STANDARD KEMAHIRAN PEKERJAAN KEBANGSAAN
(*NATIONAL OCCUPATIONAL SKILLS STANDARD*)

STANDARD PRACTICE & STANDARD CONTENT
FOR

BUILDING OPERATION & MAINTENANCE SERVICES
LEVEL 2
BC-070-2:2014

JABATAN PEMBANGUNAN KEMAHIRAN
KEMENTERIAN SUMBER MANUSIA
MALAYSIA

CONSTRUCTION INDUSTRY DEVELOPMENT BOARD (CIDB)

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STANDARD PRACTICE

NATIONAL OCCUPATIONAL SKILLS STANDARD (NOSS) FOR;

BUILDING OPERATION & MAINTENANCE SERVICES
LEVEL 2

1. INTRODUCTION

Building operations and maintenance services encompasses all that broad spectrum of services required to assure the built environment will perform the functions for which a facility was designed and constructed. Operations and maintenance typically includes the day-to-day activities necessary for the building and its systems and equipment to perform their intended function. Providing these services in an effective and efficient manner will ensure the reliability, access and safety of the community buildings and facilities.

The maintenance activities include preventive and predictive (planned) maintenance and corrective (repair) maintenance. Preventive Maintenance (PM) consists of a series of time-based maintenance requirements that provide a basis for planning, scheduling, and executing scheduled (planned versus corrective) maintenance. PM includes adjusting, lubricating, cleaning, and replacing components. Time intensive PM, such as bearing/seal replacement, would typically be scheduled for regular (plant or "line") shutdown periods. Corrective maintenance is a repair necessary to return the equipment to properly functioning condition or service and may be both planned or un-planned. Some equipment, at the end of its service life, may warrant overhaul.

This NOSS document outlines the structured career path and competencies of Building Operation & Maintenance Technician. The NOSS document provides structured sets of activities that enable a person who aspires to achieve competency in this particular occupation. This ultimately enables him or her to embark on a career in the Building Operation Maintenance – Building Industry. Department of skills Development (DSD) and CIDB have taken the responsibility in the development of the NOSS with the collaboration of the industrial experts and practitioners within this industry.

The Standard Practice (SP) and Standard Content (SC) are part of the NOSS document, which is developed together with the Training Manual and Internship Manual to complete the whole NOSS. This session concluded that the NOSS is at level 2 which are currently of priority to the Building Operation Maintenance. The job area requires a significant range of varied work activities, performed in a variety of contexts, most of which are complex and necessary. In order to produce a competent Building Operation & Maintenance Technician in this industry, the need for knowledge and skills training are essential.

The NOSS document comprises of Job Profiles (JP) which consists of Competency Unit (CU) titles, Competency Profile (CP) and Curriculum of Competency Unit (CoCu). The competency profile consists of competency unit titles, descriptor, work activities and performance criteria. The curriculum of competency unit (CoCu) which comprises work activities, related knowledge, applied skills, attitude/safety/environmental, training hours, delivery mode, assessment criteria, employability skills (core abilities & social skills), tools, equipment and materials

(TEM) and references. The information in the CoCu can be used by training centres to conduct training in order for Building Operation & Maintenance Technician in this profession to meet the industry requirements. This NOSS can also be used by the industry to determine the job scope, responsibilities, remuneration, salary, job modification and career enhancement.

Pre-requisites

Based on the workshop findings, it is decided that the minimum requirements for those interested to enrol in this course areas below:

i) Be able to calculate, read and write in Bahasa Malaysia and / English and;
ii) Full interest in building operations and maintenance services and;
iii) Medically and physically fit to meet the high demands of this particular job scope.

2. OCCUPATIONAL STRUCTURE

Existing Occupational Structure (OS)

SECTOR	BUILDING & CONSTRUCTION
SUB SECTOR	BUILDING MAINTENANCE
JOB AREA	BUILDING OPERATION AND MAINTENANCE
LEVEL 5	**Building Operation & Maintenance Manager**
LEVEL 4	**Building Operation & Maintenance Executive**
LEVEL 3	**Building Operation & Maintenance Supervisor**
LEVEL 2	**Building Operation & Maintenance Technician**
LEVEL 1	**Building Operation & Maintenance Assistant (Handyman)**

Figure 1.1: Existing Occupational Structure Framework Matrix for Building Operation and Maintenance, Sub sector of Building Maintenance in Malaysia

Proposed Occupational Area Structure (OAS)

SECTOR	BUILDING & CONSTRUCTION
SUB SECTOR	BUILDING MAINTENANCE
JOB AREA	BUILDING OPERATION AND MAINTENANCE
LEVEL 5	**Building Operation & Maintenance Management**
LEVEL 4	**Building Operation & Maintenance Administrative**
LEVEL 3	**Building Operation & Maintenance Supervision**
LEVEL 2	**Building Operation & Maintenance Services**
LEVEL 1	**No Level**

Figure 1.1: Proposed Occupational Area Structure Framework Matrix for Building Operation and Maintenance, Sub sector of Building Maintenance in Malaysia

3. DESCRIPTION OF COMPETENCY LEVEL

The NOSS is developed for various occupational areas. Candidates for certification must be assessed and trained at certain levels to substantiate competencies. Below is a guideline of each NOSS Level as defined by the Department of Skills Development, Ministry of Human Resources, Malaysia.

