

Sample C1: Prototype Core Curriculum

for

Plant Maintenance Mechanic (First

Level)

Part 1 Knowledge Requirements

PROTOTYPE CORE CURRICULUM

Sector : Metal and Engineering Occupations

Occupational field : Plant Maintenance Mechanic

Level : First Level

Subject :

National Certificate : National Certificate II

Duration : 1Year (Part 1 and 2)

Duration Part 1 : 1 Semester = 18 weeks = 92 days
(1 day In-School/Center = 6 h , 1 day In-Firm = 8 h)

Course Content

Part 1 Based on Knowledge Requirements of the Training Regulation for Plant Maintenance Mechanic

Code: (TR)	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
1.1	Safety Precautions	To be imparted during the entire subject		
1.2	Blueprint Reading and Drawing	5 days	-	-
1.3	Shop Mathematics	10 days	-	-
1.4	Measurements and Inspection	2 days	3 days	-
1.5	Materials and Heat Treatment	2 days	-	-
1.6	Toolroom Machining	5 days	25 days	-

Code: (TR)	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
1.7	Hand- and Power-operated Tools	To be imparted during the entire subject		
1.8	Hydraulics and Pneumatics	3 days	5 days	-
1.9	Mechanism and Machine Elements	5 days	-	-
1.10	Machine Repair/Overhaul	-	7 days	-
1.11	Preventive and Corrective Maintenance	-	4 days	-
1.12	Machine Reconditioning	-	4 days	-
	Industry Immersion	-	-	12 days
Summary		32 days	48 days	12 days
		80 days (480 h)		12days (96 h)
Total		92 days		

Sample C2: Prototype Core Curriculum
for

Plant Maintenance Mechanic (First Level)
Part 2 Skills Requirements

PROTOTYPE CORE CURRICULUM

Sector : Metal and Engineering Occupations
Occupational field : Plant Maintenance Mechanic
Level : First Level
Subject :
National Certificate : National Certificate II
Duration : 1 Year (Part 1 and 2)
Duration Part 2 : 1 Semester plus Semestral Break = 28 weeks = 168 days
 (1 day In-School/Center = 8 h , 1 day In-Firm = 8 h)

Course Content

Part 2 **Based on Skills Requirements of the Training Regulation for Plant Maintenance Mechanic**

According to the DACUM Research Chart

Code: (TR)	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
A	Performing Preventive Maintenance	1 day	2 days	30 days
B	Performing Corrective Maintenance	-	2 days	30 days
C	Repairing and maintaining fluid system	1 day	3 days	30 days
E	Fabricating simple parts	1 day	5 days	40 days
F	Fitting parts into assembly	1 day	2 days	20 days
	Summary	4 days	14 days	150 days
		18 days (144 h)		150 days (1200 h)
		168 days		

Code: (TR)	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Total Summary Part 1 (Knowledge Requirements and Industry Immersion) Part 2 (Skills Requirements)	80 days 18 days	12 days 150 days	
		98 days	162 days	
		260 days		

TESDA,NITVET,CTAD, Schwarz 11/23/1999

Drafted by Workgroup:

Sector: **Metal and Engineering Occupations**

Occupational Field: Plant Maintenance Mechanic

Level: Class B

Subject:

National Certificate: NC 2

Duration Part 1: 1 Semester = 18 weeks = 92 days

Total Duration: 1 Year (Part 1 and 2)

Course Content

Part 1. Based on Knowledge Requirements of the Training Regulation for Plant Maintenance Mechanic

Training Plan for Schools / Centers and for Industry Immersion for Plant Maintenance Mechanic

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.1 Safety Precautions	To interpret safety precautions and analyze the safety conditions of the working place	1.1.1 Safe handling of tools, equipment and materials	To be imparted during the entire subject			Regular meeting and exercises. Information material. Seminars and learning sessions
		1.1.2 Protective clothing and equipment				
		1.1.3 Cleanliness and tidiness				
		1.1.4 First-aid Treatment				
		1.1.5 Fire extinguisher				
		1.1.6 Safety and health regulation				

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.2 Blueprint Reading and Drawing	<p>To explain the information given in technical drawings and apply this information for different manufacturing processes.</p> <p>To translate the abstract information into practice..</p>		30			
		<p>2.2.1 The working Drawing :</p> <p>requirements of an explicit working drawing, manufacturing specification to ensure correct processing.</p>	6			Lecture
		<p>1.2.2 ISO Limits and Fits: general and shafts; commonly used holes and shafts; tolerances grades; commonly used fits; use of table</p>	4			Tutorial
		<p>1.2.3 The reference surface: datum featuring used measuring and setting-up</p>	4			Practical Exercises
		<p>1.2.4 Machining accuracy: dimension chain and classification; rules in dimensional relationship</p>	4			
		<p>1.2.5 Geometrical Tolerances: Conventional representation of geometric tolerances especially to straightness, flatness, parallelism and locational tolerances</p>	4			

C = Classroom SS = School shop IN = Industry

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
		1.2.6 Surface Finish: Definition of terms; conventional representation specification	4			
		1.2.7 Graphs: Use and interpretation; making graphs of different types, Cartesian, polar and logarithmic	4			

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.3 Shop Mathematics	To demonstrate basic mathematical operations and solve related workshop problems.		60			Self-learning programs Problem-solving teamwork Evaluation and assessment instruments Lecture
		1.3.1 Average, percentage, ratio proportion	4			
		1.3.2 Manipulation of formulas, areas and plan figure, volumes and weight of common regular solids	12			
		1.3.3 Geometrical properties of a circle	4			
		1.3.4 Simple trigonometric functions and application	16			
		1.3.5 Pythagorean theorem	12			
		1.3.6 Workshop problem in layout, measuring, setting-up and machining	12			

C = Classroom SS = School shop IN = Industry

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.4 Measure- ments and Inspection	To list measuring tools and distinguish the application in different operational areas.		12	18		Lecture Practical exercises Instructional materials Evaluation assessment instruments
		1.4.1 Tools of measuring: The reference gauge, the measuring tools and comparators	4	6		
		1.4.1.1 Measuring Tools: Use, care and calibration of vernier calipers, micrometers, dials, indicators, special measuring tools, special applications in measuring angles, tapers, center distances, bore, etc.	8	12		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.5 Materials and Heat Treatment	To classify the physical properties of metals and distinguish heat treatment operations and procedures needed to fabricate simple parts.		12			Lecture Instructional materials Evaluation and assessment instruments Company visit
		1.5.1 Tool Components	4			
		1.5.1.1 Physical properties of tool components for cutting and shearing, drawing, hot pressing tool, extrusion tools dies sinking tools: - Low melting alloys - Cast iron, high grade - Carbon steel	2			
		1.5.2 Heat treatment operations	2			
		1.5.2.1 The procedure followed in: - Hardening - Tempering - Flame hardening	2			
		1.5.2.2 Heat treatment equipment and control	2			

