QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR POWER SECTOR

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

Qualifications Pack- Power Plant Millwright Fitter

SECTOR: POWER

SUB-SECTOR: Generation

OCCUPATION: Plant & Equipment Maintenance

REFERENCE ID: PSC / Q 0301

ALIGNED TO: NCO-2004/7233.38

Power Plant Millwright Fitters also known as Maintenance Fitters are responsible for dismantling, inspecting, repairing, assembling, installing, aligning, commissioning of power plant machinery and equipment.

Brief Job Description: The incumbent works on power plant machinery and mechanical equipment and components. This equipment may include turbines and internal combustion engines, power transmission assemblies, basic pneumatic systems, basic hydraulic systems, pumps, compressors,fans, fuel handling system, lubrication, cooling and exhaust systems, etc. Some components worked on include bearings, valves, drives.

Personal Attributes: Physically and mentally able to safely perform essential functions of the job. This will also include differently abled people who can perform the job with or without reasonable accommodations (modified practices.) The candidate should be able to climb ladders, scaffolds, poles and towers of various heights. Also able to crawl and work in confined spaces such as attics, manholes and crawlspaces.The candidate should be able to read, hear and understand instructions and warnings.

Job Details

Qualifications Pack Code	**PSC / Q 0301**		
Job Role	**Power Plant Millwright Fitter**		
Credits (NSQF)	**TBD**	**Version number**	**1.0**
Sector	**Power**	**Drafted on**	**26/03/15**
Sub-sector	**Generation**	**Last reviewed on**	**26/03/15**
Occupation	**Plant and Equipment Maintenance**	**Next review date**	**26/03/17**

Job Role	**Power Plant Millwright Fitter also known as Power Plant Maintenance Fitter**
Role Description	**Power Plant Millwright Fitter** is responsible for dismantling, inspecting, repairing, assembling, installing, aligning, commissioning of power plant machinery and equipment.
NSQF level **Minimum Educational Qualifications** **Maximum Educational Qualifications**	4 8th NA
Training (Suggested but not mandatory)	ITI, Certificate or Customised training on Mechanical equipment or machines Maintenance/ installation / commissioning MMA Welding and Oxy-Fuel Gas Cutting
Experience	For ITI - 1 year on the job experience as Power Plant Mechanical Junior Fitter For Non-ITI upto 8th Std - 2 years on the job experience as Power Plant Mechanical Junior Fitter
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. PSS/ N 0302 (Perform maintenance activities on power generation plant equipment and machinery) 2. PSS/ N 0301 (Install Power Plant mechanical equipment at site) 3. PSS/ N 2001 (Use basic health and safety practices for power related work) 4. CSC/ N 1336 (Work effectively with others) **Optiional:** N.A.
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
Core Skills/Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or 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 NOS.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
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.
National Occupational Standards (NOS)	NOS are Occupational Standards which apply uniquely in the Indian context
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Organisational Context	Organisational 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.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
Qualifications Pack(QP)	Qualifications Pack comprises the set of NOS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code.
Qualifications Pack Code	Qualifications Pack Code is a unique reference code that identifies a qualifications pack.
Scope	Scope is the 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 the quality of performance required.
Sector	Sector is a conglomeration of different business operations having similar businesses 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.
Sub-functions	Sub-functions are sub-activities essential to fulfil the achieving the objectives of the function.
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Unit Code	Unit Code is a unique identifier for a NOS unit, which can be denoted with an 'N'
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do
Vertical	Vertical may exist within a sub-sector representing different domain areas or the client industries served by the industry.

Acronyms

Keywords /Terms	Description
CO2	Carbon dioxide
CPR	Cardiac Pulmonary Resuscitation
PPE	Personal Protective Equipment
OEE	Overall Equipment Effectiveness

PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery

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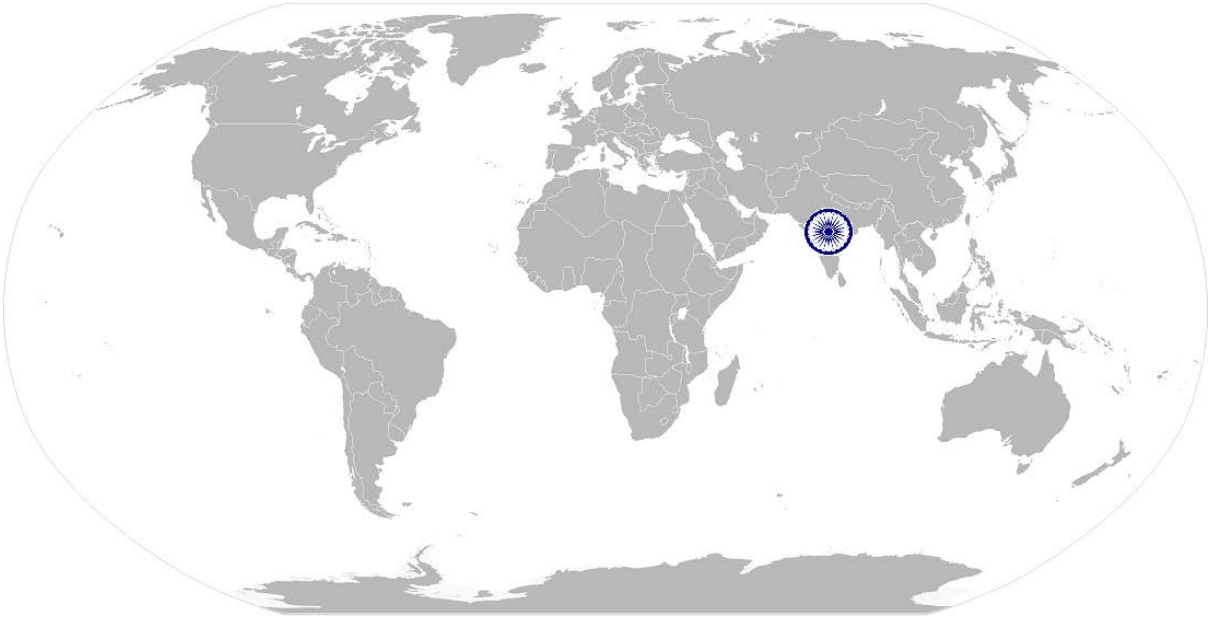
National Occupational Standard



Overview

This unit covers maintenance such as activities assembling, maintaining, repairing, dismantling and moving power plant machinery and equipment.

PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery

National Occupational Standard

Unit Code	**PSS / N 0302**
Unit Title (Task)	**Perform maintenance activities on power generation plant equipment and machinery**
Description	This unit covers performing maintenance activities on mechanical equipment, as per approved procedures. As part of the team the candidate will be required to maintain a range of mechanical equipment which could include gearboxes, machine tools, lifting and handling equipment, processing plant, production plant, engines, pumps, process control valves, compressors, transfer equipment, mechanical structures and work holding devices. The candidate will be expected to work safely, independently taking full responsibility for their own actions, and for the quality and accuracy of the work that they carry out. They and may have to instruct other fitters and maintenance personnel.
Scope	This unit/task covers the following: • Working safely • Preparing for power plant mechanical, hydraulic and pneumatic maintenance operations • Ensure upkeep of tools • Performing power plant mechanical, hydraulic and pneumatic maintenance operations

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	The user/individual on the job should be able to: PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations PC3. work following laid down procedures and instructions PC4. ensure work area is clean and safe from hazards PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition PC6. follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned PC7. follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved
Prepare for power plant mechanical, hydraulic and pneumatic maintenance operations	The user/individual on the job should be able to: PC8. obtain job specifications and requirements from valid sources and find out the fault **Valid sources**: instructions from supervisor, instructions from user of the equipment, condition of end product, person or operator who reported the fault, sensory input (sight, sound, smell, touch), monitoring equipment or gauges

PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery

	PC9. seek help of the supervisor or engineer to obtain relevant information for interpretation of drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process PC10. need to confirm lock-out/tag-out and zero energy procedures in machines, process systems and components as per organizational guidelines before attending any job PC11. follow the work procedure to attend the fault and the tools to be used **Tools:** e.g. allen key, spanner, torque wrench, pliers, bearing puller, circlip plier, scraper (flat & triangular), etc. PC12. evaluate sensory information to assess and accurately ascertain likely abnormalities **Abnormalities:** e.g. change in sound/ vibration/ temperature/ smell / visual impact etc. PC13. perform hands-on inspections like checking tolerances and clearances of machinery, equipment PC14. check for worn, defective, broken or otherwise unacceptable components PC15. check condition, level and temperature of fluids according to manufacturers' recommendations PC16. identify common types of metals by examining chips, spark test and magnet test PC17. apply monitoring or testing procedures to help in the fault diagnosis using a range of test equipment **Monitoring or testing procedures:** alignment checks, force/pressure checks (e.g. spring pressure, hydraulic or pneumatic pressures), leakage, vibration, thermal checks (e.g. bearings, friction surfaces), movement checks (e.g. travel, clearance, levers, links), visual checks **Test equipment:** measuring instruments/devices, thermal indicators, dial test indicators, audio test devices, torque measuring devices, self-diagnostic equipment, other specific test equipment PC18. relate previous reports/records of similar fault conditions to identify patterns and history PC19. erect and use scaffolding upto 6 meters height using cup lock scaffolding materials as per standard procedures
Performing power plant mechanical, hydraulic and pneumatic maintenance operations	The user/individual on the job should be able to: PC20. ensures tool are fit for use and used operated in a safe manner, efficiently **Tools:** hand tools (files, hacksaws, chisels and hammers); hand held power tools (portable electric drill, portable grinders, hydraulic wrenches, hydraulic jack etc., measuring tools (micrometers, vernier calipers, feeler gauges, telescoping gauges, protractors, dial indicators, straightedges, height gauges, solid square, combination square, combination set, optical equipment and measuring tape; rigging equipment (block and tackles, chains, wire ropes, nylon slings, eye-bolts, hoist rings, hooks, softeners, snatch blocks, spreader bars, lifting beams and shackles); hoisting/lifting and moving equipment (overhead crane, hoist and jacks); machines (drill, presses, stationary grinders, chop saws etc.) PC21. carry out maintenance activities on various power plant equipment in line