Malaysia Skills Certificate Level 1: (Operation and Production Level)	Competent in performing a range of varied work activities, most of which are routine and predictable.
Malaysia Skills Certificate Level 2: (Operation and Production Level)	Competent in performing a significant range of varied work activities, performed in a variety of contexts. Some of the activities are non-routine and required individual responsibility and autonomy.
Malaysia Skills Certificate Level 3: (Supervisory Level)	Competent in performing a broad range of varied work activities, performed in a variety of contexts, most of which are complex and non-routine. There is considerable responsibility and autonomy and management or guidance of others is often required.
Malaysia Skills Diploma Level 4: (Executive Level)	Competent in performing a broad range of complex technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present.
Malaysia Skills Advanced Diploma Level 5: (Managerial Level)	Competent in applying a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources features strongly, as do personal accountabilities for analysis, diagnosis, planning, execution and evaluation.

4. MALAYSIAN SKILL CERTIFICATION

Candidates after being assessed verified and fulfilled Malaysian Skill Certification requirements shall be awarded with Sijil Kemahiran Malaysia (SKM) for Level 2.

5. JOB COMPETENCIES

Building Operation & Maintenance Services (Level 2) is competent in performing:

- Building finishes maintenance
- Building electrical system maintenance
- Building air conditioning and mechanical ventilation system maintenance
- Plumbing system maintenance
- Fire protection system maintenance
- Building telecommunication system maintenance
- Building contract services

6. WORKING CONDITIONS

They may be required to work extra hours to fulfil internal and external requirement. In Building operations and maintenance services, they may be needed to work in shift to accommodate work requirements. They need to use / wear appropriate attire during the commencement of their jobs. They may work in a modular group in a conducive and ventilated environment. The unavoidable, externally imposed conditions under which the work must be performed and which create hardship for the incumbent including the frequency and duration of occurrence of physical demands, environmental conditions, demands on one's senses and metal demands

7. EMPLOYMENT PROSPECTS

There are excellent prospect in private sectors due to shortage of hands-on expert in Building Operation & Maintenance services. In public sector there are lacking of professional and well experience of building maintenance technician. This area has a very good job market potential abroad for skilled personnel due to shortage of such highly skilled personnel in this region. Excellent prospects in building maintenance technician related industries such as air-conditioning services, electrical services, plumbing services, furniture industry and training industry.

8. TRAINING, INDUSTRIAL/PROFESSIONAL RECOGNITION, OTHER QUALIFICATIONS AND ADVANCEMENT

Most competent Building Operation & Maintenance Services gain their competency through working experience. Certification may increase their chances of career advancement. Thus with additional formal training/education and certification, this competent Building Operation & Maintenance Services can advance become a certified trainer for Building Operation & Maintenance Services or can be promoted to a supervisory level.

9. SOURCES OF ADDITIONAL INFORMATION

- Malaysian Association of Facility Management (MAFM)
  257A, Jalan Bandar 12, Taman Melawati,
  53100 Kuala Lumpur, Malaysia
  Tel : 03-41072250 Fax : 03-41072251
  Email : admin@mafm.org.my

- Lembaga Pembangunan Industri Pembinaan Malaysia
  Tingkat 10, No 45, Menara Dato' Onn,
  Pusat Dagangan Dunia Putra,
  Jalan Tun Ismail
  50480 Kuala Lumpur
  Tel: 03-40477000
  Fax 03 4047 7070
  email: cidb@cidb.gov.my

- Jabatan Bomba dan Penyelamat Malaysia
  Lebuh Wawasan, Presint 7, 62250 Putrajaya PUTRAJAYA
  Telephone: 03-8888 0036/37/38/40
  Fax: 03-8888 0025
  Website: http://www.bomba.gov.my