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.6 Toolroom Machining	To identify and explain parts and functions and operating procedures of various machine tool.	<p>1.6.1 Materials Preparations: machines used for preparation of materials: power hacksaw, band saw, abrasive cutters, gas cutting</p> <p>1.6.2 Marking and Layout: The manual method of location of holes and outlines</p> <p>1.6.3 Turning: The machine tools needed, work holding devices, tools and attachment <ul style="list-style-type: none"> - Safety precaution - Spindle speeds and feed rate for different materials and tools - Turning faults and correction </p> <p>1.6.4 Milling: Machine tool used, work holding devices, tools and attachment used: <ul style="list-style-type: none"> - Safety precaution - Spindle speeds and feed rate for different materials and tools - Work holding devices - Milling computations </p>	30	150		<p>Lecture</p> <p>Practical exercises</p> <p>Instructional materials</p> <p>Evaluation and assessment instruments</p> <p>Company visit</p> <p>Trainer and simulators</p>
			2	2		
			2	4		
			8	42		
			8	42		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
		<p>1.6.5 Grinding:</p> <ul style="list-style-type: none"> - Safety precautions - Selection of grinding wheel - Grinding wheel specifications - Work holding devices - Grinding operations involving surface grinding <p>1.6.6 Bench work operations safety, tools, work holding devices for:</p> <ul style="list-style-type: none"> - Filing - Scraping - Drilling/counter boring - Tapping 	6	18		
			4	42		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.7 Hand- and Power- operated Tools	To classify types of hand tools and explain their uses..	1.7.1 Types and uses of hand tools (wrenches, files, pliers, pullers, screw drivers, punchers, hack saws and hammers)	To be imparted during the entire subject			Lecture Instructional materials Evaluation and assessment instruments

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.8 Hydraulics and Pneumatics	To identify symbols and controls used in fluid system, and apply the basic fluid principles necessary to repair and maintain fluid system.		18	30		Lecture
		1.8.1 Knowledge of the symbols used in hydraulic and pneumatic diagrams	12	16		Instructional materials Practical exercises
		1.8.2 Types of control valves and application	2	6		Trainers/simulators Evaluation and assessment instruments
		1.8.3 Basic fluid principles	2	4		
		1.8.4 Uses of filters and strainers	2	4		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.9 Mechanism and Machine Elements	To Identify common machine parts and their uses, and explain its installing procedures.		30			Lecture
		1.9.1 Identification of common machine parts	4			Instructional materials
		1.9.2 Kinds of bearings and their uses	8			Evaluation and assessment instruments
		1.9.3 Storage, cleaning and lubrication of bearings	4			
		1.9.4 Identification of different kinds of scales, packings and gaskets	4			
		1.9.5 Procedure in installing of belts, couplings and bearings	8			
		1.9.6 Relation of machine parts with others	2			

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.10 Machine Repair/ Overhaul	To identify machine parts and functions and explain dismantling and assembling procedures.			42		Lecture
	To diagnose common machine faults.	1.10.1 Function of machine elements		4		Instructional materials Trainer/simulators
		1.10.2 Function of machine parts		4		Practical exercises
		1.10.3 Steps and procedures in dismantling and assembling of standard parts		4		Evaluation and assessment instruments
		1.10.4 Common machine faults		6		
		1.10.5 Electric arc and gas welding		24		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.11 Preventive and Corrective Maintenance	To identify machine parts that requires lubrication and explain lubrication procedures and scheduling.			24		Lecture Instructional materials Practical exercises Evaluation and assessment instruments Company visit
		1.11.1 Lubricating procedures for machines like shaper, drilling, lathe, milling, boring and grinding machine		12		
		1.11.2 Frequency for changing of oil of shop equipment/machine tools		6		
		1.11.3 Identification of machine parts requiring lubrication		6		

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
1.12 Machine Reconditioning	To determine steps and procedures in setting-up parts, in accordance with machine metrology.			24		Lecture
		1.12.2 Machine tool metrology		12		Instructional materials Trainer/simulators
		1.12.3 Knowledge of transporting equipment		4		Practical exercises
		1.12.5 Steps and procedures in setting-up parts		8		Evaluation and assessment instruments
2.1 Industry Immersion	To join in selected firms for familiarization and job induction of possible company assignment				96	

Summary	192	288	96
	480		96
Total	576		

C = Classroom SS = School shop IN = Industry

Sector: Metal and Engineering Occupations
Occupational Field: Plant Maintenance Mechanic
Level: Class B

Subject:
National Certificate: NC 2
Duration Part 2: 1 Sem. (18 weeks) + Sem. Break (10 weeks)
Total Duration: 1 Year (Part 1 and 2)

Course Content

Part 2. Based on Skills Requirements of the Training Regulation for Plant Maintenance Mechanic
 (According to the DACUM Research Chart)

Training Plan for Schools / Centers and Industry for Plant Maintenance Mechanic

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
A Perform Preventive Maintenance	To inspect and maintain various machines/equipment in accordance with manufacturers specifications and preventive maintenance scheduling.		8	16	240	Lecture Instructional materials
		A-2 Lubricate machines		20	24	Practical exercises
		A-3 Inspect/maintain V-belt drive	2	2	40	Competency assessment instruments
		A-4 Inspect/maintain chain and sprocket drives	2	2	40	Industry immersion
		A-8 Adjust gibs of slide ways		2	16	Company visit

Note: *Didactical remarks are recommended to all competencies.*

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
		A-9 Inspect/maintain drive coupling	2	2	40	
		A-13 Lubricate seal faces		2	16	
		A-14 Participate in safety training program		2	24	
		A-15 Orient OJT trainees/operators on safety and maintenance practices	2		24	
		A-16 Perform housekeeping		2	16	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
B Perform Corrective Maintenance	To remove and install specific spare parts in accordance with manufacturers specifications and machine setting and tolerances.			16	240	
		B-2 (A) Remove and install plain bearing (bushes and sleeves)	8	120		
		B-4 (A) Remove and install roller bearing	8	120		

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
C Repair and maintain fluid system	To describe the functions of hydraulic systems.		8	24	240	
	To inspect and replace hydraulic lines and pipping systems.	C-1 (A) Inspect a hydraulic system	8	8	80	
		C-9 Replace hydraulic gasket and seals		2	8	
		C-11 Repair/replace hydraulic lines		4	80	
		C-12 Replace damaged/faulty lines/fittings		4	24	
		C-16 Install and replace a steel piping system		4	40	
		C-20 Install plastic tube to machine		2	8	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)	
			C	SS	IN		
E Fabricate simple parts	To demonstrate skills on operating various industrial tools and machine/equipment.		8	40	320		
		E-1	Cut metal stock with hand hacksaw			4	
		E-2	Cut metal stock with hand chisel			4	
		E-3	File workpiece			16	
		E-4	Mark workpiece		2	4	
		E-5	Drill holes with portable drill		2	4	
		E-6	Drill holes to size with drill press		2	8	
		E-7	Counterbore holes to depth		2	8	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
		E-8 Countersink holes		2	4	
		E-9 Spot-face hole		2	4	
		E-12 Cut internal thread with hand taps		2	8	
		E-13 Cut thread with dies		2	8	
		E-21 (A) Gas weld ferrous metals	2	4	40	
		E-25 Arc-weld ferrous metals	2	4	40	
		E-27 Harden metals	2	4	8	
		E-28 Temper metals	2	2	4	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
		E-29 Turn workpiece		4	40	
		E-30 Face workpiece		2	40	
		E-32 (A) Mill workpiece square		4	80	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	
F Fit parts into assembly	To fit and assemble parts with specified connectors in accordance with manufacturers specifications and mechanical safety.		8	16	160	
		F-2 Bolt parts		2	16	
		F-3 Dowel parts		2	16	
		F-4 Pin parts to a shaft		2	16	
		F-6 Fit/extract wheel	2	2	24	
		F-7 Fit parallel and tapered keys	2	2	16	
		F-8 Fit/extract bearing	2	4	40	
		F-13 Bend pipes	2	2	32	

Summary	32	112	1200
	144	1200	
Total	1344		

C = Classroom SS = School shop IN = Industry

Code: (TR)	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
				-
				-
				-
				-
				-
				-
				-
	Industry Immersion	-	-	
Summary		..... days	..... days	.... days
		.... days (.... h)		.... days (.... h)
Total		.... days		

Code: (TR)	Duties	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Summary	.... days	.... days	.... days
		.... days (.... h)		.... days (.... h)
		.... days		