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	with job requirement, and as per organizational standards and manufacturers' guidelines **Equipment:** prime movers (turbines and internal combustion engines); power transmission assemblies(belt drives, gear drives, chain drives, clutches, brakes, couplings); various power plant equipment (fans and blowers, compressors, pumps, conveying systems, etc.); basic hydraulic and pneumatic systems PC22. carry out the maintenance activities in the specified sequence and in an agreed timescale PC23. perform dismantling processes mechanical equipment using appropriate method or technique in order to replace defective components **Dismantling processes:** e.g. release of pressures/force, proof marking of components, removal of components by extraction or pressing, etc. Range of components: shafts; couplings; gears; clutches; valves and seats; pistons; splined components; brakes; bearing and seals; fitting keys; springs; diaphragms; cams and followers; chains & sprockets; pulleys and belts; levers and links; slides; rollers; tooling; fluid storage units; fabricated components; wire ropes/cables; housings; actuating mechanisms; structural/operational components; locking & retaining devices (e.g. circlips, pins, lock nuts); covers and casings; integrated modules; other specific components **Methods and techniques:** release of pressures/forces, proof marking, extraction, pressing, alignment PC24. inspect components to check that the dismantled components are fit for reuse or due for replacement and identify the need to replace lifed items **Components:** e.g. seals, gaskets, O-rings etc. PC25. re-assemble the components using appropriate methods, and adjust them to meet the operating specification **Adjustments:** setting working clearance, setting travel, setting backlash in gears, preloading bearings, bearing pressing, lubrication oil/grease to be added PC26. carry out servicing and maintenance techniques as applicable **Maintenance techniques:** installing, dismantling and reinstalling equipment to unit/sub-assembly level; installing, dismantling and reinstalling units to component level; proof marking/labelling of components; checking components for serviceability; replacing all lifed items (e.g. seals, bearings, gaskets); replacing damaged/defective components; setting, aligning and adjusting replaced components; tightening fastenings to the required torque; making 'off-load' checks before starting up; replenishing oils and greases; safety system checks; functionally testing the completed system; check levelling and alignment PC27. replace or refit basic hydraulic and pneumatic components **Components:** valves; seals; buckets; cylinders; clamping and positioning components; other basic components PC28. identify requirements for machining, electric or electronic repair and to intimate the supervisor/engineer for arrangement to handover to the relevant personal after following due process for rectification PC29. witness a trial run of the equipment at full power/speed/flow to identify any

	abnormality of the repaired/installed equipment PC30. confirm that the attended component/equipment gives expected process outcomes PC31. carry out maintenance as per maintenance procedures and plans **Procedures and plans:** e.g. preventive maintenance (routine inspections, and adjustments); corrective maintenance (activities identified from preventative maintenance activities); supervision and guidance to the junior team members; etc. PC32. deal with equipment malfunction and rectify faults during the breakdown servicing process as appropriate **Breakdown categories:** intermittent problem, partial failure/out-of specification output, complete breakdowns, preventive maintenance PC33. adhere to a routine schedule of maintenance activities to prevent faults PC34. apply predictive maintenance tests for early detection of equipment defects **Tests for predictive maintenance:** non-destructive tests (dye penetrant, based on the characteristics of the machinery, equipment or component being tested), static balancing and alignment PC35. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve PC36. leave the work area in a safe and tidy condition on completion of the maintenance activities
Knowledge and 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. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. relevant health and safety requirements applicable in the work place KA3. layout of a power plant and the various functions KA4. importance of working in clean and safe environment KA5. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA6. reporting structure, inter-dependent functions, lines and procedures in the work area KA7. relevant people and their responsibilities within the work area KA8. escalation matrix and procedures for reporting work and employment related issues KA9. documentation and related procedures applicable in the context of employment and work KA10. importance and purpose of documentation in context of employment and work KA11. service request procedures, tools, and techniques KA12. organizational procedure(s) to be adopted for the safe disposal of waste of all types of materials
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. health and safety requirements, and safe working practices and procedures required for the mechanical maintenance activities undertaken

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	Safe working practices and procedures: ensuring the correct isolation of the machine or system before starting of any job on the machine or system; fitting and adjusting machine guards; ensuring personal protective equipment (PPE) to be worn for the maintenance activities e.g. correctly fitting overalls and safety glasses; ensuring long hair is tied back or netted; jewellery or other items that can become entangled in the machinery are removed KB2. hazards associated with the mechanical maintenance activities and how they can be minimized **Hazards**: handling oils; greases; stored pressure/force; misuse of tools; using damaged or badly maintained tools and equipment; not following laid-down maintenance procedures KB3. hazards and isolating procedures associated with high pressure fluids, zero energy and stored energy KB4. isolation and lock-off procedures or permit-to-work procedure that applies lock-out, tag-out and zero energy procedures KB5. how to extract and use information from engineering drawings and related specifications in relation to work undertaken with the help of supervisor/ engineer when needed KB6. how to interpret imperial and metric systems of measurement, workpiece reference points and system of tolerancing KB7. power plant terminology KB8. the methods of positioning, aligning and securing the workpiece KB9. assembly methods, techniques and procedures to be used **Methods:** assembling components having interference fits (e.g. by pressure, expansion or contraction)**;** securing components using threaded fasteners (e.g. nuts, bolts, machine screws, cap screws)**;** securing components using spring clips (e.g. external circlips, internal circlips, special clips)**;** using locking and retaining devices (e.g. tab washers, locking nuts, wire locks)**;** securing components using rivets (e.g. countersunk, roundhead, blind)**;** applying sealing compounds or adhesives**;** setting and adjusting components to give correct working parameters (e.g. shimming and packing)**;** torque setting of nuts and bolts**;** by welding KB10. how the components are to be aligned, adjusted and positioned prior to securing them, and the tools and equipment **Tools and equipment**: clamping direct to machine table, pneumatic or magnetic table; machine vice (e.g. plain, swivel, universal); angle plate; vee block and clamps; fixtures; chucks (e.g. 3, 4 jaw); magnetic chucks; in a bench vice; collets KB11. various mechanical fastening devices that are used **Fastening devices**: nuts; bolts; machine screws; cap screws; clips; pins; locking and retaining devices; rivets KB12. procedure(s) to be followed for investigating the faults, and how to deal with intermittent faults KB13. how to analyze and evaluate possible characteristics and causes of specific faults/problems KB14. types of prime movers such as electric motors, turbines, and internal combustion engines

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	KB15. types of turbines such as gas, wind, water and steam and associated equipment such as boilers KB16. auxiliary systems such as lubrication and cooling KB17. common faults such as loss of rpm and the failure of bearings, seals and lubrication systems KB18. components such as bearings, shafts, seals, couplings, clutches, brakes, chains, belts and gears KB19. types of bearing fits such as press, slide and interference KB20. types of bearing housings such as pillow blocks, split, flange KB21. types of bearings such as radial and axial KB22. anti-friction (rolling element-type) bearing and journal bearing installation and removal KB23. components and tools such as taper locks and pullers KB24. bearing faults such as loss of clearance, overheating, excessive lubrication and lack of lubrication KB25. type of spindles and shafts **Types**: Universal spindle, Plain shaft, Hollow shaft, crank shaft, cam shaft KB26. seal faults such as leaking, deterioration and improper installation KB27. seal materials' compatibility with medium KB28. types of seals such as static, dynamic, mechanical, contact and non-contact KB29. shaft faults such as bent and worn shafts KB30. shaft restoration applications such as shaft straightening, spray welding, peening, knurling and using sleeves KB31. clutch and brake faults such as wear, overheating, excessive vibration and slippage KB32. types and components of couplings, clutches, brakes and fasteners and retainers KB33. coupling faults such as compromised transfer of movement, excessive vibration and worn components KB34. indications of component failure such as clutch and brake slippage, excessive heat and vibration KB35. required clearances and tolerances for couplings, clutches and brakes KB36. speed, length, sizing and ratio calculations for belt drive and chain KB37. belt drive and chain drive types and components KB38. manufacturers' specifications such as tension, rpm, capacity limitations and operating conditions KB39. gear faults such as overheating, vibration and excessive noise KB40. gear system components and their installation requirements such as fits, thrust, clearances and tolerances KB41. gear terminology such as pitch diameter, diametral pitch, dedendum, addendum and working depth KB42. installation methods for gear drives such as pressed, keyed, sliding and pinned KB43. lubrication methods such as splash, forced and oil rings KB44. procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities KB45. sequence to be adopted for the dismantling/re-assembly of various types of

PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery

	assemblies KB46. methods and techniques used to dismantle/assemble mechanical equipment **Methods and techniques**: release of pressures/forces, proof marking, extraction, pressing, alignment **Methods to produce mechanical assemblies**: assembling components having interference fits (e.g. by pressure, expansion or contraction); securing components using threaded fasteners (e.g. nuts, bolts, machine screws, cap screws); securing components using spring clips (e.g. external circlips, internal circlips, special clips); using locking and retaining devices (e.g. tab washers, locking nuts, wire locks, special purpose types); securing components using rivets (e.g. countersunk, roundhead, blind, special purpose types); applying sealing compounds or adhesives; electrical bonding of components; setting and adjusting components to give correct working parameters (e.g. shimming and packing); torque setting of nuts and bolts; sby welding KB47. methods of checking components are fit for purpose, and how to identify defects and wear characteristics KB48. monitoring equipment such as temperature probes and thermographic equipment, oil analysis, vibration analysis, ultrasound devices, fluid analysis, infrared thermography and motor current analysis KB49. basic principles of how the equipment functions, operation sequence, the working purpose of individual units/components and how they interact KB50. identification, application, fitting and removal of different types of bearings and gears KB51. how to correctly adjust tension belts and chains KB52. identification and application of different types of locking devices KB53. methods of checking that removed components are fit for purpose, and the need to replace `lifed' items KB54. uses of measuring equipment **Measuring equipment**: external micrometers, vernier/digital/dial caliper, surface finish equipment (e.g. comparison plates, machines), rules, squares, protractors, depth micrometers, depth verniers, feeler gauges, bore/hole gauges, slip gauges, radius/profile gauges, thread gauges, tachometers, torque wrenches, sprit levels KB55. how to make adjustments to components/assemblies to ensure they function correctly **Adjustments**: setting working clearance, setting travel, setting backlash in gears, preloading bearings, bearing pressing KB56. importance of making `off-load' checks before running the equipment under power KB57. how to check tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose KB58. importance of maintenance documentation and/or reports following the maintenance activity KB59. equipment operating and control procedures to be applied during the maintenance activity **Operating and control procedures**: organisational guidelines and procedures;

PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery

	equipment manufacturer's operating specification/range; recognised compliance agency/body standards or directives; health, safety and environmental requirements; customer standards and requirements KB60. how to use lifting and handling equipment in the maintenance activity KB61. problems associated with the maintenance activity, and how they can be overcome KB62. extent of their own authority and to whom they should report if they have a problem that they cannot resolve KB63. techniques of checking dimensional accuracy KB64. how to check the workpiece and the measuring equipment that is used KB65. need to check that the measuring equipment is within current calibration dates, and that the instruments are correctly zeroed KB66. basic hydraulic systems and components KB67. auxiliary components such as coolers, heaters and accumulators KB68. basic rigging practice KB69. viscosity of fluids KB70. installation procedures for hydraulic systems and components KB71. hydraulic system faults such as loss of pressure, cavitations, contamination of fluid, aeration, leaks, loss of movement and speed, and overheating KB72. installation procedures for basic types of pneumatic and vacuum systems and components KB73. pneumatic system faults such as leaks, loss of movement and speed, and overheating KB74. benefits of RCM methodology KB75. preventive and predictive maintenance programs and schedules KB76. NDT techniques such as dye penetrant, magnetic particle, radiography and ultrasonic KB77. types of imbalance such as static, dynamic and coupled KB78. basic metallurgy KB79. properties and characteristics of common types of metals and materials use in the trade KB80. ways in which a metal can fail KB81. compatibility of metals and of other materials KB82. heat treatment procedures such as annealing, hardening, tempering and normalizing of metals KB83. when to act on their own initiative and when to seek help and advice from others KB84. importance of leaving the work area and equipment in a safe and clean condition on completion of the machining and fitting activities
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication**

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	The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in local language SA2. check and clarify task-related information SA3. liaise with appropriate authorities using correct protocol SA4. convey and share technical information clearly using appropriate language SA5. communicate with people in respectful form and manner in line with organizational protocol
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA6. undertake basic numerical computations and calculations **Numerical computations:** addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages SA7. identify and draw various basic, compound and solid shapes as per dimensions given **Basic shapes:** square, rectangle, triangle, circle, quadrilaterals **Compound shapes:** involving squares, rectangles, triangles, circles, semi-circles, quadrants of a circle **Solid shapes:** cube, rectangular prism, cylinder SA8. use appropriate measuring techniques and units of measurement SA9. use appropriate units and number systems to express degree of accuracy **Units and number systems representing degree of accuracy**: decimals places, significant figures, fractions as a decimal quantity SA10. calculations related to force and pressure relevant to operating/testing the machines to be maintained
	Learning
	The user/individual on the job needs to know and understand how to: SA11. participate in on-the-job and other learning, training and development interventions and assessments SA12. clarify task related information with appropriate personnel or technical adviser SA13. seek to improve and modify own work practices SA14. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
B. Professional Skills	**Problem Solving**
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques

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	SB7. select and apply resolution techniques SB8. seek evidence for problem resolution
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative and Enterprise
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. one's competencies in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand how to: SB15. exercise restraint while expressing dissent and during conflict situations SB16. avoid and manage distractions to be disciplined at work SB17. Manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB18. work in a team in order to achieve better results SB19. identify and clarify work roles within a team SB20. communicate and cooperate with others in the team for better results SB21. seek assistance from fellow team members

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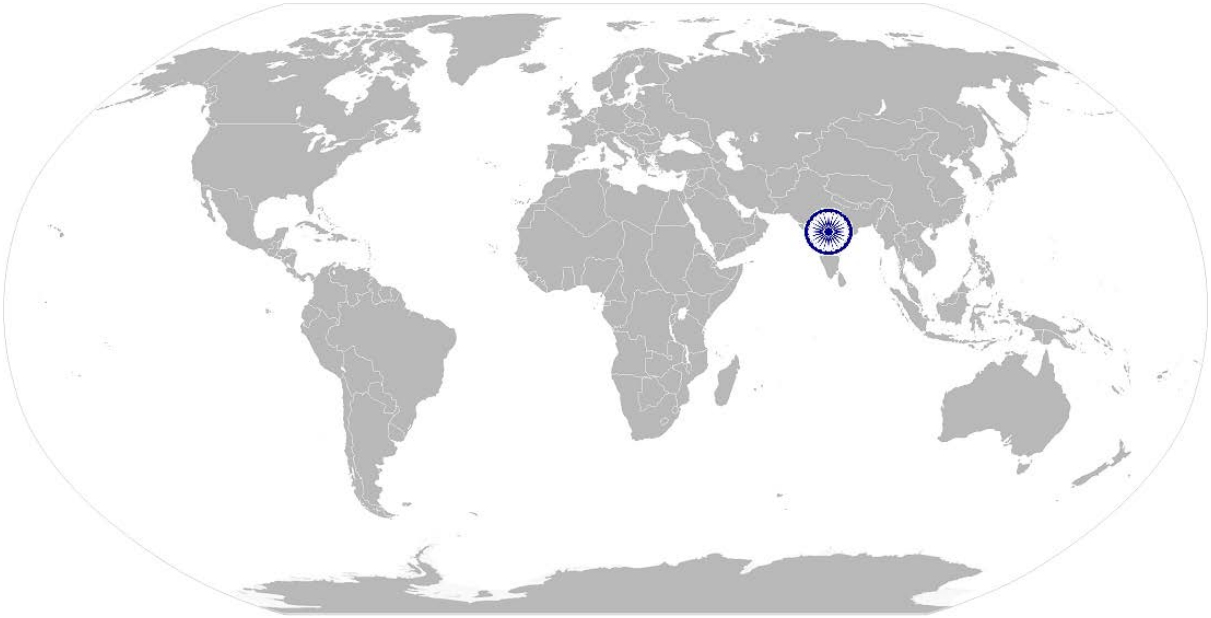
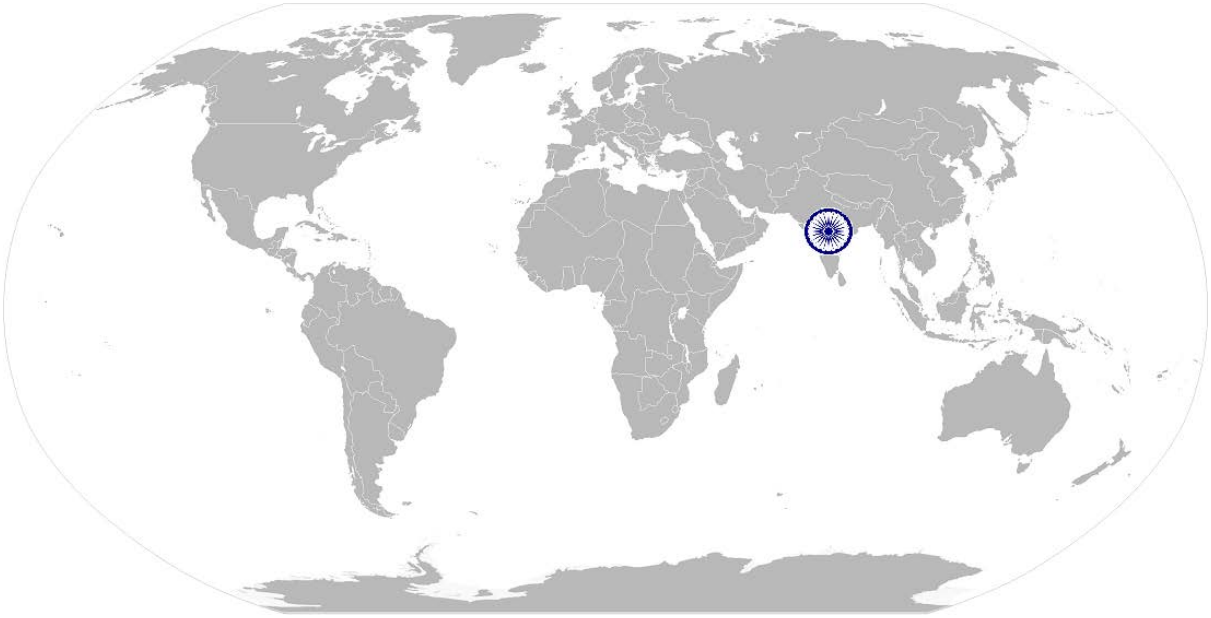
NOS Version Control

NOS Code	PSS/ N 0302		
Credits NSQF	TBD	Version number	1.0
Industry	Power	Drafted on	26/03/15
Industry Sub-sector	Generation	Last reviewed on	26/03/15
		Next review date	26/03/17



National Occupational Standard



Overview

This unit covers the installing of a range of mechanical equipment in a power plant set-up including equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, equipment for lifting and handling, hydraulic press, furnaces, auto / manual welding machines, shot blasting machines, process plant equipment, in accordance with approved procedures.

