Examine the PLC connection with the HMI/SCADA system is healthy PC8. Perform Input and Output checks on HMI/SCADA by activating them in field PC9. Check the picture navigation on HMI Panel or the SCADA system PC10. Test the animation on the pictures, values/alarms storage, security level and the report printout
Developing the fault monitoring program in the HMI/SCADA project	PC11. Create objects on the HMI/SCADA project which monitors failure of PLC connection with HMI panel or PC system. PC12. Develop pictures monitoring the performance of the PC system in SCADA projects PC13. Interconnect SCADA project with diagnostic software's for fault diagnostics in components. PC14. Protect PC systems by using recommended antivirus software
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. Basics of electrical, electronics and instrumentation KB2. Basics of computer and operating systems

	KB3. Standard operating procedure (SOP) of the organization for process automation HMI/SCADA testing KB4. HMI/SCADA system 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. Testing process and parameters involved in the testing KB11. Sources and methods for obtaining required technical information for the HMI/SCADA project to be tested KB12. Relevant documents to be referred for testing HMI/SCADA project
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
	Oral Communication (Listening and Speaking skills)
	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
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 faults in programming SB3. Make decisions pertaining to readiness of HMI/SCADA project for

	installation SB4. Make decisions pertaining to installation of HMI/SCADA project onsite
	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 deliver most appropriate solution SB8. Build good relationships and rapport with customers which will help in inputs related to program testing
	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 problems of colleagues lacking the technical background SB11. Identify immediate or temporary solutions to resolve faults and implement the proper solution immediately
	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 to optimize HMI/SCADA project SB14. Analyze problems and identify causes and possible solutions
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB15. Apply, analyze and evaluate the information gathered from observation, experience, reasoning or communication, as a guide to think and take action SB16. Anticipate problems, risks and opportunities and utilize these for optimizing HMI/SCADA project

NOS Version Control

NOS Code	IAS/N2102		
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	HMI/SCADA Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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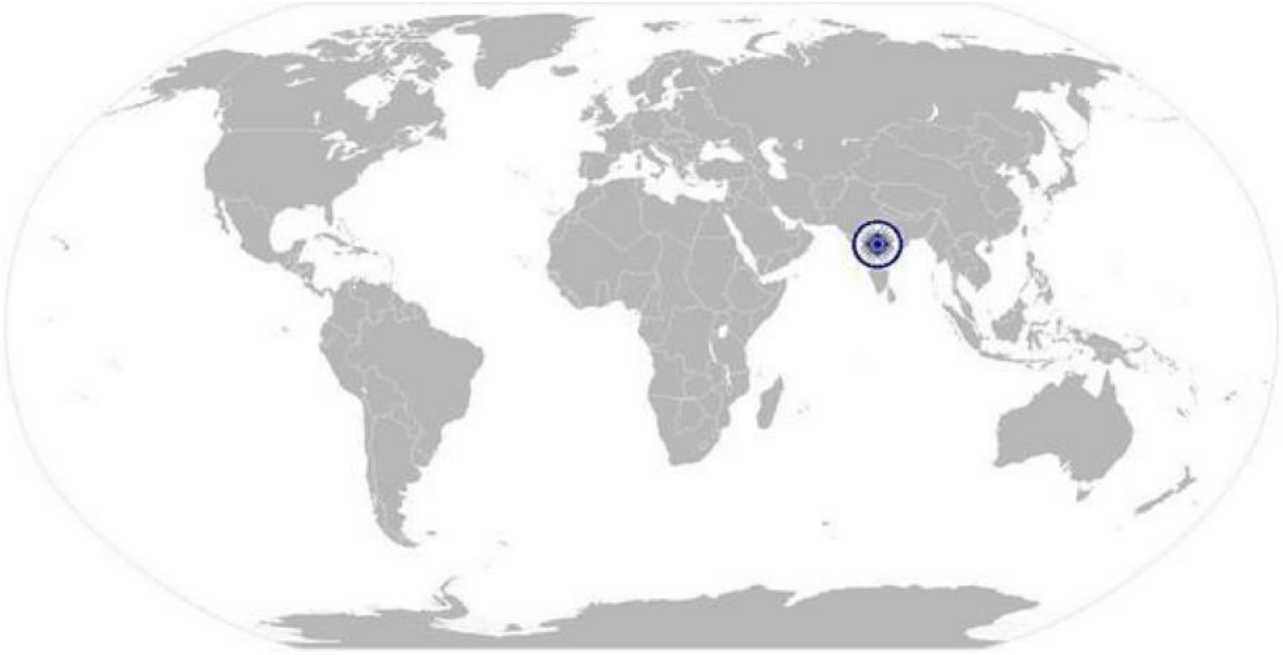