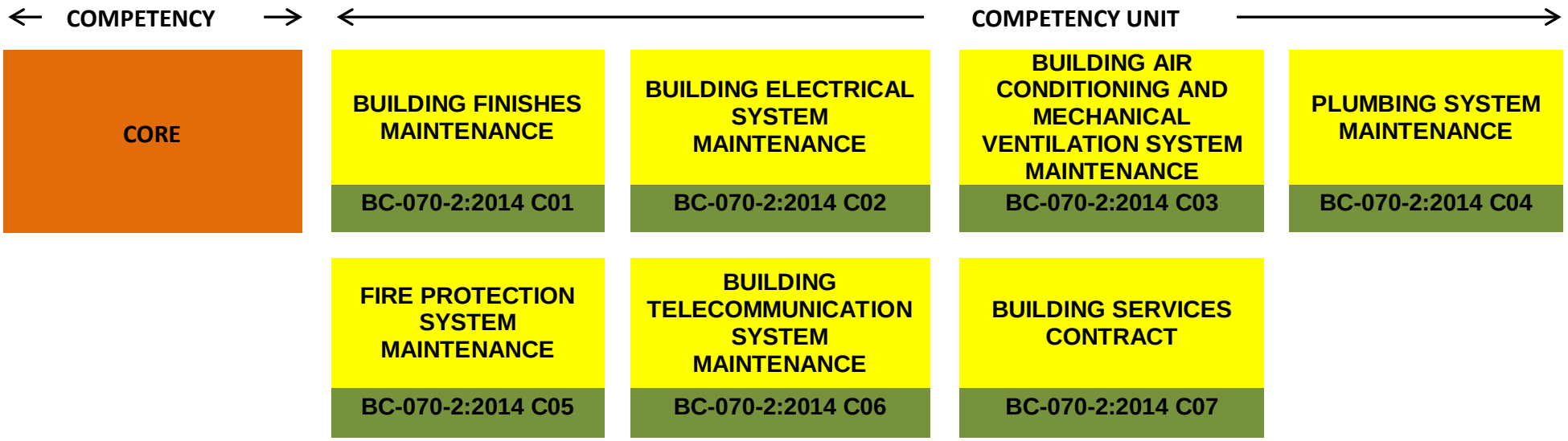
10. NOSS DEVELOPMENT COMMITTEE MEMBERS

BUILDING OPERATION & MAINTENANCE SERVICES LEVEL 2

PANEL		
1.	Arwin Bin Yac'cob	Lecturer ABM Wilayah Selatan Johor
2.	Ng Wen Bin	Senior Lecturer UniKL MFI
3.	Peter Tan Chin Wah	Managing Director Genesis Prominent Sdn Bhd
4.	Ir.Mazlan Mahmud	Senior Manager Tech Art Sdn Bhd
5.	Suhaimi Bin Satari	Project Supervisor AMS Engineering Sdn Bhd
6.	Rozaimi Bin An	Head Of Business Development UDA Dayaurus Sdn Bhd
7.	Zulramly Bin Baharudin	Manager Houz Deport Sdn Bhd
8.	Mohamed Ali Bin Karim	Manager Farid Ahmad Consulting Engineering Sdn Bhd
FACILITATOR		
9.	Basharudin Bin Mohamed	
CO-FACILITATOR		
10.	Khairul Nizan Bin Yusoff	

COMPETENCY PROFILE CHART (CPC)

SECTOR	BUILDING & CONSTRUCTION		
SUB SECTOR	BUILDING MAINTENANCE		
JOB AREA	BUILDING OPERATION & MAINTENANCE		
NOSS TITLE	BUILDING OPERATION & MAINTENANCE SERVICES		
JOB LEVEL	TWO (2)	JOB AREA CODE	BC-070-2:2014



COMPETENCY PROFILE (CP)

Sub Sector		BUILDING MAINTENANCE		
Job Area		BUILDING OPERATION & MAINTENANCE		
NOSS Title		BUILDING OPERATION & MAINTENANCE SERVICES		
Level		TWO (2)		
CU Title	**CU Code**	**CU Descriptor**	**CU Work Activities**	**Performance Criteria**
1. Building finishes maintenance	BC-070-2:2014 C01	Building finishes maintenance provides a diverse range of services, which include routine maintenance, and upgrading of facilities. Services provided include: building or demolishing walls; installing or removing windows and doors; repairing floors, walls, ceilings, windows, and doors; forming, pouring, and refinishing concrete walks, steps, and retaining walls; laying blocks, brick, and stone; and repairing roofs/ installing shingle roofs. The person who is competent in building finishes maintenance and shall be able to identify building finishes maintenance requirement, prepare building finishes maintenance tools, equipment and material,	1. Identify building finishes maintenance requirement 2. Prepare building finishes maintenance tools, equipment and material	1.1 Building finishes maintenance work order interpreted sufficiently 1.2 Building finishes maintenance condition checked according to work order 1.3 Type of building finishes maintenance work determined 1.4 Specification of building finishes maintenance work detailed out 1.5 Building finishes maintenance area/location determined according to work order 1.6 Building finishes maintenance duration work determined according to SOP/work order 2.1 Type and function of building finishes maintenance tools, equipment and material determined 2.2 Type and function of PPE arranged 2.3 Requisition procedure followed 2.4 Building finishes maintenance tools, equipment and material arranged according to maintenance requirement 2.5 Building finishes maintenance tools, equipment functionality and condition checked

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		repair building finishes and report building finishes maintenance work The outcome of this competency is to ensure acceptable quality and within specific time frame of building finishes maintenance work according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - Not applicable	3. Repair building finishes 4. Report building finishes maintenance work	3.1 Type of building finishes such as wall, ceiling, windows door, floor, identified 3.2 Building drawing such as electrical diagram, piping diagram and telecommunication diagram interpreted and finalised 3.3 Site preparation carried out (signage, announcement/ memo, safety and security, scaffolding) according to maintenance standard practice 3.4 Repair work carried out according to work order 3.5 Authority body rules and regulation complied 3.6 Housekeeping work carried out 4.1 Reporting hierarchy determined according to company organisation structure 4.2 Work order closed according to standard operating procedure (SOP) 4.3 Work order submitted to supervisor

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
2. Building electrical system maintenance	BC-070-2:2014 C02	The building electrical system maintenance provides preventative and corrective maintenance on all electrical equipment in the building, which include all interior lighting and building electrical systems to ensure maximum reliability. The person who is competent in building electrical maintenance shall be able to identify building finishes maintenance requirement, prepare building electrical maintenance tools, equipment and material, service building electrical component, Repair building electrical component, replace building electrical component, report building electrical maintenance work The outcome of this competency is to ensure acceptable quality and within specific time frame of building electrical maintenance work according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - PW2	1. Identify building electrical maintenance requirement 2. Prepare building electrical maintenance tools, equipment and material 3. Service building electrical component	1.1 Work order interpreted sufficiently 1.2 Building electrical system condition checked according to work order 1.3 Type of maintenance work such as repair or replace checked and confirmed according to work order 1.4 Specification of maintenance work determined 1.5 Location of maintenance work determined 1.6 Duration of maintenance work determined 2.1 Type and function of building electrical maintenance tools, equipment and material determined 2.2 Type and function of PPE arranged according to electrical maintenance work requirement 2.3 Requisition procedure followed 2.4 Building electrical maintenance tools equipment and material arranged according to maintenance requirement 2.6 Building electrical maintenance tools, equipment functionality and condition checked 3.1 Type of building electrical component such as switch socket outlet, lightning arrestor, electrical fitting, electrical sensor, electrical protection devices, electrical motor, identified according to work order 3.2 Electrical drawing such as single line diagram, wiring diagram, schematic diagram interpreted according to servicing requirement 3.3 Site preparation carried out (signage, announcement/ memo, safety and