PSS/ N 0301: Install power plant mechanical equipment at site

National Occupational Standard

Unit Code	CSC/ N 0301
Unit Title (Task)	**Install mechanical equipment at site**
Description	This unit covers the skills and knowledge required for installing a range of mechanical equipment at a power plant set-up including equipment such as machine tools, process control equipment, rotating mechanical equipment, conveyors, lifting and handling equipment hydraulic press, furnaces, auto / manual welding machines, shot blasting machines and processing plant machinery that have mechanical systems connected to them, in accordance with approved procedures. The candidate will be expected to work with a minimum of supervision, taking personal responsibility for own actions and for the quality and accuracy of the work.
Scope	This unit/task covers the following: • Working safely • Carry out a site check, prior to the installation • Carry out a check on receiving the product for installation • Prepare the product for installation • Install the mechanical equipment

Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working safely	The user/individual on the job should be able to: PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations PC3. ensure work area is clean and safe from hazards PC4. work safely in confined space, in trenches or excavated area, PC5. handle large and heavy objects/loads and machines in a safe manner for self and others PC6. work safely on high pressure line/system (steam, compressed air, hydraulic, etc.) PC7. work safely on energized systems, steam and compressed air systems, etc. PC8. follow safety signages where displayed including road safety PC9. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition PC10. obtain clearance to carry out the installation activities PC11. provide safe access and working arrangements for the installation area PC12. ensure safe isolation of services during the installation PC13. dispose of waste items in a safe and environmentally acceptable manner PC14. leave the work area in a safe condition and free from foreign object debris
Carry out a site check, prior to the installation	The user/individual on the job should be able to: PC15. plan the installation activities in an efficient and appropriate manner PC16. survey and inspect the site and foundation for the following: **Inspect the following**: ensure that the site is accessible; ensure that site is

PSS/ N 0301: Install power plant mechanical equipment at site

	free from obstructions or hazards; ensure the site is suitably prepared for the mechanical equipment installation to take place PC17. ensure that appropriate utilities are available (e.g. gas, water, air, electricity) PC18. ensure that required installation consumables are available PC19. ensure that safety and environmental conditions can be met PC20. obtain necessary permits to carry out the required work PC21. check the installation job specification documentation are available and correct **Job specification documents**: e.g. assembly drawings; layout drawings; contractual specifications; manufacture's guidelines for installation; spares check and handover; manuals check and handover, etc. PC22. marking out of positioning and layouts
Check and prepare the product for installation	The user/individual on the job should be able to: PC23. check and record for any physical damages to the machine/equipment PC24. check position and condition of anchor bolts/foundation bolts PC25. movement and positioning of equipment, using cranes or forklifts as per the layout PC26. remove moisture absorbent bags, rust preventive, locking devices PC27. fill oils for lubrication, hydraulic and other special oils PC28. ensure the machine is clean
Install the mechanical equipment	The user/individual on the job should be able to: PC29. install the machine in accordance with manufacturers' and site specifications PC30. instruction/guidance of the manufacturer/customer and received through team supervisor/engineer PC31. use the various installation tools and equipment as required **Instruments**: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape, vernier caliper, micrometers, depth gauges); plumb lines and taut wires; customized gauges; right angle/square block PC32. apply installation techniques like leveling, aligning, coupling and connecting in accordance with specifications PC33. fill coolants, oil and other fluids as per specifications PC34. ensure the site is cleaned and clear of all debris and left in safe state PC35. all reports and documentation are completed correctly to required specifications PC36. produce installations which comply with the equipment manufacturer's operation specification/range PC37. deal promptly and effectively with problems within control, and seek help and guidance from the relevant people for problems that cannot be resolved PC38. witness No-Load trail run of the equipment and carry out check for proper functioning without load **Checks**: system turns on; input and output voltage levels are being arrived at; hydraulics are working; pressure is building as per requirement; working of fans, motors, ACs, etc. and functioning properly; various sub-parts of the machinery functions; check oils and coolant; PC39. make adjustments, appropriate to the equipment being installed and seek guidance of the supervisor/engineer when required

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Knowledge and 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. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. relevant health and safety requirements applicable in the work place KA3. importance of working in clean and safe environment KA4. own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities KA5. reporting structure, inter-dependent functions, lines and procedures in the KA6. work area KA7. relevant people and their responsibilities within the work area KA8. escalation matrix and procedures for reporting work and employment related issues KA9. documentation and related procedures applicable in the context of employment and work KA10. importance and purpose of documentation in context of employment and work
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. procedures to be carried out before starting work on the installation KB2. specific safe working practices, installation procedures and environmental regulations that must be observed KB3. hazards associated with carrying out the installation of machinery and plant equipment and how can they be minimized KB4. personal protective equipment to be used during the fabrication and fitting activities and where can it be obtained KB5. types and sources of appropriate job specifications **Job specification documents**: e.g. assembly drawings; layout drawings; contractual specifications; manufacture's guidelines for installation; spares check and handover; manuals check and handover KB6. common terminology used in installation of machinery and plant equipment KB7. interpretation of drawings, standards, quality control procedures and specifications used for the installation including testing procedures KB8. equipment to be installed, its operating procedures and function KB9. methods of marking out the site for positioning of the equipment, and the tools and equipment used for this KB10. methods of drilling holes for rag and expanding bolts (including the use of grouting and adhesives) KB11. various mechanical fasteners that will be used, and their method of installation (e.g. threaded fasteners, special securing devices, masonry fixing devices) KB12. torque loading requirements of the fasteners, and what to do if these loadings are exceeded or not achieved KB13. correct tools, equipment, and fasteners for the installation activities KB14. types of tools and instruments used to position, secure and align the equipment (e.g. spanners, wrenches, crow bars, torque wrenches, engineer's levels, alignment telescopes and laser devices) **Instruments**: straight edges and feeler gauges; spirit levels with appropriate accuracy; mandrels; dial test indicators; measuring instruments (meter tape,

	vernier caliper, micrometers, depth gauges); plumb lines and taut wires; customized gauges; multimeters; right angle/square block KB15. techniques used to position, align, level and adjust the equipment KB16. methods of lifting, handling and supporting the equipment during the installation activities KB17. methods of connecting to mechanical power transmission devices (eg. belt and chain drives, couplings, clutches and brakes) KB18. methods of connecting equipment to service supplies (eg. electrical, fluid power, compressed air oil and fuel supplies) KB19. procedure for the safe disposal of waste materials KB20. how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy, and quality of the installation **Checks**: setting working clearance; tensioning; checking level and alignment; making visual checks for completeness and freedom from damage; making sensory checks (sight, sound, smell, touch); ensuring that moving parts are guarded and clear of obstruction; checking torque settings of fasteners fitted at the site; ensuring locking devices are fitted to fasteners (where appropriate); ensure fulfillment of specific instruction in manufactures' guidelines KB21. how to recognize installation defects and how to address them appropriately **Defects**: leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, contamination, vibration, etc. KB22. importance of ensuring that the completed installation is free from dirt, and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected KB23. care and control procedures for tools and equipment KB24. problems that can occur with the installation operations, and how these can be overcome KB25. fault-finding techniques to be used when the equipment fails to operate correctly KB26. extent of own responsibility, and whom to report to in case there is a problems that is not getting resolved KB27. various job related engineering drawings KB28. knowledge of the mechanical equipment function and product KB29. knowledge of component machining processes KB30. do's and don'ts of operating and maintaining the machine
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Communication**
	The user/ individual on the job needs to know and understand how to: SA1. read and interpret information correctly from various job specification documents, manuals, health and safety instructions, memos, etc. applicable to the job in local language SA2. convey and share technical information clearly using appropriate language SA3. check and clarify task-related information SA4. liaise with appropriate authorities using correct protocol SA5. communicate with people in respectful form and manner in line with organizational protocol

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	SA6. listen to questions and concerns of the customer and provide resolution in a respectful manner as per organizational guidelines SA7. be well dressed and groomed SA8. put forward ones point of view in a convincing manner
	Numerical and computational skills
	The user/individual on the job needs to know and understand how to: SA9. undertake numerical operations, geometry and calculations/ formulae **Arithmetic**: addition, subtraction, multiplication, division, fractions and decimals, percentages and proportions, simple ratios and averages SA10. use appropriate measuring techniques SA11. express numerical solutions to a degree of accuracy that is appropriate to the value being calculated **Degree of accuracy**: correct to three significant figures, correct to two decimal places, express a decimal fraction in standard form, express tolerance in terms of limits of size SA12. use a calculator to raise a number to a power and determine square roots SA13. plot and interpret straight line graphs SA14. apply pythagoras' theorem to perform calculations SA15. define work, power and energy SA16. define friction **Friction:** definition, explain coefficient of friction, explain how friction can be reduced, select materials that will rotate, or slide together with low frictional value SA17. describe the relationship between temperature changes and changes in length SA18. measure heights and angles at a site
	Learning
	The user/individual on the job needs to know and understand how to: SA19. participate in on-the-job and other learning, training and development interventions and assessments SA20. clarify task related information with appropriate personnel or technical adviser SA21. seek to improve and modify own work practices SA22. maintain current knowledge of application standards, legislation, codes of practice and product/process developments
	Computer Basics
	The user/individual on the job needs to know and understand how to: SA23. perform basic operations in a computer like switching it on/off, using the mouse and keyboard, accessing files, opening, closing, creating and deleting folders, etc. SA24. use email to communicate within the organization as per organization guidelines SA25. retrieve and enter data using standard system forms and templates SA26. take printouts of documents