Overview

This unit is about fault finding and troubleshooting of HMI/SCADA project during runtime onsite location.

IAS/N2103 **Troubleshooting of faults in HMI/SCADA project during runtime**

National Occupational Standard

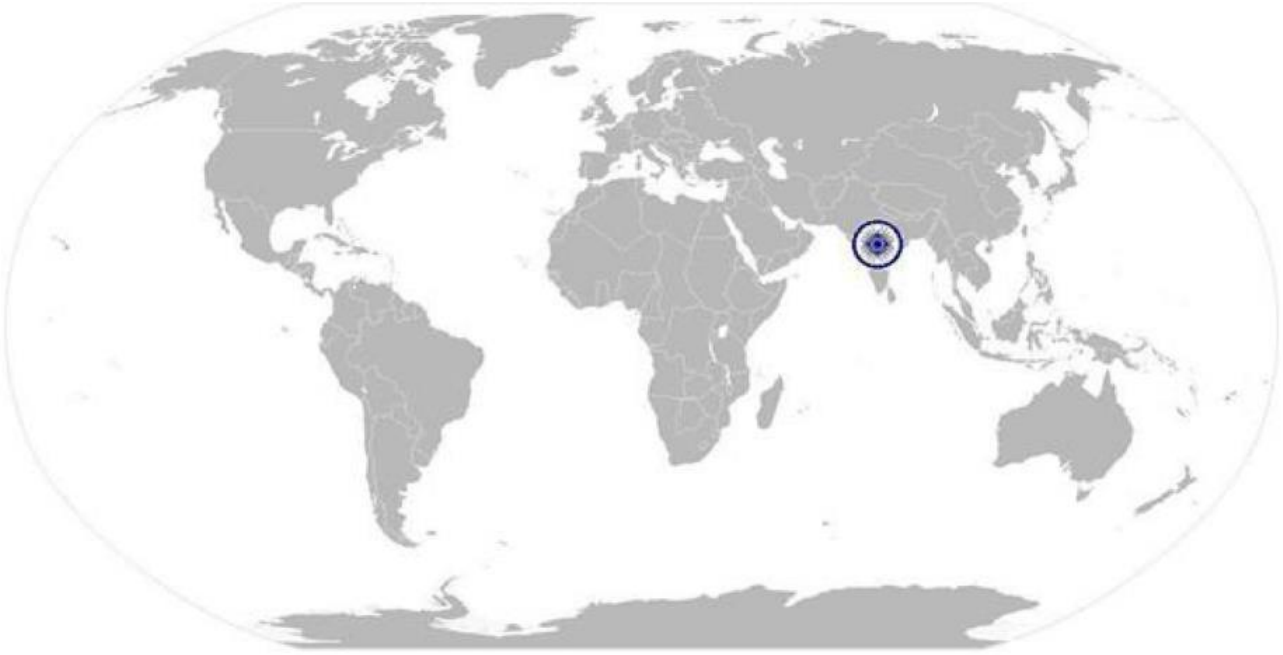
Unit Code	**IAS/N2103**
Unit Title (Task)	**Troubleshooting of faults in HMI/SCADA project during runtime**
Description	This unit is about fault finding and troubleshooting of HMI/SCADA projects during runtime.
Scope	This unit/task covers the following: • Check the HMI Panel and its connectivity • Check the SCADA system on a PC to understand the development
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Check the HMI Panel and its connectivity	To be competent, the user/individual on the job must be able to PC1. Ensure proper power supply is received by the HMI panel PC2. Examine the communication cable between PLC and HMI panel is healthy PC3. Verify the program in HMI panel is latest, if not transfer the latest program again PC4. Perform preliminary test on the HMI panel and its connection
Check the SCADA system on a PC to understand the development	PC5. Check the healthiness of the PC system PC6. Examine the communication cable between PLC and PC system is healthy PC7. Create free space in PC system by deleting unwanted projects PC8. Check the PC system for any virus and eliminate the virus PC9. Transfer the latest backup in the PC system and start the project PC10. Check connection with PLC and various activities in project
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 code of conduct, organization culture and reporting structure KA2. Company's documentation policy KA3. Company's line of business and production policy KA4. Departments involved with installation and commissioning KA5. Quality and standards system followed in the company
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. Basics of electrical, electronics and instrumentation KB2. Basics of computer and operating systems KB3. Standard operating procedure (SOP) of the organization for troubleshooting of process plant KB4. Basics of machine safety and normal safety processes KB5. Quality, standards and guidelines to be followed during installation and commissioning KB6. HMI/SCADA programming software used for fault finding KB7. Application software, Installation and debugging