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				security and scaffolding) according to maintenance standard practice 3.4 Building electrical component servicing work carried out according to work order 3.5 Authority body rules and regulation complied 3.6 Building electrical component functionality test carried out according to maintenance SOP 3.7 Housekeeping work carried out
			4. Repair building electrical component	4.1 Type of building electrical component such as switch socket outlet, lightning arrestor, electrical fitting, electrical sensor, electrical wiring and electrical motor identified according to work order 4.2 Electrical drawing such as single line diagram, wiring diagram and schematic diagram interpreted according to repairing requirement 4.3 Site preparation carried out (signage, announcement/ memo, safety and security scaffolding) according to maintenance standard practice 4.4 Building electrical component repairing work carried out according to work order 4.5 Authority body rules and regulation complied 4.6 Building electrical component functionality test carried out according to maintenance SOP 4.7 Housekeeping work carried out
			5. Replace building electrical component	5.1 Type of building electrical component for replacement such as switch socket outlet, lightning arrestor, electrical fitting,

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				electrical sensor, electrical wiring, electrical motor, distribution box component identified according to work order 5.2 Electrical drawing such as single line diagram, wiring diagram, schematic diagram interpreted according to maintenance requirement 5.3 Site preparation carried out (signage, announcement/ memo, safety and security, scaffolding) according to maintenance standard practice 5.4 Building electrical component replacement work carried out according to work order 5.5 Authority body rules and regulation complied 5.6 Building electrical component functionality test carried out according to maintenance SOP 5.7 Housekeeping work carried out
			6. Report building electrical maintenance work	6.1 Reporting hierarchy determined according to company organisation structure 6.2 Work order closed according to standard operating procedure (SOP) 6.3 Work order submitted to supervisor

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
3. Building air conditioning and mechanical ventilation system maintenance	BC-070-2:2014 C03	Building air conditioning and mechanical ventilation system maintenance provides preventative and corrective maintenance on air conditioning and mechanical ventilation equipment and system in the building, which include air filtration, cooling and humidification or heat recovery. The person who is competent in building air conditioning and mechanical ventilation maintenance shall be able to Identify building air conditioning and mechanical ventilation maintenance requirement, prepare building air conditioning and mechanical ventilation maintenance tools, equipment and material, service building air conditioning and mechanical ventilation system and component, maintenance, repair building air conditioning and mechanical ventilation component, replace building air conditioning and mechanical ventilation maintenance and report building air conditioning and mechanical ventilation maintenance work	1. Identify building air conditioning and mechanical ventilation maintenance requirement	1.1 Work order interpreted sufficiently 1.2 Building air conditioning and mechanical ventilation condition checked according to work order 1.3 Type of maintenance work such as preventive or corrective maintenance checked and confirmed according to work order 1.4 Specification of maintenance work determined 1.5 Location of maintenance work determined 1.6 Duration of maintenance work determined
			2. Prepare building air conditioning and mechanical ventilation maintenance tools, equipment and material	2.1 Type and function of building air conditioning and mechanical ventilation maintenance tools, equipment and material determined 2.2 Type and function of PPE arranged according to building air conditioning and mechanical ventilation maintenance work requirement 2.3 Requisition procedure followed 2.4 Building air conditioning and mechanical ventilation maintenance tools equipment and material arranged according to maintenance requirement 2.5 Building air conditioning and mechanical ventilation maintenance tools, equipment functionality and condition checked
			3. Service building air conditioning and mechanical ventilation system and component	3.1 Type of building air conditioning and mechanical ventilation components such as indoor fan motor, outdoor condenser fan motor, diffuser, air filter, cooling tower, air conditioning drive unit, air conditioning starter identified according to work order

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		The outcome of this competency is to ensure quality of building air conditioning and mechanical ventilation maintenance works are according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - Not applicable		3.2 Air conditioning electrical drawing such as single line diagram, wiring diagram, schematic diagram interpreted according to repairing requirement 3.3 Site preparation carried out (signage, announcement/ memo, safety and security scaffolding) according to maintenance standard practice 3.4 Building air conditioning and mechanical ventilation servicing work carried out (split unit air conditioning refrigerant refilled, air conditioning lubrication refilled, air conditioning filter and coil cleaned, air conditioning electrical component functionality and condition checked) according to work order 3.5 Building air conditioning and mechanical ventilation serviced according to work order 3.6 Authority body rules and regulation (JABATAN ALAM SEKITAR) complied 3.7 Building air conditioning and mechanical ventilation maintenance functionality test carried out according to maintenance SOP 3.8 Housekeeping work carried out
			4. Repair building air conditioning and mechanical ventilation component	4.1 Type of building air conditioning and mechanical ventilation component such as blower fan motor, condenser fan motor, piping, electrical wiring, electrical switch and remote control (wired/wireless) identified according to work order and operation manual 4.2 Air conditioning electrical drawing such as single line diagram, wiring diagram,

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				schematic diagram interpreted according to repairing requirement 4.3 Site preparation carried out such as signage, announcement/ memo, safety and security, temporary structure (scaffolding/ ladder) according to maintenance standard practice 4.4 Building air conditioning and mechanical ventilation repairing work such as motor jammed, piping leak, electrical wiring carried out according to work order 4.5 Authority body rules and regulation complied 4.6 Building air conditioning and mechanical ventilation system functionality test carried out according to maintenance SOP 4.7 Housekeeping work carried out
			5. Replace building air conditioning and mechanical ventilation system and component	5.1 Type of building air conditioning and mechanical ventilation component for replacement such as blower fan motor, condenser fan motor, piping, electrical wiring, electrical switch, remote control (wired/wireless), compressor, air conditioning electrical starter identified according to work order 5.2 Air conditioning electrical drawing such as single line diagram, wiring diagram, schematic diagram interpreted according to repairing requirement 5.3 Site preparation such as signage, announcement/ memo, safety and security, scaffolding carried out according to maintenance standard practice 5.4 Building air conditioning and mechanical ventilation component replacement work