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B. Professional Skills	**Problem Solving**
	The user/individual on the job needs to know and understand how to: SB1. identify problems with work planning, procedures, output and behavior and their implications SB2. prioritize and plan for problem solving SB3. communicate problems appropriately to others SB4. identify sources of information and support for problem solving SB5. seek assistance and support from other sources to solve problems SB6. identify effective resolution techniques SB7. select and apply resolution techniques SB8. seek evidence for problem resolution
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB9. plan, prioritize and sequence work operations as per job requirements SB10. organize and analyze information relevant to work SB11. basic concepts of shop-floor work productivity including waste reduction, efficient material usage and optimization of time
	Initiative and Enterprise
	The user/individual on the job needs to know and understand how to: SB12. undertake and express new ideas and initiatives to others SB13. give inputs to modify work plan to overcome unforeseen difficulties or developments that occur as work progresses SB14. participate in improvement procedures including process, quality SB15. one's competencies in new and different situations and contexts to achieve more
	Self-Management
	The user/individual on the job needs to know and understand how to: SB16. exercise restraint while expressing dissent and during conflict situations SB17. avoid and manage distractions to be disciplined at work SB18. manage own time for achieving better results
	Teamwork
	The user/individual on the job needs to know and understand how to: SB19. work in a team in order to achieve better results SB20. identify and clarify work roles within a team SB21. communicate and cooperate with others in the team for better results SB22. seek assistance from fellow team members
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB23. follow correct communication protocols with customers SB24. work towards ensuring customer satisfaction and delight SB25. contribute to customer satisfaction SB26. meet customer needs for information and assistance SB27. recognize and communicate limits of one's authority and ability in responding to customer expectations SB28. collect and pass on accurate and timely customer feedback to appropriate

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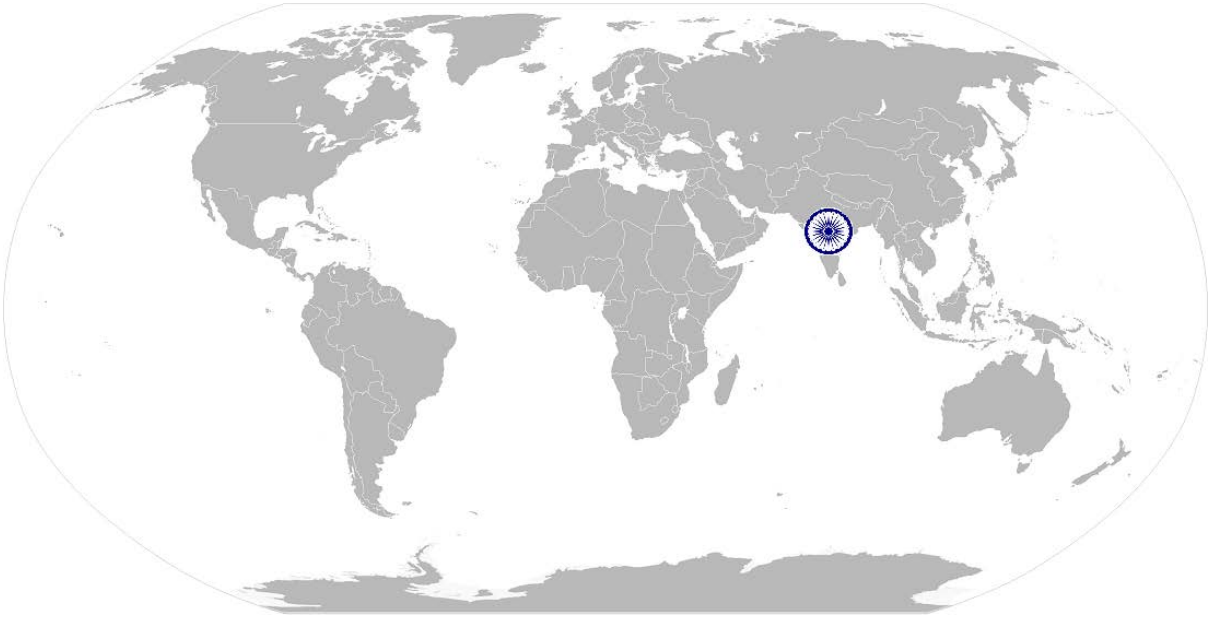
	company authorities SB29. handle customer disgruntlement and dissatisfaction
	Critical Thinking
	The user/individual on the job needs to know and understand how to: SB30. apply, analyze, and evaluate the information gathered from observation, experience, reasoning, or communication, as a guide to thought and action



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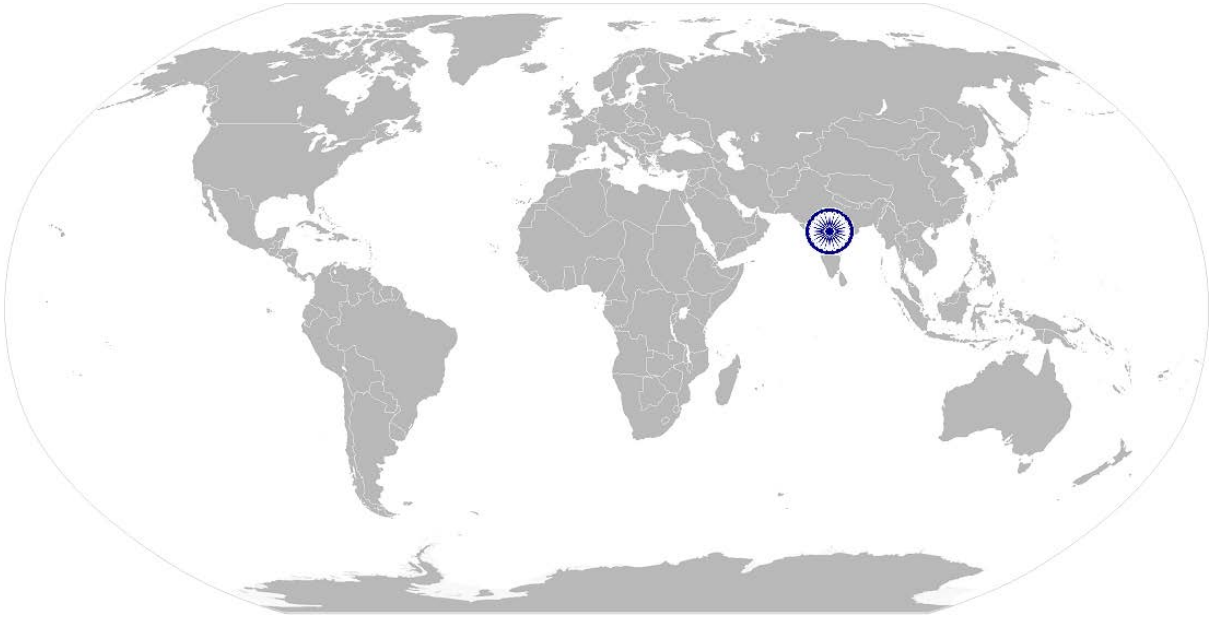
NOS Version Control

NOS Code	PSS/ N 0301		
Credits(NSQF)	TBD	Version number	1.0
Industry	Power	Drafted on	26/03/15
Industry Sub-sector	Power Generation	Last reviewed on	26/03/15
		Next review date	26/03/17



PSS/ N 2001: Use basic health and safety practices for power related work

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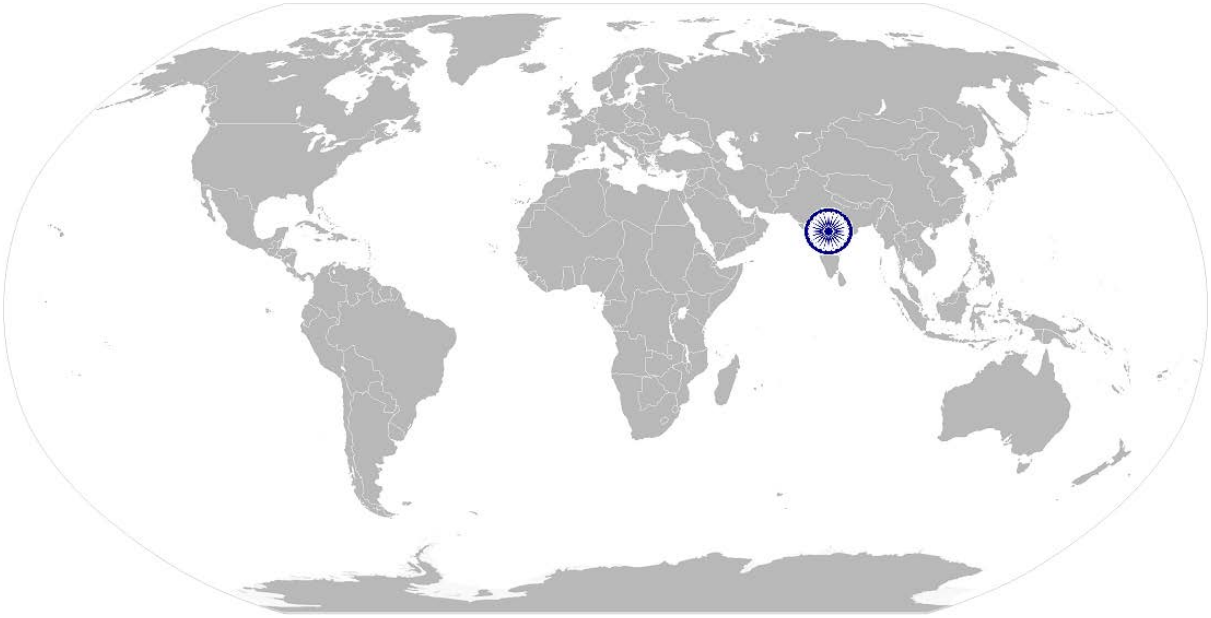
National Occupational Standard



Overview

This unit covers health, safety and security for power related work. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment in a power plant, power station/substation or on the field while working on power equipment.