Code: (TR)	Topics/Duties	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Total Summary Part 1 (Knowledge Requirements and Industry Immersion) Part 2 (Skills Requirements)	.... days		.... days
		.... days		.... days
		.... days		.... days
		.... days		.... days
		.... days		

Drafted by Workgroup:		Subject:	
Sector:		National Certificate:	
Occupational Field:		Duration Part 1:	
Level:		Total Duration:	

Course Content

Part 1. Based on Knowledge Requirements of the

Training Plan for Schools / Centers for Plant Maintenance Mechanic

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

C = Classroom SS = School shop IN = Industry

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

C = Classroom SS = School shop IN = Industry

Knowledge Requirements	Objectives	Contents	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

Summary			
Total			

C = Classroom SS = School shop IN = Industry

Drafted by Workgroup:		Subject:	
Sector:		National Certificate:	
Occupational Field:		Duration Part 1:	
Level:		Total Duration:	

Course Content

Part 2. Based on Skills Requirements of the

Training Plan for Schools / Centers for Plant Maintenance Mechanic

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

C = Classroom SS = School shop IN = Industry

Skills Requirements	Objectives	Tasks	Learning Hours/ Venue			Didactical Remarks (Recommendations)
			C	SS	IN	

Summary			
Total			

C = Classroom SS = School shop IN = Industry

PLANT MAINTENANCE MECHANICS

OCCUPATIONAL SKILLS STANDARDS

(Part of the Training Regulation)

- **Introduction**
- **General Principles**
- **Job Description**
- **Index of Knowledge Requirements**
- **Index of Skills Requirements**
- **DACUM Research Chart for Plant
Maintenance Mechanics**

OCCUPATIONAL SKILLS STANDARD

PLAN MAINTENANCE MECHANICS

INTRODUCTION

This Occupational Skills Standard defines the MINIMUM required stock of knowledge and skills a tradesman is supposed to possess to qualify as a PLANT MAINTENANCE MECHANIC. A tradesman is granted a certificate of proficiency (national skills certificate) under this occupational title once he passes the Competency Assessment.

This Occupational Skills Standard is herein formulated and developed for any, and/or all of the following purposes:

1. To upgrade the level of skill of workers in the METALS and ENGINEERING INDUSTRY, with the end in view of coming up with quality products/service, optimal use of equipment/tools/materials and increased productivity.
2. To provide employers with a structural basis in the preparation of job specification necessary for salary and /or wage administration.
3. To enhance the development of human resources through a precise assessment of skilled manpower in the Metals and Engineering Industry at large.
4. To serve as a basis in the establishment of Testing and Certification System, which machinery can be used for setting up of a classified pool of Plant Maintenance Mechanics ready to service both domestic and overseas requirements.
5. To facilitate the setting up of a machinery for determination of appropriate and adequate remuneration and the implementation of “equal work ,equal pay” .
6. Finally, to enhance the government’s desire to professionalize the skilled worker for which role the Technical Education and Skills Development Authority was established.

GENERAL PRINCIPLES

1. Classification

- 1.1 This Trade Skills Standard classifies PLANT MAINTENANCE MECHANIC into two two (2) classes: Class B and Class A (the higher).
- 1.2 Candidates who wish to be certified for their competency as PLANT MAINTENANCE MECHANIC will be required to show by written examination and by practical demonstration that they are in possession of the knowledge and skills required by the standard.
- 1.3 Candidates who passed the trade test will be issued a certificate bearing their names and photograph and shall be listed in the National Registry of Certified Skilled Workers in the Philippines.

2. Entry Requirements

- 2.1 Candidates for certification as PLANT MAINTENANCE MECHANIC class B must:
 - 2.1.1 Have had one year work experience as Plant Maintenance Mechanic;
or
 - 2.1.2 Have completed a short intensive training in Plant Maintenance Mechanic conducted by Technical Education and Skills Development Authority (TESDA) , or any certified industrial/training institution; or equivalent course requiring a minimum of 720 hours of practical training recognized by TESDA followed by one (1) year working experience as a Plant Maintenance Mechanic, or
 - 2.1.3 Have completed a primary apprenticeship training approved by the Department of Labor and Employment, or a appropriate training which equates to a short intensive course as Plant Maintenance Mechanic.
- 2.2 Candidate for certification for Plant Maintenance Mechanic Class A must:
 - 2.2.1 Have had one year relevant working experience as Plant Maintenance Mechanic Class B or,
 - 2.2.2 Have completed an intensive advanced training course in Plant Maintenance Mechanic conducted by TESDA or any certified industrial/training institution,
or
 - 2.2.3 Have had at least four (4) years working experience as Plant Maintenance Mechanic.

3. Definition of Terms

For the purpose of this standard, the word

3.1 Class - refer to the category according to the level of difficulty and complexity of skills and knowledge required of the job.

4. Delimitation of this Standard

In the context of this prepared standard, Plant Maintenance Mechanic's body of knowledge and skills covers only machine maintenance and does NOT include:

4.1 machine tool rebuilding

4.2 production tooling

JOB DESCRIPTION

PLANT MAINTENANCE MECHANIC

A Plant Maintenance Mechanic performs preventive and corrective maintenance, repairs and maintains fluid systems, install and removes machinery, and fabricates and fits machinery parts.

CLASSIFICATION

In this Occupational Skills Standard, Plant Maintenance Mechanics are classified according to level of difficulty and complexity of skills and knowledge required of the job and consideration on safety.

A PLANT MAINTENANCE MECHANIC CLASS B is equivalent to a skilled worker who has the ability to do a practical job or work at high level of efficiency and manipulative skills.

A PLANT MAINTENANCE MECHANIC CLASS A is equivalent to a highly - skilled worker who has the ability to perform a wide range of tasks at high level competence.

PLANT MAINTENANCE MECHANIC

CLASS B

A Plant Maintenance Mechanic Class B performs preventive maintenance, repairs and maintains fluid system, and fabricates and fits parts into assembly.

In particular, under limited supervision of a Class A mechanic, he:

1. Lubricate and adjusts machines, belts and drives, chain and sprockets drives, gobs, couplings and seals and participates in training and orients trainees and performs housekeeping;
2. Replaces gaskets and seals, hydraulic lines and fittings and steel piping system and installs plastic tubes to machines;
3. Performs cutting with hacksaw, cutting with cold chisel, filling and marking of workpieces;
4. Drills, counterbores, countersinks and spot - faces holes and performs threading using taps and dies;
5. Welds, hardens and tempers metals and operates lathe to turn and face workpieces;
6. Bolts, pins and dowels parts and fits wheels, keys and bearings and bends pipes.

PLANT MAINTENANCE MECHANIC

CLASS A

A Plant maintenance Mechanic Class A performs preventive maintenance, repairs and maintains fluid systems, installs and removes machineries, and fabricates and fits parts into assembly.

In addition to performing work of the Plant maintenance Mechanic Class B, he:

1. Maintains linkages and mechanism, bearing, gear drives, centrifugal and pneumatic clutch and gear box drives;
2. Diagnose machine breakdown and remove and installs plain bearing bushes and sleeves and roller bearings;
3. Removes and installs belts, chain drives, flexible couplings and universal joints;
4. Maintains hydraulic strainers/filters, cylinders, motors or pumps, and repairs/replaces;
5. Repairs/replaces internal parts of vane-and piston -type hydraulic pump or motor;
6. Repairs/replaces hydraulic gaskets and seals, flexible hoses. Lines, fittings and valves;
7. Install and maintains air-compressor and water pump;
8. Transport, moves, installs, positions and aligns machineries;
9. Reams holes and laps flat surfaces and aligns machineries;
10. Cuts, shapes, welds and solders metal using gas cutting equipment; and
11. Aligns parts, scrapes workpieces, fits flanges and balances static rotating parts.