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				carried out according to work order 5.5 Authority body rules and regulation complied 5.6 Building air conditioning and mechanical ventilation system functionality test carried out according to maintenance SOP 5.7 Housekeeping work carried out
			6. Report building air conditioning and mechanical ventilation system maintenance work	6.1 Reporting hierarchy determined according to company organisation structure 6.2 Work order closed according to standard operating procedure (SOP) 6.3 Work order submitted to supervisor
4. Plumbing system maintenance	BC-070-2:2014 C04	Plumbing system maintenance provides installing or repairing piping systems, plumbing fixtures and equipment for water heaters, backflow preventers, clean water system and sanitary works in the building. The person who is competent in plumbing maintenance shall be able to identify plumbing system maintenance requirement, prepare plumbing system maintenance tools, equipment and materials,service plumbing system and component,repair plumbing system and component,report plumbing system maintenance works.	1. Identify plumbing system maintenance requirement 2. Prepare plumbing system maintenance tools, equipment and material	1.1 Work order determined sufficiently 1.2 Plumbing system condition checked according to work order 1.3 Type of maintenance work checked and confirmed according to work order 1.4 Specification of maintenance work determined 1.5 Location of maintenance work determined 1.6 Duration of maintenance work determined 2.1 Type and function of plumbing system maintenance tools, equipment and material identified 2.2 Type and function of PPE arranged according to plumbing system maintenance work requirement 2.3 Requisition procedure followed 2.4 Plumbing maintenance tools and equipment arranged according to maintenance requirement 2.5 Plumbing maintenance tools, equipment

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		The outcome of this *competency is to ensure quality of plumbing maintenance works are according to work order and regulatory body requirement* *The personnel who is competent in this competency must in prior have the following competencies: -* *Not applicable*		functionality and condition checked
			3. Service plumbing system and component	3.1 Type of plumbing component such as sanitary fitting/accessories, water filter, grease trap, floor trap, water tank, water pump, swimming pool /fountain water retention structure, plumbing valve, water heater, solar panel identified according to work order 3.2 Plumbing system drawing such as single line drawing, layout piping drawing, water reticulation plan interpreted according to repairing requirement 3.3 Site preparation carried out (signage, announcement/ memo, safety and security scaffolding) according to maintenance standard practice 3.4 Plumbing system serviced (cleaning, greasing, alignment, water treatment) according to work order 3.5 Authority body rules and regulation (SPAN, IWK and DOE) complied 3.6 Plumbing component and fitting functionality test (pressure and leak test) carried out according to maintenance SOP 3.7 Housekeeping work carried out
			4. Repair plumbing system and component	4.1 Type of plumbing component such as cold water, sanitary, sewerage, water tank, water pump, fountain system, swimming pool system, drinking water system, water harvesting system identified according to work order 4.2 Plumbing drawing such as single line drawing, layout piping drawing, water

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				reticulation plan, sewerage layout drawing interpreted according to repairing requirement 4.3 Site preparation carried out such as signage, announcement/ memo, safety and security, temporary structure (scaffolding/ ladder) according to maintenance standard practice 4.4 Repair/replace work carried out such as choked/clogged/ pipe, fix, remove and install part and component, repair part and component and seal according to work order 4.5 Plumbing system testing carried out according to maintenance SOP 4.6 Housekeeping activities carried out
			5. Report plumbing system maintenance work	5.1 Reporting hierarchy determined according to company organisation structure 5.2 Work order closed according to standard operating procedure (SOP) 5.3 Work order submitted to supervisor
5. Fire protection system maintenance	BC-070-2:2014 C05	Fire protection systems maintenance provides schedule and corrective maintenance and inspection on sprinkler system, fire alarm system, emergency lights, exit signs, fire extinguishers etc so that building occupants are	1. Identify fire protection system maintenance requirement	1.1 Work order determined sufficiently 1.2 Fire protection system condition checked according to work order 1.3 Type of maintenance work checked and confirmed according to work order 1.4 Specification of maintenance work determined 1.5 Location of maintenance work determined 1.6 Duration of maintenance work determined

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		assured that the systems will function properly in the event or an emergency The person who is competent in fire protection system maintenance shall be able to Identify fire protection system maintenance requirement, prepare fire protection system maintenance tools, equipment and material, carry out fire protection system functionality check, test fire protection system and report fire protection system maintenance work The outcome of this competency is to ensure quality of fire protection system maintenance works are according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - Not applicable	2. Prepare fire protection system maintenance tools, equipment and material 3. Carry out fire protection system functionality check 4. Test fire protection system	2.1 Type and function of fire protection system maintenance tools, equipment and material identified 2.2 Type and function of PPE arranged according to fire protection system maintenance requirement 2.3 Requisition procedure followed 2.4 Fire protection system maintenance tools, equipment and material arranged according to maintenance requirement 2.5 Fire protection system tools, equipment functionality and condition checked 3.1 Type of fire protection system such as fire extinguisher, hose reel, detector, manual call point, sprinkler, fire alarm panel, fire tank, fire pumping system, fire curtain, fire intercom system, fireman switches identified 3.2 Fire protection system drawing such as electrical diagram, piping diagram, mimic diagram interpreted 3.3 Fire protection condition checked (physical appearance, validity period/expiry date, pressure, leak, operational, life span) according to SOP 3.4 Authority body rules and regulation (JABATAN BOMBA DAN PENYELAMAT) complied 3.5 Housekeeping work carried out 4.1 Hose reel and fire sprinkler functionality, pressure, fire pump tested according to SOP