PSS/ N 2001: Use basic health and safety practices for power related work

National Occupational Standard

Unit Code	**PSS / N 2001**
Unit Title (Task)	**Use basic health and safety practices for power related work**
Description	This unit covers health, safety and security for power related work. This includes procedures and practices that candidates need to follow to help maintain a healthy, safe and secure work environment in a power plant, power station/substation or on the field while working on power equipment. It covers responsibilities towards self, others, assets and the environment. It includes understanding of risks and hazards in the workplace, along with common techniques to minimize risk, deal with accidents, emergencies, etc. It covers knowledge of fire safety, common first aid applications, safe practices and emergency procedures.
Scope	This unit/task covers the following: • Health and safety • Fire safety • Emergencies, rescue and first-aid procedures
Performance Criteria(PC) w.r.t. the Scope	
Element	**Performance Criteria**
Health and safety	The user/individual on the job should be able to: PC1. use protective clothing/equipment for specific tasks and work conditions **Protective clothing**: leather or asbestos gloves, flame proof aprons, flame proof overalls buttoned to neck, cuffless (without folds), trousers, reinforced footwear, helmets/hard hats, cap and shoulder covers, ear defenders/plugs, safety boots, knee pads, particle masks, glasses/goggles/visors **Equipment**: hand and face shields, machine guards, residual current devices, shields, dust sheets, respirator PC2. state the name and location of people responsible for health and safety in the workplace PC3. state the names and location of documents that refer to health and safety in the workplace PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace **Hazards**: electrical hazards (dealing with high voltage equipment, power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.); sharp edged and heavy tools; heated metals; oxyfuel and gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, oxy-fuel, fumes, dust, hazardous waste materials, etc.); physical hazards(working at heights, working in windy

	or moist areas, large and heavy objects and machines, sharp and piercing objects, moving objects and part of machinery, tolls and machines, intense light, load noise, abnormal temperature; obstructions in corridors, by doors, blind turns, over stacked shelves and packages, etc.); working in high temperatures **Possible causes of risk and accident**: physical actions; not following instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness); not taking safety precautions PC5. follow electrical safe working procedures such as Tag out/Lock out, PTW (Permit To Work), PC6. follow warning signs (danger, out of service, etc.) while working with electrical systems PC7. use standard safe working practices when working at heights, confined areas and trenches PC8. test any electrical equipment and system using insulated testing devices before touching them PC9. ensure positive isolation of electrical equipment & system as per given standards PC10. recognize any abnormalities in electrical equipment or system installed alarm annunciation and/or noticing parameters from gauge/ indicator installed **Parameters**: temperature, pressure, flow& current PC11. carry out safe working practices while dealing with hazards to ensure the safety of self and others **Safe working practices**: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working at heights, etc. including safety harness, fall arrestors, guardrails, proper work positioning, do not jump or overload, etc.; take due measures for safety while working in confined spaces or trenches, etc. PC12. state methods of accident prevention in the work environment of the job role **Methods of accident prevention**: training in health and safety procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors PC13. state location of general health and safety equipment in the workplace **General health and safety equipment**: fire extinguishers; first aid equipment; safety instruments and clothing; safety installations(e.g.

PSS/ N 2001: Use basic health and safety practices for power related work

	fire exits, exhaust fans) PC14. inspect for faults, set up and safely use of scaffolds and elevated platforms and ladders **Faults**: corrosion of metal components, deterioration, splits and cracks timber components, imbalance, loose rungs, missing/ unfixed nuts or bolts, etc. **Set up**: firm/level base, clip/lash down, leaning at the correct angle, appropriate load as per capacity, etc. PC15. lift, carry and transport heavy objects & tools safely using correct procedures from storage to workplace and vice versa PC16. inspect power plant and its equipment routinely for any signs of oil, water and/or steam leakage PC17. store flammable materials and machine lubricating oil safely and correctly PC18. check that the emission and pollution control devices are working properly in line with environmental policy standards PC19. apply good housekeeping practices at all times **Good housekeeping practices**: clean/tidy work areas, removal/disposal of waste products, protect surfaces PC20. identify common hazard signs displayed in various areas **Various areas**: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc. PC21. retrieve and/or point out documents that refer to health and safety in the workplace **Documents**: fire notices, accident reports, safety instructions for equipment and procedures, company notices and documents, legal documents (e.g. government notices) PC22. inform relevant authorities about any abnormal situation/behavior of any equipment/system promptly
Fire safety	The user/individual on the job should be able to: PC23. use the various appropriate fire extinguishers on different types of fires correctly **Types of fires**: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids; Class C: e.g. combustible gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class D: combustible chemicals and metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents) Class E: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, C and D fires when the electrical equipment that initiated the fire is no longer receiving electricity;) PC24. demonstrate rescue techniques applied during fire hazard PC25. demonstrate good housekeeping in order to prevent fire hazards PC26. demonstrate the correct use of a fire extinguisher

PSS/ N 2001: Use basic health and safety practices for power related work

Emergencies, rescue and first-aid procedures	The user/individual on the job should be able to: PC27. demonstrate how to free a person from electrocution PC28. administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc. PC29. demonstrate basic techniques of bandaging PC30. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments PC31. perform and organize loss minimization or rescue activity during an accident in real or simulated environments PC32. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases PC33. demonstrate the artificial respiration and the CPR Process PC34. participate in emergency procedures **Emergency procedures**: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work PC35. complete a written accident/incident report or dictate a report to another person, and send report to person responsible **Incident Report includes details of**: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified PC36. demonstrate correct method to move injured people and others during an emergency
Knowledge and 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. names (and job titles if applicable), and where to find, all the people responsible for health and safety in a workplace. KA2. names and location of documents that refer to health and safety in the workplace.
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. meaning of “hazards” and “risks” KB2. health and safety hazards commonly present in the work environment and related precautions KB3. possible causes of risk, hazard or accident in the workplace and why risk and/or accidents are possible KB4. possible causes of risk and accident **Possible causes of risk and accident**: physical actions; not following instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness); not taking safety precautions KB5. methods of accident prevention **Methods of accident prevention**: training in health and safety

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	procedures; using health and safety procedures; use of equipment and working practices (such as safe carrying procedures); safety notices, advice; instruction from colleagues and supervisors KB6. safe working practices when working with tools and machines KB7. safe working practices while working at various hazardous sites KB8. where to find all the general health and safety equipment in the workplace KB9. various dangers associated with the use of electrical equipment KB10. positive isolation of electrical equipment and system KB11. safe handling and disposal of hazardous power plant wastes KB12. use of emission and pollution control devices and measures taken to control pollution KB13. various safety procedures and equipment used to work at heights, trenches and confined places KB14. safe working practices specific to working with electrical equipment & system e.g. lock out/ tag out, PTW, etc. KB15. preventative and remedial actions to be taken in the case of exposure to toxic materials **Exposure:** ingested, contact with skin, inhaled **Preventative action**: ventilation, masks, protective clothing/ equipment); **Remedial action:** immediate first aid, report to supervisor **Toxic materials:** solvents, flux, lead KB16. importance of using protective clothing/equipment and other insulated work gear while handling electrical system and equipment KB17. precautionary activities taken to prevent fire accident KB18. various causes of fire **Causes of fires**: heating of metal; spontaneous ignition; sparking; electrical heating; loose fires (smoking, welding, etc.); chemical fires; etc. KB19. techniques of using the different fire extinguishers KB20. different methods of extinguishing fire KB21. different materials used for extinguishing fire **Materials**: sand, water, foam, CO2, dry powder KB22. emergency rescue techniques applied during a fire hazard KB23. various types of safety signs and what they mean KB24. appropriate basic first aid treatment relevant to the condition e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries KB25. content of written accident report KB26. potential injuries and ill health associated with incorrect manual handing KB27. safe lifting, carrying and transporting practices KB28. personal safety, health and dignity issues relating to the movement of a person by others KB29. potential impact to a person who is moved incorrectly
Skills (S) [Optional]	

PSS/ N 2001: Use basic health and safety practices for power related work

A. Core Skills/ Generic Skills	**Reading and Writing Skills**
	The user/individual on the job needs to know and understand how to: SA1. read and comprehend basic content to read labels, charts, signages SA2. read and comprehend basic English to read manuals of operations SA3. read and write an accident/incident report in local language or English
	Oral Communication (Listening and Speaking skills)
	The user/individual on the job needs to know and understand how to: SA4. question coworkers appropriately in order to clarify instructions and other issues SA5. give clear instructions to coworkers, subordinates others
	Decision Making
	The user/individual on the job needs to know and understand how to: SA6. make appropriate decisions pertaining to the concerned area of work with respect to intended work objective, span of authority, responsibility, laid down procedure and guidelines
B. Professional Skills	**Plan and Organize**
	The user/individual on the job needs to know and understand how to: SB1. plan and organize their own work schedule, work area, tools, equipment and materials to maintain decorum and for improved productivity
	Working with others
	The user/individual on the job needs to know and understand how to: SB2. remain congenial while discussing and debating issues with co-workers SB3. follow appropriate protocols for communication based on situation, hierarchy, organizational culture and practice SB4. ask for, provide and receive required assistance where possible to ensure achievement of work related objectives SB5. thank coworkers for any assistance received SB6. offer appropriate respect based on mutuality and respect for fellow worksmanship and authority
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB7. think through the problem, evaluate the possible solution(s) and suggest an optimum /best possible solution(s) SB8. identify immediate or temporary solutions to resolve delays SB9. identify sources of support that can be availed of for problem solving for various kind of problems SB10. seek appropriate assistance from other sources to resolve problems SB11. report problems that you cannot resolve to appropriate authority
	Analytical Thinking