INDEX OF KNOWLEDGE REQUIREMENTS

- 1.1 SAFETY PRECAUTIONS
- 1.2 BLUEPRINT READING AND DRAWING
- 1.3 SHOP MATHEMATICS
- 1.4 MEASUREMENT AND INSPECTION
- 1.5 MATERIALS AND HEAT TREATMENT
- 1.6 TOOL ROOM MACHINING
- 1.7 HAND AND POWER- OPERATED TOOLS
- 1.8 HYDRAULICS AND PNEUMATICS
- 1.9 MECHANISM AND MACHINE ELEMENTS
- 1.10 MACHINE REPAIR/OVERHAUL
- 1.11 PREVENTIVE AND CORRECTIVE MAINTENANCE
- 1.12 MACHINE RECONDITIONING

Code	Knowledge Requirements	Class B	Class A
1.1	SAFETY PRECAUTIONS		
1.1.1	Safe handling of tools, equipment and materials	X	
1.1.2	Protective clothing and equipment	X	
1.1.3	Cleanliness and tidiness	X	
1.1.4	First-aid treatment	X	
1.1.5	Fire extinguishers	X	
1.1.6	Safety ad health regulation	X	
1.2	BLUEPRINT READING AND DRAWING		
1.2.1	The Working Drawing: requirement of an explicit working working drawing, manufacturing, specifications to ensure correct processing	X	
1.2.2	ISO Limits and Fits: general and shafts, commonly used holes and shafts; tolerances grades; commonly used fits, use of tables	X	
1.2.3	The reference surface: datum featuring used measuring and sitting up	X	
1.2.4	Machining accuracy: dimension chain and classification; rules in dimensional relationship	X	
1.2.5	Geometrical Tolerances: Conventional representation of geometric tolerances especially to straightness, fitness, parallelism and locational tolerances	X	
1.2.6	Surface Finish: Definition of terms; conventional representation specification	X	
1.2.7	Graphs: Use and interpretation ; making graphs of different types, cartesian, polar, and logarithmic	X	
1.3	SHOP MATHEMATICS		
1.3.1	Average, percentage, ratio and proportion	X	
1.3.2	Manipulation of formulas Areas and plan figure Volume and weight of common regular solids	X X	
1.3.3	Geometrical properties of a circle	X	
1.3.4	Simple trigonometric functions and application	X	
1.3.5	Pythagorean theorem	X	
1.3.6	Workshop problem in layout, measuring, setting up and machining	X	

Code	Knowledge Requirements	Class B	Class A
1.4	MEASUREMENTS AND INSPECTION		
1.4.1	Standard of length; international metric standard; the flow chart showing interrelation form primary workshop measuring instrument; dimensional stability in the workshop, the “ ten percent rule “ calibration of measuring tools.		X
1.4.2	Tools of Measuring : The reference gauge, the measuring tools, and comparators:	X	
1.4.2.1	Gauges Blocks: the use and care of gauges block as measuring and marking tools		X
1.4.2.2	Measuring Tools: Use, care, and calibration of vernier calipers, micrometers, dial, indicators, special measuring tools, special applications in measuring angles, tapers, center distances, bores, etc.	X	
1.4.2.3	Comparative Measurements: types of comparators; profile projection and tool makers microscope		X
1.5	MATERIALS & HEAT TREATMENT		
1.5.1	Tool Components		
1.5.1.1	Physical properties of tool components for cutting and searing, drawing, hot pressing tool, extrusion tools, dies sinking tools: <ul style="list-style-type: none"> - Low melting alloys - Cast iron , high grade - Carbon steel - Tool steel and alloyed steel - Rubber, polyurethane - Carbides - Composites 	 X X X 	 X X X X

Code	Knowledge Requirements	Class B	Class A
1.5.2	Heat treatment operations		
1.5.2.1	The procedure followed in:		
	- Annealing		X
	- Normalizing		X
	- Hardening	X	
	- Tempering	X	
	- Flame hardening	X	
1.5.2.2	Heat treatment equipment and control	X	
1.5.2.3	Inspection of heat treated parts		
	- Crack detection		X
	- Warpage test		X
	- Hardness test		X
1.6	TOOLROOM MACHINING		
1.6.1	Materials Preparations: machine used for preparation of materials: power hacksaw, bandsaw, Abrasive cutters, gas cutting .	X	
1.6.2	Marking and Layout:		
1.6.2.1	The manual method of location of holes and outlines	X	
1.6.2.2	The use of jigs borers		X
1.6.3	Turning: The machine tools needed, work holding devices, tools and attachment		
1.6.3.1	Safety precaution	X	
1.6.3.2	Spindle speed and feed rate for different materials and tools	X	
1.6.4	Milling: Machine tool used, work holding devices, tools and attachment used		
1.6.4.1	Safety precaution	X	
1.6.4.2	Spindle speed and feed rate for different materials and tools	X	
1.6.4.3	Work holding devices	X	
1.6.4.4	Milling faults and ratifications		X
1.6.4.5	Milling computations	X	
1.6.4.6	Advance milling problems		X

Code	Knowledge Requirements	Class B	Class A
1.6.5	Grinding:		
	1.6.5.1 Safety precaution	X	
	1.6.5.2 Selection of grinding wheel	X	
	1.6.5.3 Grinding wheel specifications	X	
	1.6.5.4 Balancing & mounting of grinding wheel		X
	1.6.5.5 Dressing a grinding wheel		X
	1.6.5.6 Wheel speed, work speed and feed rate		X
	1.6.5.7 Work holding devices	X	
	1.6.5.8 Grinding operations involving		
	- Surface grinding		X
	- Cylindrical and taper		X
	- Internal grinding		X
	- Linear form grinding		X
1.6.6	Machining surfaces of Irregular shapes		X
1.6.7	Bench work operations safety, tools, work holding devices for:		
	- Filing	X	
	- Scraping	X	
	- Drilling / counter boring	X	
	- Reaming		X
	- Tapping	X	
	- Polishing		X
1.7	HAND AND POWER OPERATED TOOLS		
1.7.1	Types and uses of handballs (wrenches, files, pliers, pullers, screw drivers, punchers, hacksaws and hammers)	X	
1.7.2	Types and uses of power tools (grinders, sanders, polishers, electric drills and hydraulic pullers)		X
1.8	HYDRAULICS AND PNEUMATICS		
1.8.1	Knowledge of the symbols used in hydraulic and pneumatic diagram	X	
1.8.2	Types of control valves and application	X	
1.8.3	Basic fluid principles	X	
1.8.4	Hydraulic and pneumatic pipings		X
1.8.5	Uses of filters and strainers	X	
1.8.6	Types of pumps and uses		X

Code	Knowledge Requirements	Class B	Class A
1.8.7	Liquid use in hydraulic system		X
1.8.8	Hydrostatic testing		X
1.9	MECHNISM AND MACHINE ELEMENTS		
1.9.1	Identification of common machine parts	X	
1.9.2	Kinds of bearing and their uses	X	
1.9.3	Storage, cleaning and lubrication of bearings	X	
1.9.4	Identification of different kinds of seals, packing and gaskets	X	
1.9.5	Procedure in installing of belts, couplings and bearings	X	
1.9.6	Clearance / timing of gears		X
1.9.7	Relation of machine parts and others	X	
1.9.8	Cams and their uses		X
1.10	MACHINE REPAIR AND OVERHAUL		
1.10.1	Function of machine elements	X	
1.10.2	Function of machine parts	X	
1.10.3	Steps and procedures in dismantling and assembling of: - standard parts - major parts / components of machine	X	X
1.10.4	Common machine faults	X	
1.10.5	Special tools / fixtures for dismantling / assembling		X
1.10.6	Fits and tolerances		X
1.10.7	Electric arc and gas welding	X	
1.11	PREVENTIVE AND CORRECTIVE MAINTENANCE		
1.11.1	Lubricating procedures for machines like shaper, drilling, lathe, milling , boring and grinding machine	X	
1.11.2	Frequency for changing of oils of shop equipment/machine tools	X	
1.11.3	Identification of machine parts requiring lubrication	X	
1.11.4	Knowledge of checking out machine for major repair		X
1.12	MACHINE RECONDITIONING		
1.12.1	Knowledge of machine tool standard		X
1.12.2	Machine metrology	X	
1,12,3	Knowledge of transporting equipment	X	
1.12.4	Sequence of reconditioning operation		X
1.12.5	Steps and procedures in setting-up parts	X	
1.12.6	Type and uses of rust preventive and paints		X