	KB8. Piping and instrumentation diagram (P&ID) KB9. Basics on industrial process involved (example: oil and gas, refinery, etc) and stages involved in the process KB10. Basics on infrastructure process involved in the industry (example: water treatment plant, chilling units etc.) KB11. Electrical panel and wiring knowledge KB12. Debugging process and parameters involved in the troubleshooting KB13. Sources and methods for obtaining required technical information for troubleshooting KB14. Relevant regulations, standards and codes of practice for fault finding process KB15. How to communicate with shop floor technicians in order to resolve any error during debugging
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
	Plan and Organise
	The user/individual on the job needs to know and understand: SB3. Plan and organize project - including requirements, design and integration, testing, installation and commissioning, Troubleshooting, Customer Acceptance Test and customer feedback SB4. Anticipate issues and have alternate strategy
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB5. Understand real needs of the customer and suggest most appropriate solution SB6. Support customer when they need help SB7. Make customer happy and make them want to work with the company SB8. Manage relationships with customers who may be stressed, frustrated, confused or angry SB9. Build customer relationships and rapport which will speed up commissioning
	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 problems of co-workers during troubleshooting SB12. Identify immediate or temporary solutions to resolve delays and implement the proper solution when possible
	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 by optimizing solution 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 thought and action SB17. Anticipate problems, risks and opportunities and utilize these for optimizing the commissioning

NOS Version Control

NOS Code	**IAS/N2103**		
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	**HMI/SCADA Programming, Comissioning & troubleshooting**	**Next review date**	**15/09/2019**