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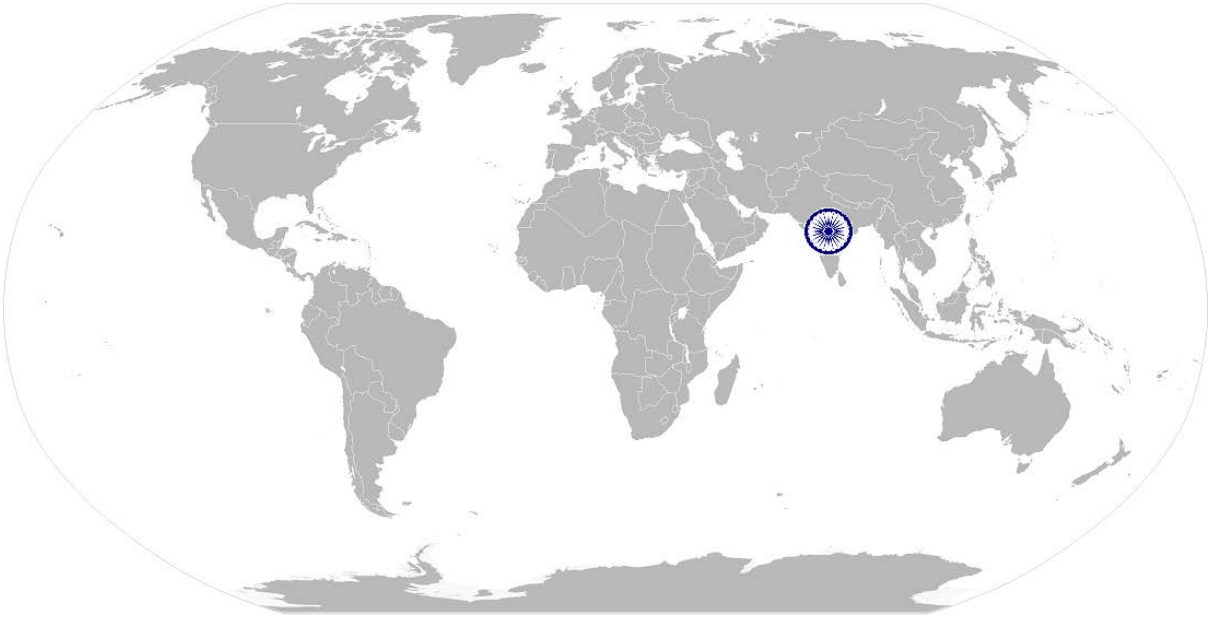
	The user/individual on the job needs to know and understand how to: SB12. identify cause and effect relations in their area of work SB13. use cause and effect relations to anticipate potential problems and their solution

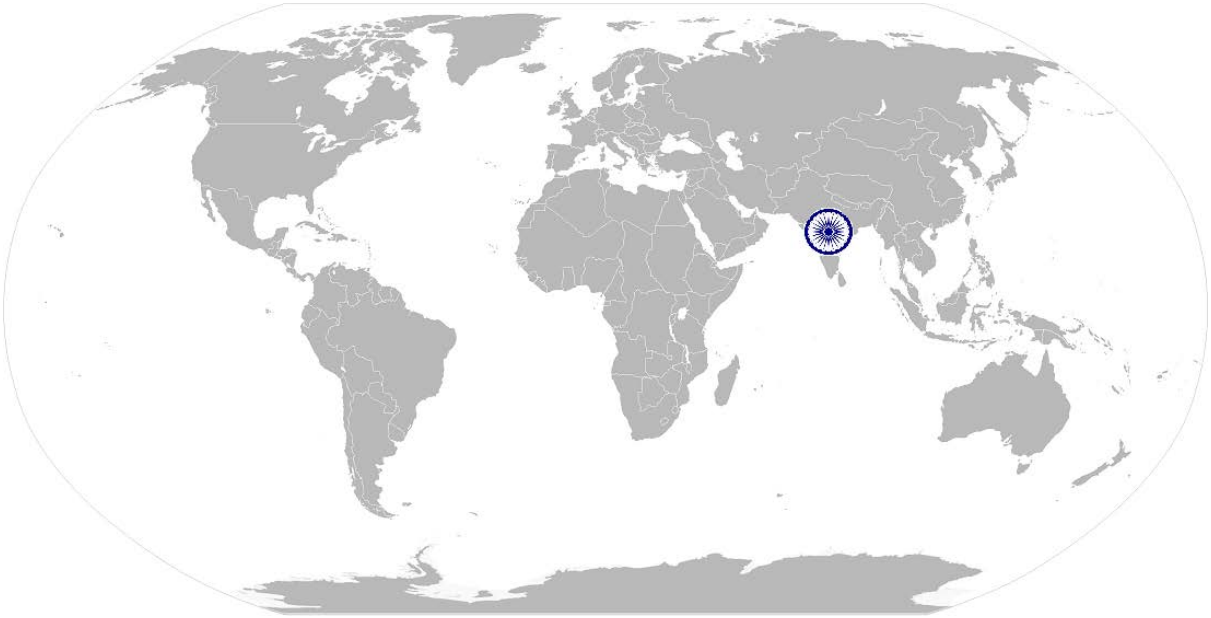


PSS/ N 2001: Use basic health and safety practices for power related work

NOS Version Control

NOS Code	PSS / N 2001		
Credits (NSQF)	TBD	Version number	1.0
Industry	Power	Drafted on	26/03/15
Industry Sub-sector	Generation, Transmission, Distribution, Renewable energy, Equipment manufacturing	Last reviewed on	26/03/15
		Next review date	26/03/17

National Occupational Standard



Overview

This unit covers basic practices that improve effectiveness of working with others in an organizational set-up.

CSC/ N 1336: Work effectively with others

National Occupational Standard

Unit Code	CSC / N 1336
Unit Title (Task)	**Work effectively with others**
Description	This unit covers basic etiquette and competencies that a candidate is required to possess and demonstrate in their behavior and interactions with others at the workplace. These cover areas such as communication etiquette, discipline, listening, handling conflict and grievances.
Scope	This unit/task covers the following: • Working with others

Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Working with others	The user/individual on the job should be able to: PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt PC3. give information to others clearly, at a pace and in a manner that helps them to understand PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks PC6. display appropriate communication etiquette while working **Communication etiquette:** do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa)etc. PC7. display active listening skills while interacting with others at work PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism PC9. demonstrate responsible and disciplined behaviors at the workplace **Disciplined behaviors:** e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict

Knowledge and 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. legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions KA2. reporting structure, inter-dependent functions, lines and procedures in the work area KA3. relevant people and their responsibilities within the work area KA4. escalation matrix and procedures for reporting work and employment related issues

CSC/ N 1336: Work effectively with others

B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. various categories of people that one is required to communicate and co-ordinate with in the organization KB2. importance of effective communication in the workplace KB3. importance of teamwork in organizational and individual success KB4. various components of effective communication KB5. key elements of active listening KB6. value and importance of active listening and assertive communication KB7. barriers to effective communication KB8. importance of tone and pitch in effective communication KB9. importance of avoiding casual expletives and unpleasant terms while communicating professional circles KB10. how poor communication practices can disturb people, environment and cause problems for the employee, the employer and the customer KB11. importance of ethics for professional success KB12. importance of discipline for professional success KB13. what constitutes disciplined behavior for a working professional KB14. common reasons for interpersonal conflict KB15. importance of developing effective working relationships for professional success KB16. expressing and addressing grievances appropriately and effectively KB17. importance and ways of managing interpersonal conflict effectively
Skills (S) [Optional]	

CSC/ N 1336: Work effectively with others

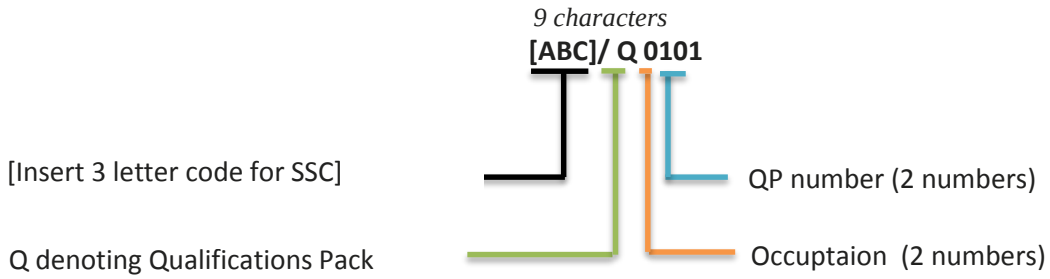
NOS Version Control

NOS Code	CSC / N 1336		
Credits(NSQF)	TBD	Version number	1.0
Industry	Power	Drafted on	26/03/15
Industry Sub-sector	Generation, Transmission, Distribution, Renewable Energy, Power Equipment Manufacturing	Last reviewed on	26/03/15
		Next review date	26/03/17

Annexure

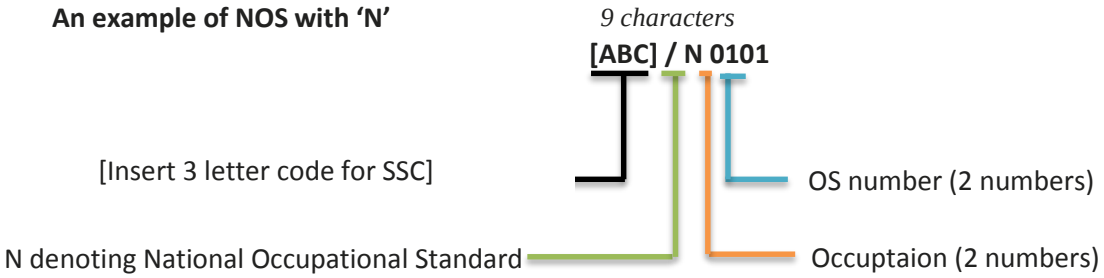
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



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

Sub-sector	Range of Occupation numbers
Generation	01-10
Transmission	01-10
Distribution	01-10
Renewable Energy	01-10
Power Equipment Manufacturing	01-10

Sequence	Description	Example
Three letters	Power	PSS
Slash	/	/
Next letter	Whether **Q**P or **N**OS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Power Plant Millwright Fitter

Qualification Pack PSS/ Q 0301

Sector Skill Council Power

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
6. 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