INDEX OF SKILLS REQUIREMENTS

- 2.1 PERFORMING PREVENTIVE MAINTENANCE**
- 2.2 PERFORMING CORRECTIVE MAINTENANCE**
- 2.3 REPAIRING AND MAINTAINING FLUID SYSTEM**
- 2.4 INSTALLING AND MOVING MACHINERY**
- 2.5 FABRICATING SIMPLE PARTS**
- 2.6 FITTING PARTS INTO ASSEMBLY**

Code	Skills Requirements	Class B	Class A
2.1	PERFORMING PREVENTIVE MAINTENANCE		
2.1.1	Performing PM inspection		X
2.1.2	Lubricating machines	X	
2.1.3	Maintaining belts and V-belt drives	X	
2.1.4	Maintaining chain and sprocket drives	X	
2.1.5	Inspecting and maintaining linkages and mechanism		X
2.1.6	Maintaining bearings		X
2.1.7	Maintaining gear drives		X
2.1.8	Adjusting gibs for free operations	X	
2.1.9	Maintaining couplings	X	
2.1.10	Inspecting/maintaining centrifugal clutch		X
2.1.11	Inspecting/maintaining pneumatic clutch		X
2.1.12	Inspecting/maintaining gear box drives	X	
2.1.13	Lubricating seal faces	X	
2.1.14	Participating in safety training program	X	
2.1.15	Orienting OJT trainees/operators on safety and maintenance	X	
2.1.16	Performing housekeeping	X	
2.2	PERFORMING CORRECTIVE MAINTENANCE		
2.2.1	Diagnosing machine breakdown		X
2.2.2	Removing and installing plain bearing (bushes and sleeves)		X
2.2.3	Removing and installing plain bearing on shafts		X
2.2.4	Removing and installing roller bearings		X
2.2.5	Straightening shaft using a press		X
2.2.6	Replacing a shaft		X
2.2.7	Removing and installing V-belt assembly		X
2.2.8	Constructing belt joints with mechanical fastener		X
2.2.9	Constructing belt joints with adhesive		X
2.2.10	Removing and installing chain drives		X
2.2.11	Installing and aligning flexible coupling		X
2.2.12	Replacing universal joints		X
2.2.13	Installing and aligning closed gear drive		X
2.2.14	Removing and installing lip seal		X
2.2.15	Removing and installing mechanical seals		X
2.2.16	Ordering materials for the job		X
2.2.17	Updating machine maintenance record		X

Code	Skills Requirements	Class B	Class A
2.3	REPAIRING AND MAINTAINING FLUID SYSTEM		
2.3.1	Inspecting a hydraulic system		X
2.3.2	Replacing and clean hydraulic strainer/filter		X
2.3.3	Refilling hydraulic system		X
2.3.4	Inspecting hydraulic cylinder		X
2.3.5	Replacing hydraulic motor or pump		X
2.3.6	Replacing internal parts of hydraulic pump (vane type)		X
2.3.7	Replacing internal parts of hydraulic pump (piston type)		X
2.3.8	Replacing internal parts of hydraulic motor (vane type)		X
2.3.9	Replacing hydraulic gasket and seals	X	
2.3.10	Repairing flexible hose (high pressure)		X
2.3.11	Repairing /replace hydraulic lines		X
2.3.12	Replacing damaged /faulty lines/fitting		X
2.3.13	Replacing valves in a hydraulic system		X
2.3.14	Inspecting pressure control relief valve (relief, reducing, sequencing)		X
2.3.15	Inspecting directional valve		X
2.3.16	Installing and replace a steel piping system	X	
2.3.17	Installing air compressor		X
2.3.18	Lubricating air compressor		X
2.3.19	Inspecting/maintain air compressor		X
2.3.20	Installing plastic tube		X
2.3.21	Inspecting/maintaining water pump	X	
2.4	INSTALLING AND MOVING MACHINERY		
2.4.1	Preparing area for machine installation		X
2.4.2	Raising machinery using jacks, bars and blocks		X
2.4.3	Transporting machinery using forklift		X
2.4.4	Transporting machinery using overhead crane or chain block		X
2.4.5	Moving machine/equipment using roller		X
2.4.6	Moving machine/equipment with skids or dollies		X
2.4.7	Positioning and secure machinery on foundation		X
2.4.8	Leveling machinery on foundation		X
2.4.9	Aligning shaft (reverse indicator method)		X
2.4.10	Performing alignment test		X
2.4.11	Connecting machine to air or hydraulic source		X
2.4.12	Blocking and bracing equipment for moving or shipping		X
2.4.13	Cribbing a piece of equipment to distribute the load over a large area		X

Code	Skills Requirements	Class B	Class A
2.5	FABRICATINGt SIMPLE PARTS		
2.5.1	Cutting metal stock with hacksaw	X	
2.5.2	Cutting metal stock with chisel		X
2.5.3	Filing workpiece	X	
2.5.4	Marking workpiece	X	
2.5.5	Drilling holes with portable tools	X	
2.5.6	Drilling holes to size with drill press	X	
2.5.7	Counter boring holes to depth	X	
2.5.8	Counter sinking holes	X	
2.5.9	Spot-facing hole		X
2.5.10	Reaming holes with hand reamer		X
2.5.11	Reaming hole using machine reamer		X
2.5.12	Cutting thread with hand taps	X	
2.5.13	Cutting thread with dies	X	
2.5.14	Removing damaged thread screws etc.		X
2.5.15	Lapping flat surfaces		X
2.5.16	Lapping holes	X	
2.5.17	Installing gas regulator		X
2.5.18	Flame cutting metal with gas equipment	X	
2.5.19	De-burring with hand grinder	X	
2.5.20	Shaping (form) metals using heat	X	
2.5.21	Gas welding ferrous metals		X
2.5.22	Lead soldering metal		X
2.5.23	Off-hand grinding workpiece		X
2.5.24	Cutting off materials with disc cutter		X
2.5.25	Arc-welding ferrous metal	X	
2.5.26	Annealing metals		X
2.5.27	Hardening metals	X	
2.5.28	Tempering metals	X	
2.5.29	Turning workpiece	X	
2.5.30	Facing workpiece	X	
2.5.31	Grinding flat surfaces on surface grinder		X
2.5.32	Milling workpiece square	X	

Code	Skills Requirements	Class B	Class A
2.6	FITTING PARTS INTO ASSEMBLY		
2.6.1	Fitting parts into assembly		X
2.6.2	Bolting parts	X	
2.6.3	Doweling parts	X	
2.6.4	Pinning parts to a shaft	X	
2.6.5	Locating parts by pegging		X
2.6.6	Fitting /extract wheel	X	
2.6.7	Fitting parallel and tapered keys	X	
2.6.8	Fitting/extract bearing	X	
2.6.9	Aligning parts		X
2.6.10	Scraping a small flat surface		X
2.6.11	Hand scraping bearing (round) surface		X
2.6.12	Balancing static rotating parts		X
2.6.13	Bending pipes	X	
2.6.14	Fitting pipe flange		X