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				4.2 Fire detector functionality tested according to smoke test and heat test procedure 4.3 Fire alarm panel such as Central Monitoring System (CMS), fireman intercom and manual call point tested according to SOP
			5. Report fire protection system maintenance work	5.1 Reporting hierarchy determined according to company organisation structure 5.2 Work order closed according to standard operating procedure (SOP) 5.3 Work order submitted to supervisor
6. Building telecommunication system maintenance	BC-070-2:2014 C06	Building telecommunication system maintenance describes the competency in preventive and corrective maintenance and inspection on communication and audio visual system in the building so that building telecommunication systems will function properly at all time. The person who is competent in building telecommunication system maintenance shall be able to Identify building telecommunication system maintenance requirement, prepare building telecommunication system maintenance tools, equipment and material, carry out	1. Identify building telecommunication system maintenance requirement	1.1 Work order determined sufficiently 1.2 Building telecommunication system condition checked according to work order 1.3 Type of maintenance work checked and confirmed according to work order 1.4 Specification of maintenance work determined 1.5 Location of maintenance work determined 1.6 Duration of maintenance work determined
			2. Prepare building telecommunication system maintenance tools and material	2.1 Type and function of building telecommunication system maintenance tools and material identified 2.2 Type and function of PPE arranged according to telecommunication system maintenance requirement 2.3 Requisition procedure followed 2.4 Building telecommunication system maintenance tools equipment and material arranged according to maintenance requirement 2.5 Building telecommunication system

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		telecommunication system maintenance and report telecommunication system maintenance The outcome of this competency is to ensure quality of building telecommunication system maintenance works are according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - Not applicable		maintenance tools, equipment functionality and condition checked
			3. Carry out telecommunication system maintenance	3.1 Type building telecommunication components such as socket, service box, junction box, cabling, telephone set, antenna/ satellite disc, arrestor, audio visual system identified 3.2 Building telecommunication system drawing such as single line diagram, wiring diagram, schematic diagram interpreted and finalised 3.3 Site preparation carried out (signage, announcement/ memo, safety and security, scaffolding) according to maintenance standard practice 3.4 Building telecommunication system maintained (check, service and repair/replace) according to work order 3.5 Authority body rules and regulation such as Suruhanjaya Komunikasi Dan Multimedia Malaysia (SKMM) complied 3.6 Building telecommunication system functionality test carried out 3.7 Housekeeping work carried out
			4. Report telecommunication system maintenance	4.1 Reporting hierarchy determined according to company organisation structure 4.2 Work order closed according to standard operating procedure (SOP) 4.3 Work order submitted to supervisor

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
7. Building services contract	BC-070-2:2014 C07	Building services contract describes the competency in building services contract He or She is the person responsible to carry out building services contract He or She is the person who is competent in building finishes maintenance and shall be able to identify building services contract requirement, interpret building services contract schedule, monitor building services contract, report building services contract work. The outcome of this competency is to ensure quality of building services contract works are according to work order and regulatory body requirement The personnel who is competent in this competency must in prior have the following competencies: - Not applicable	1. Identify building services contract requirement 2. Interpret building services contract schedule 3. Monitor building services contract 4. Report building services contract work	1.1 Work order determined sufficiently 1.2 Type of building services contract such as hygiene services, pest control, cleaning work, landscape work, waste disposal, vertical transportation, gondola services determined according to work order 1.3 Specification of maintenance work determined 1.4 Location of maintenance work determined 1.5 Duration of maintenance work determined 2.1 Type of services determined according to service contract schedule 2.2 Frequency of services determined service contract schedule 2.3 Scope of work determined service contract schedule 2.4 Work permit requirement determined 3.1 Numbers of contractor manpower confirmed according to service contract 3.2 Tools, equipment and material arranged 3.3 Quality of work assessed according to service contract 3.4 Safety and environmental rules and regulation complied 3.5 Works duration time checked and complied according to service contract 4.1 Reporting hierarchy determined according to company organisation structure 4.2 Work order closed according to standard operating procedure (SOP) 4.3 Work order submitted to supervisor

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	BUILDING FINISHES MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure acceptable quality and within specific time frame of building finishes maintenance work according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify building finishes maintenance requirement • Prepare building finishes maintenance tools, equipment and material • Repair building finishes • Report building finishes maintenance work						
Competency Unit ID	BC-070-2:2014 C01	**Level**	2	**Training Duration**	120 Hours	**Credit Hours**	

Work Activities	**Related Knowledge**	**Related Skills**	**Attitude / Safety / Environmental**	**Training Hours**	**Delivery Mode**	**Assessment Criteria**
1. Identify building finishes maintenance requirement	i. Type of building such as • Residential • Commercial • Industrial • Special purpose • Public building ii. Purpose of building finishes maintenance work order iii. Function of building finishes iv. Type of building finishes such as • Doors • Windows			4 hours	Lecture	i. Building finishes maintenance work order detail listed and explained ii. Specification of building finishes maintenance work detail out according to work order iii. Building finishes maintenance

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Ceiling • Floor • Wall v. Work order format method of checking building finishes vi. Type of building finishes maintenance work such as • Service • Repair • Replace vii. Specification of building finishes such as • Purpose • Size • Quantity • Brand • Condition • Colour					area/location confirmed according to work order iv. Building finishes maintenance duration work confirmed according to work order
		i. Interpret building finishes maintenance work order ii. Check building finishes maintenance condition iii. Determine type of building finishes maintenance work iv. Study specification of building finishes		8 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		v. Check building finishes maintenance area/location according to work order vi. Recognize building finishes maintenance duration work	*Attitude*: i. Detail in identifying building finishes maintenance requirement			
2. Prepare building finishes maintenance tools, equipment and material	i. Type and function of building finishes maintenance tools such as • Hand tools ▪ Screw driver ▪ Hammer ▪ Spanner • Power tools ▪ Hand drill ▪ Cutting drill ▪ Grinder ▪ Hammer drill ii. Type and function of building finishes maintenance equipment such as • Buffing machine • Scrubbing			8 hours	Lecture	i. Type and function of building finishes maintenance tools listed and explained ii. Type and function of building finishes maintenance equipment listed and explained iii. Type and function of building finishes