				Mark Allocation	
		Total Mark (400)	**Out of**	**Theory**	**Skills Practical**
PSS/ N 0302: Perform maintenance activities on power plant equipment and machinery	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	4	1	3
	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations		4	1	3
	PC3. work following laid down procedures and instructions		3	1	2
	PC4. ensure work area is clean and safe from hazards		2	0	2
	PC5. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC6. follow all relevant setting up and operating specifications for the products or mechanical equipment being commissioned		3	1	2

	PC7. follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved		3	1	2
	PC8. obtain job specifications and requirements from valid sources and find out the fault		1	0	1
	PC9. seek help of the supervisor or engineer to obtain relevant information for interpretation of drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process		3	1	2
	PC10. need to confirm lock-out/tag-out and zero energy procedures in machines, process systems and components as per organizational guidelines before attending any job		3	1	2
	PC11. follow the work procedure to attend the fault and the tools to be used		3	1	2
	PC12. evaluate sensory information to assess likely abnormalities		3	1	2
	PC13. perform hands-on inspections like checking tolerances and clearances of machinery, equipment		4	1	3
	PC14. check for worn, defective, broken or otherwise unacceptable components		3	1	2
	PC15. check condition, level and temperature of fluids according to manufacturers' recommendations		3	1	2
	PC16. identify common types of metals by examining chips, spark test and magnet test		2	1	1
	PC17. apply monitoring or testing procedures to help in the fault diagnosis using a range of test equipment		3	1	2
	PC18. relate previous reports/records of similar fault conditions to identify patterns and history		3	1	2
	PC19. erect and use scaffolding upto 6 meters height using cup lock scaffolding materials as per standard procedures		3	1	2

	PC20. ensures tool are fit for use and used operated in a safe manner, efficiently		2	0	2
	PC21. carry out maintenance activities on various power plant equipment in line with job requirement, and as per organizational standards and manufacturers' guidelines		2	0	2
	PC22. carry out the maintenance activities in the specified sequence and in an agreed timescale		3	1	2
	PC23. perform dismantling processes mechanical equipment using appropriate method or technique in order to replace defective components		4	1	3
	PC24. inspect components to check that the dismantled components are fit for reuse or due for replacement and to identify the need to replace lifed items (e.g. seals, gaskets, O-rings etc.)		3	1	2
	PC25. re-assemble the components using appropriate methods, and adjust them to meet the operating specification		4	1	3
	PC26. carry out servicing and maintenance techniques as applicable		2	0	2
	PC27. replace or refit basic hydraulic and pneumatic components		2	0	2
	PC28. identify requirements for machining, electric or electronic repair and to intimate the supervisor/engineer for arrangement to handover to the relevant personal after following due process for rectification		2	1	1
	PC29. witness a trial run of the equipment at full power/speed/flow to identify any abnormality of the repaired/installed equipment		2	0	2
	PC30. confirm that the attended component/equipment gives expected process outcomes		2	0	2
	PC31. carry out maintenance as per maintenance procedures and plans		4	1	3
	PC32. deal with equipment malfunction and rectify faults during the breakdown		3	1	2

	servicing process as appropriate				
	PC33. adhere to a routine schedule of maintenance activities to prevent faults		2	1	1
	PC34. apply predictive maintenance tests for early detection of equipment defects		3	1	2
	PC35. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve		3	0	3
	PC36. leave the work area in a safe and tidy condition on completion of the maintenance activities		2	0	2
		Total	**100**	**25**	**75**
PSS/ N 0301: Perform inspection activities on power plant equipment and machinery to detect and find irregularities and malfunctions	PC1. comply with health and safety, environmental and other relevant regulations and guidelines at work	**100**	4	1	3
	PC2. adhere to procedures and guidelines for personal protective equipment (PPE) and other relevant safety regulations while performing fabrication and fitting operations		4	1	3
	PC3. ensure work area is clean and safe from hazards		2	0	2
	PC4. work safely in confined space, in trenches or excavated area,		2	0	2
	PC5. handle large and heavy objects/loads and machines in a safe manner for self and others		4	1	3
	PC6. work safely on high pressure line/system (steam, compressed air, hydraulic etc.)		3	1	2
	PC7. work safely on energized systems, steam and compressed air systems, etc.		3	1	2
	PC8. follow safety signages where displayed including road safety		3	1	2
	PC9. ensure that all tools, equipment, power tool cables, extension leads are in a safe and usable condition		2	0	2
	PC10. obtain clearance to carry out the installation activities		2	0	2

	PC11. provide safe access and working arrangements for the installation area		2	0	2
	PC12. ensure safe isolation of services during the installation		3	1	2
	PC13. dispose of waste items in a safe and environmentally acceptable manner		3	1	2
	PC14. leave the work area in a safe condition and free from foreign object debris		2	0	2
	PC15. plan the installation activities in an efficient and appropriate manner		3	1	2
	PC16. survey and inspect the site and foundation for the following: Inspect the following: ensure that the site is accessible; ensure that site is free from obstructions or hazards; ensure the site is suitably prepared for the mechanical equipment installation to take place		3	1	2
	PC17. ensure that appropriate utilities are available (e.g. gas, water, air, electricity)		2	0	2
	PC18. ensure that required installation consumables are available		2	0	2
	PC19. ensure that safety and environmental conditions can be met		2	0	2
	PC20. obtain necessary permits to carry out the required work		2	0	2
	PC21. check the installation job specification documentation are available and correct		3	1	2
	PC22. marking out of positioning and layouts		3	1	2
	PC23. check and record for any physical damages to the machine/equipment		3	1	2
	PC24. check position and condition of anchor bolts/foundation bolts		3	1	2
	PC25. movement and positioning of equipment, using cranes or forklifts as per the layout		4	1	3
	PC26. remove moisture absorbent bags, rust preventive, locking devices		2	1	1
	PC27. fill oils for lubrication, hydraulic		1	0	1

	and other special oils				
	PC28. ensure the machine is clean		1	0	1
	PC29. install the machine in accordance with manufacturers' and site specifications		4	1	3
	PC30. instruction/guidance of the manufacturer/customer and received through team supervisor/engineer		3	1	2
	PC31. use the various installation tools and equipment as required		2	1	1
	PC32. apply installation techniques like leveling, aligning, coupling and connecting in accordance with specifications		3	1	2
	PC33. fill coolants, oil and other fluids as per specifications		2	1	1
	PC34. ensure the site is cleaned and clear of all debris and left in safe state		1	0	1
	PC35. all reports and documentation are completed correctly to required specifications		2	1	1
	PC36. produce installations which comply with the equipment manufacturer's operation specification/range		3	1	2
	PC37. deal promptly and effectively with problems within control, and seek help and guidance from the relevant people for problems that cannot be resolved		2	0	2
	PC38. witness No-Load trail run of the equipment and carry out check for proper functioning without load		3	1	2
	PC39. make adjustments, appropriate to the equipment being installed and seek guidance of the supervisor/engineer when required		2	0	2
		Total	**100**	**24**	**76**
PSS/ N 2001 (Use basic health and safety practices at the workplace)	PC1. use protective clothing/equipment for specific tasks and work conditions	**100**	3	0	3
	PC2. state the name and location of people responsible for health and safety in the workplace		2	0	2

	PC3. state the names and location of documents that refer to health and safety in the workplace		2	0	2
	PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace		3	1	2
	PC5. follow electrical safe working procedures such as Tag out/Lock out, PTW (Permit To Work),		3	1	2
	PC6. follow warning signs (danger, out of service, etc.) while working with electrical systems		3	1	2
	PC7. use standard safe working practices when working at heights, confined areas and trenches		3	1	2
	PC8. test any electrical equipment and system using insulated testing devices before touching them		3	1	2
	PC9. ensure positive isolation of electrical equipment & system as per given standards		3	1	2
	PC10. recognize any abnormalities in electrical equipment or system installed alarm annunciation and/or noticing parameters from gauge/ indicator installed		3	1	2
	PC11. carry out safe working practices while dealing with hazards to ensure the safety of self and others		3	1	2
	PC12. state methods of accident prevention in the work environment of the job role		2	0	2
	PC13. state location of general health and safety equipment in the workplace		2	0	2
	PC14. inspect for faults, set up and safely use of scaffolds and elevated platforms and ladders		2	0	2
	PC15. lift, carry and transport heavy objects & tools safely using correct procedures from storage to workplace and vice versa		3	1	2
	PC16. inspect power plant and its equipment routinely for any signs of oil, water and/or steam leakage		3	0	3
	PC17. store flammable materials and machine lubricating oil safely and		2	0	2

	correctly				
	PC18. check that the emission and pollution control devices are working properly in line with environmental policy standards		5	2	3
	PC19. apply good housekeeping practices at all times		3	1	2
	PC20. identify common hazard signs displayed in various areas		2	0	2
	PC21. retrieve and/or point out documents that refer to health and safety in the workplace		2	0	2
	PC22. inform relevant authorities about any abnormal situation/behavior of any equipment/system promptly		3	0	3
	PC23. use the various appropriate fire extinguishers on different types of fires correctly		4	1	3
	PC25. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC26. demonstrate the correct use of a fire extinguisher		3	1	2
	PC27. demonstrate how to free a person from electrocution		3	1	2
	PC28. administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	0	3
	PC29. demonstrate basic techniques of bandaging		3	1	2
	PC30. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments		3	1	2
	PC31. perform and organize loss minimization or rescue activity during an accident in real or simulated environments		3	1	2
	PC32. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2

	PC33. demonstrate the artificial respiration and the CPR Process		3	1	2
	PC34. participate in emergency procedures		3	1	2
	PC35. complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC36. demonstrate correct method to move injured people and others during an emergency		3	1	2
		Total	**100**	**24**	**76**
CSC/ N 1336 (Work effectively with others)	PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	**100**	10	3	7
	PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3. give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6. display appropriate communication etiquette while working		10	3	7
	PC7. display active listening skills while interacting with others at work		10	3	7
	PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9. demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		Total	**100**	**30**	**70**