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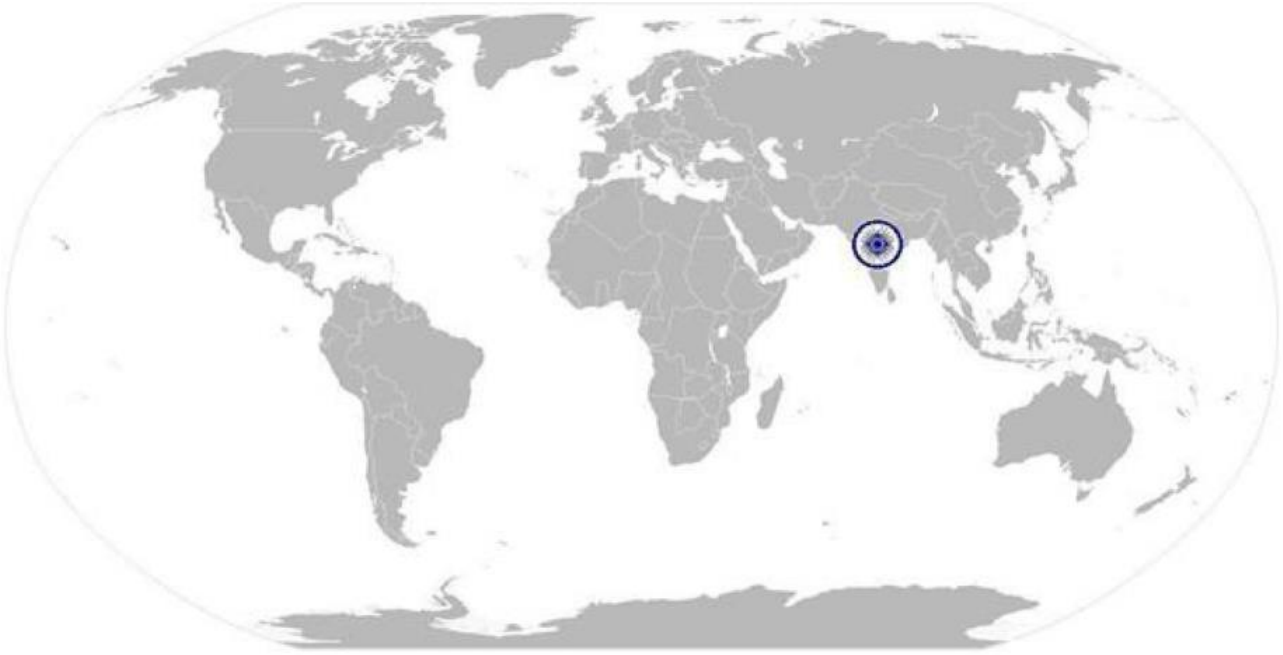
National Occupational Standard



Overview

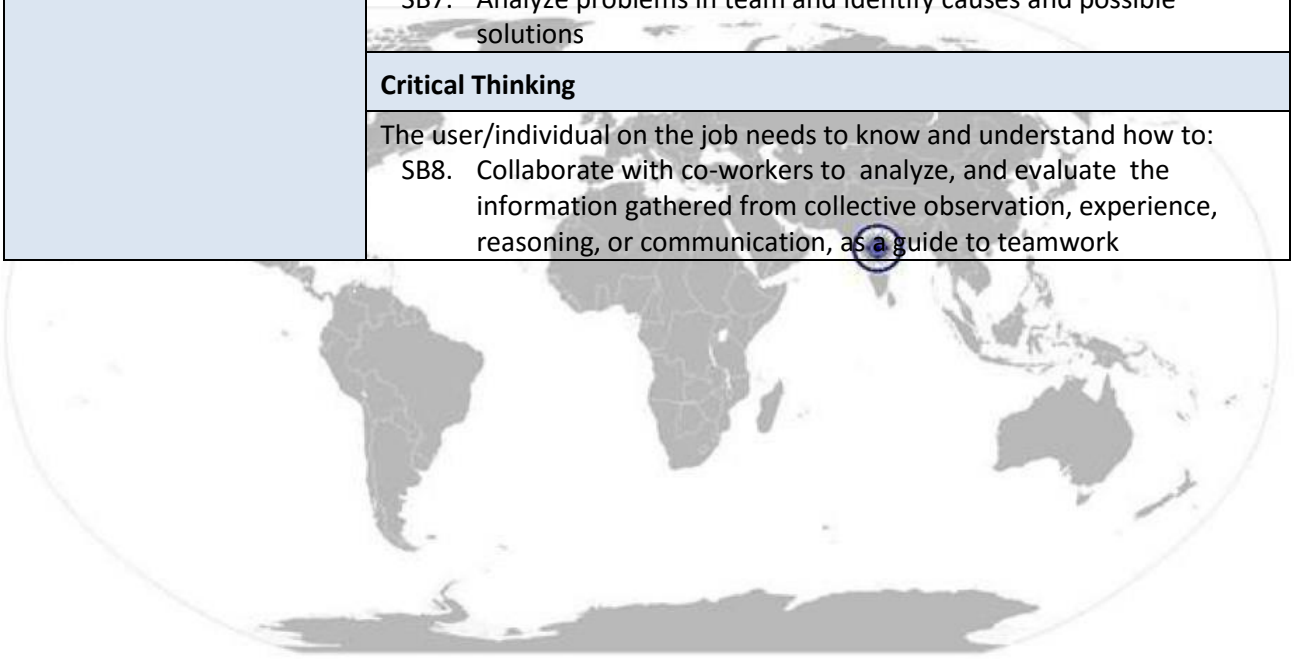
This unit is about the individual's responsibility to maintain a safe, healthy and secure working environment.