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	machine • Water pickup machine • Vacuum cleaner • Sky lift ▪ Scaffolding ▪ Gondola iii. Type and function of building finishes maintenance material such as • Tiles • Mortar • Wall paper iv. Type and function of building finishes maintenance PPE such as • Hand glove • Goggle • Safety helmet • Safety shoe • Mask • Harness v. Requisition procedure vi. Building finishes maintenance tools equipment and material arrangement vii. Building finishes maintenance tools, equipment functionality and condition					maintenance material listed and explained iv. Type and function of building finishes maintenance PPE listed and explained v. Building finishes maintenance tools equipment and material sorted and prepared according to maintenance requirement

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		i. Determine type and function of building finishes maintenance tools ii. Determine type and function of building finishes maintenance equipment iii. Determine type and function of building finishes maintenance material iv. Determine type and function of building finishes maintenance PPE v. Follow requisition procedure vi. Arrange building finishes maintenance tools equipment and material vii. Check building finishes maintenance tools, equipment functionality and condition	*Attitude*: i. Systematic in preparing building finishes maintenance tools, equipment and material	22 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
3. Repair building finishes	i. Type of building finishes such as • Wall • Ceiling • Windows • Door • Floor ii. Building as built plan • Architectural • Mechanical • Civil structure • Electrical iii. Site preparation such as • Signage • Announcement/ memo • Safety and security • Scaffolding iv. Method of building finishes repair work v. Building finishes repair work procedure vi. Building finishes repair work technique vii. Maintenance quality viii. Building repairing finishes repair work safety and regulation ix. Authority body rules and regulation x. Housekeeping work requirement			20 hours	Lecture	i. Type of building finishes listed and explained ii. Building as built plan interpreted and detailed out iii. Site prepared and arranged according to building maintenance standard practices iv. Building finishes repairedaccording to work order specification and maintenance quality v. Building finishes repair work safety and regulation adhered vi. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		i. Confirm type of building finishes ii. Interpret building as built plan iii. Carry out site preparation iv. Confirm method of building finishes repair work v. Follow building finishes repair work procedure vi. Carry out repair work vii. Apply building finishes repair work technique viii. Comply to building finishes repairing time duration ix. Adhere to building repairing finishes repair work safety and regulation x. Comply to authority body rules and regulation xi. Carry out housekeeping work	*Attitude*: i. Accurate, systematic, meticulousin repairing of building finishes	46 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			Safety: i. Adhere to all safety regulation and SOP in repairing building finishes *Environment:* i. Adhere to DOE standards and guidelines in repairing building finishes			
4. Report building finishes maintenance work	i. Organisation structure ii. Building finishes maintenance work status iii. Closing work order			4 hours	Lecture	i. Building finishes maintenance work status updated ii. Work order completed and submitted
		i. Determine organisation structure ii. Update building finishes maintenance work status iii. Close work order iv. Submit close work order to supervisor	*Attitude:* i. Meticulous in updating building finishes maintenance work status report ii. Adhere to report submission dateline	8 hours	Demonstration & Observation	

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Hand tools	1:1
2. Power tools	1:5
3. Measuring tools	1:1
4. Ladder / scaffolding	1:10
5. Building as-built plans	1:5
6. Signage	1:5
7. Building finishes material	As per required
8. Consumables materials	As per required
9. Work order format	1:1
10. PPE	1:1

REFERENCES

1. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
2. Barrie Chanter, Peter Swallow, Building Maintenance Management, John Wiley & Sons, 2008, ISBN: 0470691298, 9780470691298
3. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
4. A C Panchdhari, Maintenance Of Buildings, New Age International, 2006, ISBN: 812241012X, 9788122410129
5. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
6. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
7. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920

8. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
9. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
10. R.S. Means Company, Cost planning and estimating for facilities maintenance
RSMeans Series, illustrated, R.S. Means, 1996, the University of Michigan, ISBN: 0876294190, 9780876294192
11. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
12. Raymond C. Matulionis, Joan C. Freitag, Preventive maintenance of buildings, Joan C. Freitag, Van Nostrand Reinhold, 1991, the University of Michigan, ISBN: 0442318669, 9780442318666
13. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170
14. Kathryne Louise Larrivee, Collections in the Rain: Maintaining and Protecting Building Collections at Open Air Historic Village Museums, University of Delaware. School of Urban Affairs and Public Policy, ProQuest, 2008, ISBN: 0549812652, 9780549812654

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	BUILDING ELECTRICAL SYSTEM MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure acceptable quality and within specific time frame of building electrical maintenance work according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify building electrical maintenance requirement • Prepare building electrical maintenance tools, equipment and material • Service building electrical component • Repair building electrical component • Replace building electrical component • Report building electrical maintenance work						
Competency Unit ID	BC-070-2:2014 C02	**Level**	2	**Training Duration**	240 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify building electrical maintenance requirement	i. Type of building such as • Residential • Commercial • Industrial • Special purpose ii. Public building iii. Work order format iv. Building electrical system condition • Building electrical system such as ▪ Low voltage ▪ Extra low			4 hours	Lecture	i. Electrical maintenance work order detail listed and explained ii. Type of maintenance work confirmed according to work order iii. Specification of building electrical