OCCUPATION TITLE: : PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	3		Inspect/Maintain V-belt drive
LEVEL		PERFORMANCE OBJECTIVES : Given malfunctioning belt drive, spare parts, supplies, tools and equipment, the student(s) / trainee(s) must be able to maintain a V-belt drive. The drive must deliver rated power smoothly and at rated speed.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Run mechanism at normal rate and load. 2. Check for flying dirt, oil, grease, water and other debris. 3. Check for flapping, oscillating, and slipping of belts. 4. Check for squealing, binding and rubbing of parts. 5. Turn off mechanism power. Remove belt guard. 6. Check belts and pulley for uneven wear and damage, and replace if necessary. 7. Check for loose mounting bolts and loose guards. 8. Check for hot belt, bearing and pulley. 9. Check pulley alignment. 10. Check belt tension. 11. Clean, inspect drive for wear and damage. 12. Install belt guard. 13. Start mechanism and test. 14. Note findings in preventive maintenance inspection report. 15. Make necessary recommendation. 	<ul style="list-style-type: none"> • The drive must deliver rated power smoothly and at rated speed and free of uneven wear, squealing, high temperatures, flapping, flying dirt, rubbing of guard, and unscheduled shut down. 	<ul style="list-style-type: none"> • Explain the principle of operation of V-belts • Enumerate the maintenance practices in the use of V-belts • Enumerate the conditions of V-belt malfunction, symptoms, and causes of failure • Follow the standard procedure in removing and installing V-belts • Exercise extreme care in the inspection of V-belts at running condition. 	<ul style="list-style-type: none"> • Feeler bar • Level set • Mechanic’s tool box • (hand tool) • Personal safety equipment • Set of V-belts sheave groove templates • Straightedge or wire • Switch lock out • Tension meter • Thermometer (Fahrenheit) • Tachometer

OCCUPATION TITLE : PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	4	TASK	Inspect/maintain chain and sprocket drives
LEVEL		PERFORMANCE OBJECTIVES : Given the necessary tools , materials and equipment, the student(s) / trainee(s) must be able to maintain chain and sprocket drive. Chains and sprockets must operate within manufacturer’s specifications.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Run mechanism at normal rate and load; Check for: <ul style="list-style-type: none"> • hot bearing, sprockets, and chain. • flying dirt, oil, grease, water and other debris. • loose, flapping, chain. • rubbing, squealing, binding parts and loose bolts. 2. Stop and turn off machine power. 3. Remove safety guards(s) inspection plates; check for: <ul style="list-style-type: none"> • chain and sprockets for uneven wear and damage. • loose set screws, mounting bolts. Tighten as necessary. • correct for chain elongation in accordance with manufacturer’s specifications. 4. Start mechanism and test. 5. Note findings in PM Inspection Report with findings and action to be done. 6. Submit report to supervisor for final decision. 	<ul style="list-style-type: none"> • Chain and sprocket drive must deliver rated power at rated speed smoothly , be free of uneven wear, squealing, high temperature, loose bolts, flapping chain, flying dirt, steam, oil, water and other chemicals, rubbing , binding, and unscheduled shut down. 	<ul style="list-style-type: none"> • Explain the principle of operation of chain drives, and its specifications • Enumerate the operating symptoms of malfunctions of chain drives and causes of failure • Enumerate the standard practices in the maintenance of chain drives • Follow the standard procedure in handling, aseembly and disassembly of chain drive. • Observe safety precautions in the inspection of chain drives while the machine is running. 	<ol style="list-style-type: none"> 1. Chain detacher (s) 2. Coupling tools 3. Drive pins 4. Fahrenheit thermometer 5. feeler bars 6. Level set 7. manufacturers specifications 8. Mechanic’s tool box 9. Personal safety equipment 10. Piano wire and tightener 11. straightedge

OCCUPATION TITLE: PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	8	TASK	Adjust gibs of slide ways
LEVEL		PERFORMANCE OBJECTIVES : Given a machine mechanism adjustable gibs, lubricants, tools and equipment, the student(s) / trainee(s) must be able to adjust gibs for free operation. The moving part must operate freely without binding or side movement with specified clearance.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Remove gibs and wipe /clean area(s). 2. Determine gib clearance on both sides and ends with feeler gages. 3. Check sliding surfaces of mechanism for excessive wear with dial indicator and micrometers. 4. Check gib surfaces for excessive wear and galled with dial indicator. Replace, straighten , or scrape if necessary. 5. Adjust gib by loosening screw at small end and tightening screw at large end of gib. Draw up to point of feeling pressure and back off to specified clearance. 6. Lubricate. 7. Operate the mechanism for freedom of operation without side movement. 	<ul style="list-style-type: none"> • Moving parts must operate freely, without binding or side movement with specified clearance. 	<ul style="list-style-type: none"> • Explain the reasons for using gibs in slide ways. • Enumerate the different types or shapes of gibs. 	<ol style="list-style-type: none"> 1. Dial indicator 2. Feeler gages 3. Gib wrenches or slotted screw driver head 4. Mechanic's tool box (hand tools) 5. Oil can 6. Personal safety equipment 7. Scrapers 8. Shim stock (assortment of metal shims) 9. Wiping rags

OCCUPATION TITLE: PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	9	TASK	Inspect/maintain drive couplings
LEVEL		PERFORMANCE OBJECTIVES : Given a machine, tools and equipment; the student(s) / trainee(s) must be able to inspect and maintain drive couplings. The coupling shall perform smoothly, clean and without vibration and noise.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Coordinate with operator regarding the inspection . 2. Observe the drive coupling while it is running: <ul style="list-style-type: none"> • coupling for flying dirt, oil, or grease. • for any unusual noise generated. • for any vibration of the part. 1. Clean and adjust as necessary : <ul style="list-style-type: none"> • Tighten mounting bolts • Alignment of coupling halves. 1. Record work done on preventive maintenace inspection form. 2. Submit preventive maintenance Inspection form to Supervisor 3. Record in Equipment Maintenance Record the maintenance action done. 	<ul style="list-style-type: none"> • Coupling shall be clean and adjusted to perform smoothly without vibration and noise • Recommend further action . • Inspection report submitted 	<ul style="list-style-type: none"> • Explain the operating principle of drive couplings. • Enumerate the different types of couplings. • Explain the main considerations in the installation of drive couplings. • Describe the method of installing drive couplings. • Enumerate the different malfunctions of couplings, causes and corresponding remedy. 	<ul style="list-style-type: none"> • Coupling • Mechanic’s tool box • Dial indicator • Rags • Solvents • Preventive maintenance Inspection form • Rags

TASK ANALYSIS SHEET _____

OCCUPATION TITLE: PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	13	TASK	Lubricate seal faces
LEVEL		PERFORMANCE OBJECTIVES : Given the necessary tools, equipment and materials, the student(s) / trainee(s) must be able to lubricate seal faces to manufacturers specifications.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Turn off mechanism power. 2. Consult manufacturer's manual. 3. Select lubricant. 4. wipe off fittings. 5. Lubricate. Wipe off excess lubricant. 6. Start mechanism, observe. 7. Inspect for lubricant leakage. 	<ul style="list-style-type: none"> • Lubricated seal must conform to manufacturers specifications. 	<ul style="list-style-type: none"> • Knowledge of lubricating oils • Knowledge of different seals 	<ul style="list-style-type: none"> • Mechanics tool box • Lubricant • Manufacturers manual • Rags