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: • 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: 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	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: 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

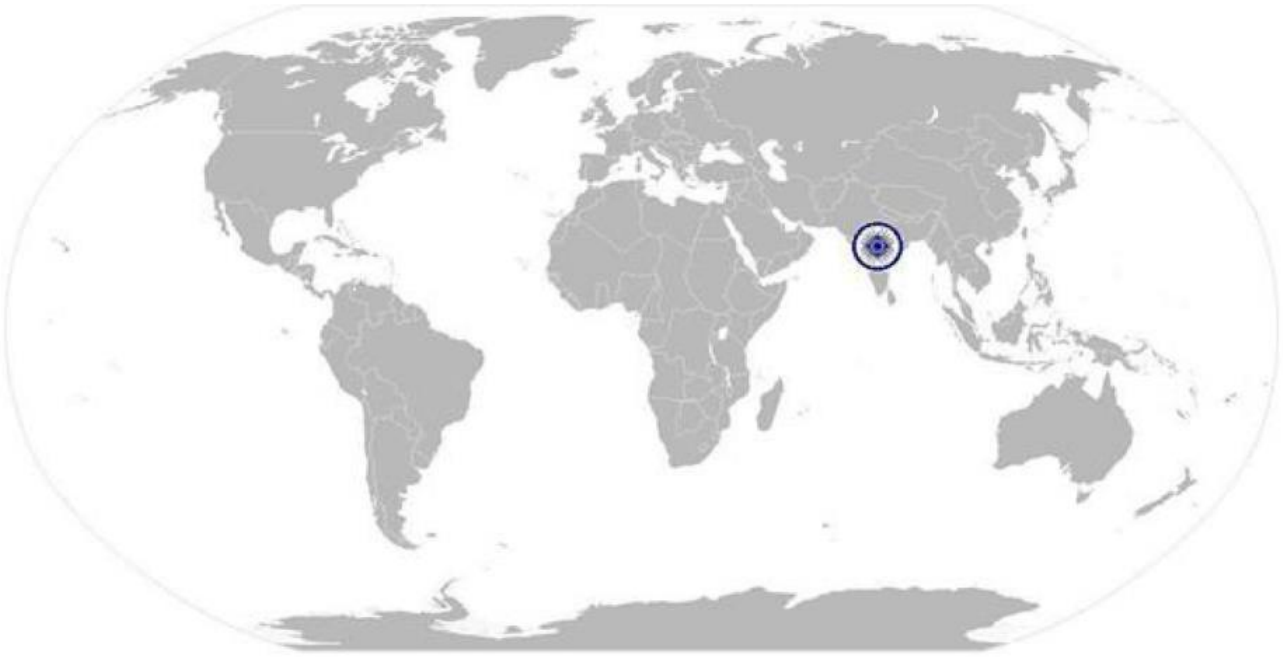
B. Technical Knowledge	The individual on the job needs to know and understand: KB1. How to maintain the work area safe and secure KB2. How to handle hazardous materials, tools and equipment KB3. Emergency procedures to be followed such as fire accidents, electrocution etc. KB4. Long term value of good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

	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



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	HMI/SCADA Programming, Comissioning & troubleshooting	Next review date	15/09/2019



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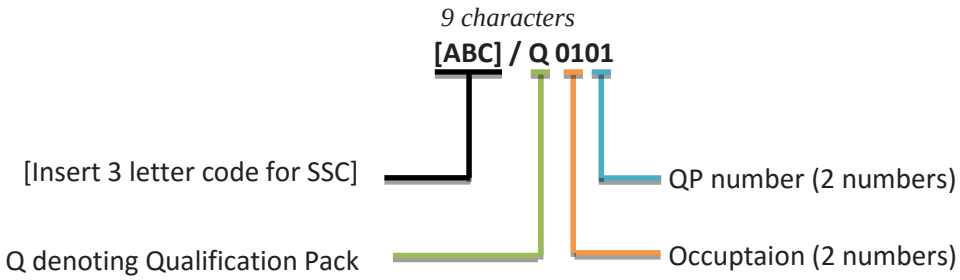
Annexure

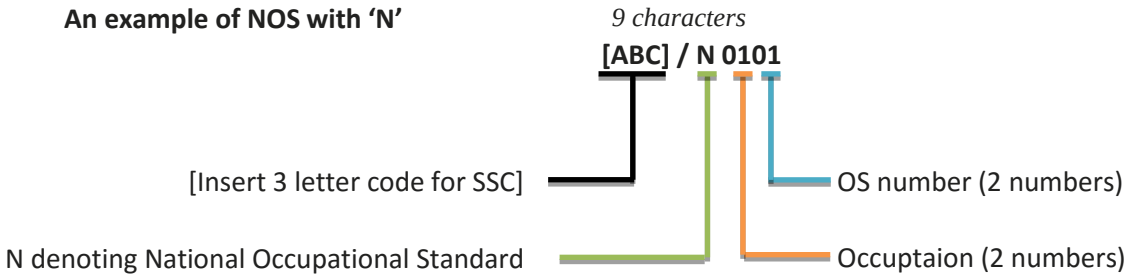
Nomenclature for QP and NOS

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 **Q**P or **N**OS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

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CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role HMI/SCADA Programmer and Troubleshooter

Qualification Pack IAS/Q8002

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 evaulations 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.

		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	**Total Mark (470)**	**Out Of**	**Theory**	**Skills Practical**
1.IAS/N2100 Collect information related to HMI/SCADA system and architectures	PC1. Collect the information from customer regarding the type of HMI/SCADA	**120**	10	10	0
	PC2. Collect the information from customer regarding the number of tags license required for SCADA software		10	10	0
	PC3. Collect the information from customer regarding the communication protocol between SCADA and PLC system		10	10	0
	PC4. Collect the details like Input/ Output list and P&ID from the plant engineer		10	10	0
	PC5. Collect information regarding the type and make of the PLC used in the Control Panel		10	10	0
	PC6. Analyze and check the cutout for HMI panel on the door of control panel		10	5	5
	PC7. Discuss and understand the detailed Plant layout		10	10	0
	PC8. Understand the plant architecture and its complexity		5	5	0
	PC9. Discuss the benefits of HMI Panel and SCADA system		10	10	0