TASK ANALYSIS SHEET _____

OCCUPATION TITLE: PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	14	TASK	Participate in safety training program
LEVEL		PERFORMANCE OBJECTIVES : Given an opportunity to participate in a safety training program, the student(s) / trainee(s) must be able to work in the company following the safety precautions and practices in the plant.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Handle safely cylinder tanks in moving from one place to another. 2. Lift loads safely. 3. Put out fires using appropriate fire extinguishers. 4. Apply first aid for cuts, and burns. 5. Apply artificial respiration. 6. Apply cardio-pulmonary resuscitation. 	<ul style="list-style-type: none"> • Observable behavior or safety practices noticeable. 	<ul style="list-style-type: none"> • Enumerate the causes of accidents • Explain the hidden costs of accidents. • Describe the safe handling of materials and tools. • Enumerate the different types of fires and corresponding fire extinguisher to put it out. 	<ol style="list-style-type: none"> 1. First aid kit 2. Fire extinguisher 3. Fire fighting equipment 4. Safety posters

TASK ANALYSIS SHEET _____

OCCUPATION TITLE: PLANT MAINTENANCE MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	15	TASK	Orient OJT trainees on safety and maintenance practices
LEVEL		PERFORMANCE OBJECTIVES : Given the necessary material tools and equipment, the OJT student(s) / trainee(s) must be oriented on safety and maintenance practices. Upon completion the OJT student(s) / trainee(s) can perform machine operating procedures within company's safety standards.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Orient the OJT trainee on the physical layout of the plant. 2. Present /discuss plant /department structure and policies. 3. Present/discuss general safety precautions and specific safety on machine operations. 4. Demonstrate job tasks as necessary. 5. Ask for and discuss questions from new employees. 	<ul style="list-style-type: none"> • Oriented personnel must be familiar with organization's safety policies and machine operating procedures. 	<ul style="list-style-type: none"> • List down the organizational structure of the plant. • List down the organizational structure in the maintenance department. • Enumerate company regulations regarding: absences and tardiness; Timekeeping; wage computation • State the general safety precautions in the plant. • Enumerate the different personal safety equipment while doing the job. 	<ol style="list-style-type: none"> 1. Floor plan of facilities 2. Tools 3. Spare parts 4. Company policies 5. Organization's safety and health policies 6. New employee personnel files 7. Personal safety equipment

TASK ANALYSIS SHEET _____

OCCUPATION TITLE: PLANT MECHANIC			
DUTY NO.	A	DUTY	PERFORM PREVENTIVE MAINTENANCE
TASK NO.	16	TASK	Perform housekeeping
LEVEL		PERFORMANCE OBJECTIVES : Given the necessary tools, equipment and specific work area, the student(s) / trainee(s) must be able to perform housekeeping. When completed, the area and equipment must be clean with all tools and devices properly stored.	

STEPS	PERFORMANCE CRITERIA	RELATED KNOWLEDGE, ATTITUDE AND SAFETY	TOOLS, EQUIPMENT, AND MATERIALS
<ol style="list-style-type: none"> 1. Inspect maintenance area of responsibility 2. Clean enclosing area. 3. Clean area under machines and work tables 4. Clean Workbench and vise. 5. Clean machine of chips, dust and grime. 6. Dispose off all trashes in an approved area or container. 7. Arrange for acquiring cabinets for storage of lubricants. Arrange lubricants in storage. Clean around lubricant storage. 8. Maintain trash box around the area. 	<ul style="list-style-type: none"> • The area and equipment must be clean with all tools and devices properly stored. 	<ul style="list-style-type: none"> • Explain the importance of cleanliness in the performance of workers especially maintenance men. • Enumerate and explain the Japanese 5 Ss of workplace management. • Explain the phrase “ a place for everything and everything in its place.” 	<ul style="list-style-type: none"> • Brooms scrapers • Scrapers • Mops • Rags • Dustpans • Trash cans

DACUM Research Chart for PLANT MAINTENANCE MECHANIC

Duties

Tasks

C Repair and maintain fluid system

Inspect a hydraulic system	Replace and clean hydraulic strainer/filter	Refill hydraulic system	Inspect hydraulic cylinder	Replace hydraulic motor or pump	Replace internal parts of hydraulic pump (vane type)	Replace internal parts of hydraulic pump (piston type)	Replace internal parts of hydraulic motor (vane type)								
B															
C-1	A	C-2	A	C-3	A	C-4	A	C-5	A	C-6	A	C-7	A	C-8	A

Replace hydraulic gasket and seals	Repair flexible hose (high pressure)	Repair/replace hydraulic lines	Replaced damaged/faulty lines/fittings	Replace valves in a hydraulic system	Inspect pressure control valve (relief, reducing, sequencing)	Inspect directional valve	Install and replace a steel piping system								
C-9. A	B	C-10.A	A	C-11. A	B	C-12. A	B	C-13. A	A	C-14	A	C-15	A	C-16	B

Install air compressor	Lubricate air compressor	Inspect/maintain air compressor	Install plastic tube to machine	Disassemble and assemble a water circulating pump											
C-17	A	C-18	A	C-19	A	C-20	B	C-21	A						

D Install and Remove Machinery

Prepare area for machine installation	Raise machinery using jacks, bars and blocks	Transport machinery using fork lift	Transport machinery using overhead crane or chain block	Move machine/equipment using roller	Move machine/equipment with skids or dollies	Position and secure machinery on foundation	Level machinery on foundation								
D-1	A	D-2	A	D-3	A	D-4	A	D-5	A	D-6	A	D-7		D-8	A

Align shaft (reverse indicator method)	Perform alignment test	Connect machine to air or hydraulic source	Block and brace equipment for moving or shipping	Crib a piece of equipment to distribute the load over a larger area											
D-9	A	D-10	A	D-11	A	D-12	A	D-13	A						

DACUM Research Chart for PLANT MAINTENANCE MECHANIC

Duties

Tasks

E Fabricate simple parts

Cut metal stock with hand hacksaw		Cut metal stock with chisel		File workpiece		Mark workpiece		Drill holes with portable tools		Drill holes to size with drill press		Counterbore holes to depth		Countersink holes	
E-1. B	B	E-2. A	B	E-3.A	B	E-4.A	B	E-5.A	B	E-6.A	B	E-7.A	B	E-8. B	B

Spot- face hole		Ream holes with hand reamer		Ream hole using machine reamer		Cut thread with hand taps		Cut thread with dies		Remove damaged screws etc.		Lap flat surfaces		Lap holes	
E-9. A	B	E-10	A	E-11	A	E-12	B	E-13	B	E-14	A	E-15	A	E-16	A

Install gas regulator		Flame cut metal with gas equipment		De-burr with hand grinder		Shape (form) metals using heat		Gas weld ferrous metals B		Lead solder metal		off -hand grind workpiece		Cut off materials with disc cutter	
E-17	A	E-18	A	E-19	A	E-20	A	E-21	A	E-22	A	E-23	A	E-24	A

Arc-weld ferrous metals		Anneal metals		Harden metals		Temper metals		Turn work piece		Face workpiece		Grind flat surfaces on surface grinder		Mill workpiece square	
E-25	B	E-26	A	E-27	B	E-28	B	E-29	B	E-30	B	E-31	A	E-32	A

F Fit parts into assembly

Fit parts into assembly		Bolt parts		Dowel parts		Pin parts to a shaft		Locate parts by pegging		Fit /extract wheel		Fit parallel and tapered keys		Fit/extract bearing	
F-1	A	F-2	B	F-3	B	F-4	B	F-5	A	F-6	B	F-7	B	F-8	B

Align parts		Scrape a small flat surface		Hand scrape bearing (round) surfaces		Balance static rotating parts		Bend pipes		Fit pipe flanges					
F-9	A	F-10	A	F-11	A	F-12	A	F-13	B	f-14	A				

Standard Time Model for a One Year Program (First Level) Recommended for Dual Training System and Dualized Programs

Part 1: 1st Semester (18 weeks)	
<p>16 weeks Fulltime In-School/Center Training to cover the Knowledge Requirements 1 week = 5 days = 30 hours (h) (6 hours per day)</p> <p>16 weeks = 80 days = 480 h Note: This number of hours is exclusive to be spent for the Knowledge Requirements. It is possible to add hours for General Educational Subjects, Academics or other activities which are not part of the Dualized Program.</p>	<p>2 weeks Industry Immersion 1 week = 6 days = 48 hours</p> <p>2 weeks = 12 days = 96 h Industry Immersion is a suggested scheme where trainees join in selected firms for familiarization and job induction of possible company assignment.</p>

Part 2: 2nd Semester (18 weeks) plus Semestral Break (10 weeks)		
18 weeks		10 weeks
<p>1 day (8 hours) per week In-School/Center Training to cover the Related Knowledge</p> <p>18 weeks “=” 18 days = 144 h</p>	<p>5 days (40 hours) per week In-Firm Training to cover the Skills Requirements</p> <p>18 weeks “=” 90 days = 720 h</p>	<p>6 days (48 hours) per week In-Firm Training to cover the Skills Requirements</p> <p>10 weeks = 60 days = 480 h</p>
In-School/Center Training = 144 h	In-Firm Training = 720 + 480 (= 150 days) = 1200 h	

Summary	In-School/Center	Industry
Part 1 Knowledge Requirements	480 h (80 days)	96h (12 days)
Part 2 Skills Requirements	144 h (18 days)	1200 h (150 days)
	624h = 32,5 %	1296 h = 67,5 %
Total	1920 h =100 %	

Name of participant: _____ Institution: _____ Region: _____

Occupational title (of existing curriculum or Training Regulation): _____

Creating a time frame. 60 – 70% of the total duration of the program must be imparted by the training company while 30 – 40% should be imparted by the school/training center.

Please decide/answer the following questions and justify your decision:

What level(s)/(class(es) your draft Dualized Core Curriculum shall cover?

Does the existing Training Regulation/Curriculum contain time allotment for Knowledge or Skills Requirements?

How long (Semesters, weeks, days) shall be the total duration of the program? Shall Saturday be included?

For the pilot implementation it is recommended that the first part of the program shall be organized as full time in-school/center, to impart the Knowledge Requirements. It is also recommended that part 1 should include an Industry Immersion as a suggested scheme where trainees join in selected firms for familiarization and job induction of possible company assignment. How long shall be the full time in-school/center part and how long shall be the integrated Industry Immersion (weeks) ?

How shall be the time divided between Knowledge Requirements and Industry Immersion (Part 1 of Dualized Core Curriculum) and Skills Requirements (Part 2 Dualized Core Curriculum) ? Please indicate the total time for Knowledge Requirements and Skills Requirements (only in weeks):

Knowledge Requirements and Industry Immersion (Part 1):

Skills Requirements (Part 2):

Please create a time model:

Knowledge Requirements and Industry Immersion (Part 1) = weeks = days

Knowledge Requirements will not only be imparted in Classroom but also in School-Shop.
 How will be the time divided (days) between Classroom and School-Shop for Part 1 ?
 (This should be only a first assessment, which can be changed in the future development)

No:	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Knowledge Requirements and Industry Immersion (Part 1 of the Dualized Core Curriculum)	.....	.....	.....
	Summary	.....		.....
			

Skills Requirements (Part 2)

Skills Requirements will not only be imparted in the Industry but also in School/Training Center.
 What will be your time model for this part of the Dual Training Program? How many days per week in School/Training Center? Any other model?

According to your decision about the model, please write down:

Skills Requirements (Part 2): Total time = weeks = days

Time to be spent in Industry = days

Time to be spent in School/Training Center = days

The time portion for imparting the Skills Requirements in School/Training Center has to be divided between Classroom and School-Shop. (This should be only a first assessment, which can be changed in the future development)

Time portion for Skills Requirements to be imparted in Classroom = days

Time portion for Skills Requirements to be imparted in School-Shop = days

No:	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Skills Requirements (Part 2 of the Dualized Core Curriculum)	.....	.....	.....
	Summary	.....		.....
			

Please list the whole time frame of your Dual Training Program.
 Check in the total summary whether your time portions for
 In-School/Training Center and In-Industry are within the demanded
 30 – 40 % or 60 – 70 %

No:	Topics	Knowledge	Skills	
		Classroom	School-Shop	Industry
	<p>Knowledge Requirements and Industry Immersion (Part 1 Dualized Core Curriculum)</p> <p>Skills Requirements (Part 2 Dualized Core Curriculum)</p>	<p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p>
	<p>Total Summary</p>	<p>.....</p> <p>= %</p>	<p>.....</p> <p>= %</p>	
		<p>.....</p> <p>=100%</p>		

Dualized Core Curriculum for Knowledge Requirements and Industry Immersion. Fixing the time portions for classroom, school-shop and industry (Industry Immersion)

Name of participant: _____ Institution: _____ Region: _____

Occupational title (of existing curriculum or Training Regulation): _____

Please list all topics of the Knowledge Requirements of the existing curriculum or Training Regulation you are going to dualize.

Please allocate the time portions for the particular topics of Knowledge Requirements. Do this according to their importance.

Please decide how much of the time portion for every particular topic should be imparted in classroom and how much should be imparted in school-shop.

Please check with your time frame. Since the time frame was only a first assessment, you can change the time allotted to classroom and school-shop.

Core Curriculum for Knowledge Requirements and Industry Immersion (Part 1 of the Dualized Core Curriculum):

No:	Topics (Knowledge Requirements)	Knowledge	Skills	
		Classroom	School-Shop	Industry
				XXXXXX
				XXXXXX
				XXXXXX
				XXXXXX

No:	Topics (Knowledge Requirements)	Knowledge	Skills	
		Classroom	School-Shop	Industry
				XXXXXX
				XXXXXX
				XXXXXX
				XXXXXX
				XXXXXX
				XXXXXX
				XXXXXX
	Industry Immersion			
	Summary			

Dualized Core Curriculum for Skills Requirements. Fixing the time portions for classroom, school-shop and industry.

Name of participant: _____ Institution: _____ Region: _____

Occupational title (of existing curriculum or Training Regulation): _____

Please list all topics of the Skills Requirements (=Duties of the DACUM Research Chart) of the existing curriculum or Training Regulation you are going to dualize.

Please calculate the time portions for the particular topics of Skills Requirements (Duties). This should be guided by the following consideration: How difficult is the task? How important is the task? How complex is the task?

Please decide how much of the time for every particular Duty will be used in the classroom, school-shop and in the industry.

Please check with your time frame. Since the time frame was only a first assessment, you can change the time for the classroom, school-shop and industry imparted skills.

Core Curriculum for Skills Requirements (Part 2 of the Dualized Core Curriculum):

No:	Duties	Knowledge	Skills	
		Classroom	School-Shop	Industry

No:	Duties	Knowledge	Skills	
		Classroom	School-Shop	Industry
	Summary			

Please list the total summary (Part 1 and 2) for your Dualized Core Curriculum.

Please check (again) in the total summary whether your time portions for In-School/Training Center and In-Industry are within the demanded 30 – 40 % or 60 – 70 %

	<p>Total summary</p> <p>Knowledge Requirements and Industry Immersion (Part 1)</p> <p>Skills Requirements (Part 2)</p>	<p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p>
		<p>.....</p> <p>=%</p>	<p>.....</p> <p>= %</p>
		<p>.....</p> <p>= 100%</p>	