	PC10. Understand and analyze the requirements of customer form the HMI/SCADA system		10	5	5
	PC11. Suggest customer for HMI Panel or SCADA system		5	5	0
	PC12. Gather information from customer regarding distribution of the process pictures on HMI/SCADA project		5	5	0
	PC13. Discuss the possible solutions regarding the distribution of pictures		5	5	0
	PC14. Identify customer needs for standard or customized layout of HMI/SCADA project		10	10	0
		Total	120	110	10
2. IAS/N2101 Develop HMI/SCADA project using relevant Software	PC1. Identify the Organization/Customer approved Software and use it for developing the HMI/SCADA project	**130**	10	5	5
	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 HMI/SCADA programming software.		5	5	0
	PC4. Ensure the communication protocol to be used for communication		5	5	0
	PC5. Gather basic knowledge on HMI/SCADA software for developing project		10	5	5
	PC6. Understand the requirement of Operating System of computer to install SCADA Software		10	10	0
	PC7. Check the availability and type of communication port on HMI Panel or PC/Laptop		5	5	0
	PC8. Check the availability of communication port on PLC for communication with HMI/SCADA system		5	5	0
	PC9. Ensure the communication protocol compatibility between PLC and HMI/SCADA		10	5	5
	PC10. Check availability of protocol convertor, if communication protocol is not compatible		10	5	5
	PC11. Arrange protocol compatible cable for communication between PLC and HMI/SCADA		5	0	5
	PC12. Create a HMI/SCADA project and establish a connection with the PLC		5	0	5
	PC13. Develop the I/O tag list in the HMI/SCADA project		5	0	5

	PC14. Develop pictures on HMI/SCADA software as per the approved distribution		10	0	10
	PC15. Create objects on the pictures as per the final P&ID and connect them with tags		10	0	10
	PC16. Develop value and alarm storage system in the software		10	0	10
	PC17. Provide security level for different users of the project.		5	0	5
	PC18. Create report templates for generation of the timely reports		5	0	5
		Total	130	55	75
3.IAS/N2102 Commissioning & Testing the HMI/SCADA project onsite	PC1. Configure IP address for HMI	**100**	5	0	5
	PC2. Configure IP address for SCADA system		5	0	5
	PC3. Transfer the HMI project from laptop to the HMI panel		10	0	10
	PC4. Copy the SCADA project to plant PC in an appropriate location		10	0	10
	PC5. Examine the plant Operator PC is equipped with approved software and licenses		10	5	5
	PC6. Activate the HMI/SCADA project in run mode		5	0	5
	PC7. Examine the PLC connection with the HMI/SCADA system is healthy		5	0	5
	PC8. Perform Input and Output checks on HMI/SCADA by activating them in field		10	0	10
	PC9. Check the picture navigation on HMI Panel or the SCADA system		5	0	5
	PC10. Test the animation on the pictures, values/alarms storage, security level and the report printout		5	0	5
	PC11. Create objects on the HMI/SCADA project which monitors failure of PLC connection with HMI panel or PC system.		10	0	10
	PC12. Develop pictures monitoring the performance of the PC system in SCADA projects		10	0	10
	PC13. Interconnect SCADA project with diagnostic software's for fault diagnostics in components		5	0	5
	PC14. Protect PC systems by using recommended antivirus software		5	5	0
		Total	100	10	90
4.IAS/N2103 Troubleshooting of faults in HMI/SCADA	PC1. Ensure proper power supply is received by the HMI panel	**50**	5	0	5
	PC2. Examine the communication cable between PLC and HMI panel is healthy		5	0	5
	PC3. Verify the program in HMI panel is latest, if not transfer the latest program again		5	0	5

project during runtime	PC4. Perform preliminary test on the HMI panel and its connection		5	0	5
	PC5. Check the healthiness of the PC system		5	0	5
	PC6. Examine the communication cable between PLC and PC system is healthy		5	0	5
	PC7. Create free space in PC system by deleting unwanted projects		5	0	5
	PC8. Check the PC system for any virus and eliminate the virus		5	0	5
	PC9. Transfer the latest backup in the PC system and start the project		5	0	5
	PC10. Check connection with PLC and various activities in project		5	0	5
		Total	50	0	50
5.IAS/N2005 Health and Safety in Workplace	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
	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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