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	voltage • Type of building electrical equipment/ device such as ▪ Distribution board ▪ Sub distribution board ▪ Electrical fittings and accessories • Functionality • Testing method v. Type of maintenance work • Service • Repair • Replace vi. Building electrical maintenance specification • Current • Voltage • Ampere • Wire size vii. Building as built plan • Architectural • Mechanical • Civil structure • Electrical					maintenance detail out according to work order iv. Building electrical maintenance area/location confirmed according to work order v. Building electrical maintenance duration work confirmed according to work order
		i. Determine type of building ii. Interpret work order iii. Check building electrical system		8 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		condition iv. Determine type of maintenance work v. Studybuilding electrical maintenance specification vi. Confirm building electrical maintenance location vii. Confirm building electrical maintenance duration work				
2. Prepare building electrical maintenance tools, equipment and material	i. Type and function of building electrical maintenance tools such as • Hand tools • Power tools • Testing tools • Measuring tools ii. Type and function of calibration equipment iii. Type and function of building electrical maintenance material/parts such as • Cable • Breakers ▪ Miniature Circuit Breaker (MCB) ▪ Earth Leakage Circuit Breaker (ELCB)			8 hours	Lecture	i. Type and function of building electrical maintenance tools listed and explained ii. Type and function of calibration equipment listed and explained iii. Type and function of building electrical maintenance material/parts listed and explained

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	▪ Residual Current Circuit Breaker (RCCB) • Trunking • Conduit • Cable tray • Cable ladder • Consumable material iv. Type and function of building electrical maintenance PPE • Helmet • Goggle • Protective glove • Safety boot • Safety apron v. Requisition procedure vi. Building electrical maintenance tools equipment and material arrangement vii. Building electrical maintenance tools, equipment functionality and condition					iv. Type and function of building electrical maintenance PPE listed and explained v. Building electrical maintenance tools equipment and material sorted and prepared according to maintenance requirement
		i. Determine type and function of building electrical maintenance tools ii. Determine type and function of calibration equipment iii. Determine type and		16 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		function of building electrical maintenance material iv. Determine type and function of building electrical maintenance PPE v. Follow requisition procedure vi. Arrange building electrical maintenance tools equipment and material vii. Check building electrical maintenance tools, equipment functionality and condition	*Attitude* i. Systematic in preparing building electrical maintenance tools, equipment and material			
3. Service building electrical component	i. Type and function of building electrical component such as • Switch socket outlet • Lightning arrestor • Light fitting • Electrical sensor • Electrical protection			12 hours	Lecture	i. Type of building electrical component explained ii. Electrical drawing explained

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	devices • Electrical motor ii. Electrical drawing • Single line diagram • Wiring diagram • Schematic diagram iii. Site preparation such as • Signage • Announcement/ Memo • Safety and security • Scaffolding iv. Building electrical component servicing method v. Building electrical component servicing procedure vi. Building electrical component servicing technique vii. Authority body rules and regulation on electrical works • Suruhanjaya Tenaga (ST) • CIDB (Green card) • DOSH viii. Building electrical component functionality test ix. Housekeeping work requirement					iii. Site preparation implemented iv. Building electrical component servicing procedure followed v. Building electrical component servicing work executed vi. Building electrical component servicing technique applied vii. Building electrical component servicing time duration followed viii. Authority body rules and regulation complied ix. Building electrical component functionality test executed

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
						x. Work area tidied up
		i. Interpret electrical drawing ii. Carry out site preparation iii. Confirm building electrical component servicing method iv. Follow building electrical component servicing procedure v. Carry out building electrical component servicing work vi. Comply to electrical component servicing time duration vii. Apply building electrical component servicing technique viii. Comply to authority body rules and regulation ix. Carry out building electrical component functionality test x. Carry out housekeeping work		24 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			Attitude: i. Meticulous in servicing building electrical component ii. Systematic in servicing building electrical component *Safety:* i. Adhere to all safety regulation and SOP in servicing building electrical component ii. Wear proper PPE			
4. Repair building electrical component	i. Operation of building electrical system component such as • Lightning arrestor • Electrical sensor • Electrical motor ii. Suruhanjaya Tenaga Electrical Act iii. Ohm law iv. Building electrical component repairing work method • Self repair • Out source v. Building electrical component repairing			24 hours	Lecture	i. Type and function of building electrical system component listed and explained ii. Electrical drawing interpreted and detailed out iii. Site prepared and arranged according to building

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	work procedure vi. Building electrical component repairing work technique vii. Maintenance quality viii. Authority body rules and regulation ix. Building electrical component functionality test x. Safety and regulation xi. Housekeeping work requirement					maintenance standard practices iv. Building electrical component repaired according to work order specification and maintenance quality v. Work area tidied up
		i. Confirm type and function of building electrical system component ii. Interpret electrical drawing iii. Carry out site preparation iv. Confirm building electrical component repairing work method v. Follow building electrical component repairing work procedure vi. Carry out building electrical component repairing work vii. Apply building electrical component repairing time duration		60 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		viii. Apply building electrical component repairing work technique ix. Comply to authority body rules and regulation x. Carry out building electrical component functionality test xi. Adhere to safety and regulation xii. Carry out housekeeping work	*Attitude*: i. Systematic, meticulous and timely in repairing building electrical component *Safety:* i. Adhere to all safety regulation and SOP in repairing building electrical component			
5. Replace building electrical component	i. Purpose of building electrical component replacement work ii. Building electrical component specification iii. Building electrical component replacement procedure			22 hours		i. Specification of building electrical component checked and confirmed as per required ii. Site prepared

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	iv. Building electrical component replacement technique v. New parts/component standard • SIRIM					for replacement work iii. Building electrical component replaced according to work order specification and maintenance quality iv. Authority body rules and regulation complied v. Building electrical component functionality test carried out according to maintenance standard practice
		i. Confirm type of building electrical component for replacement ii. Interpret electrical drawing iii. Carry out site preparation iv. Confirm building electrical component replacement method v. Follow building electrical component replacement procedure vi. Carry out building electrical component replacement work vii. Apply building electrical component replacement technique viii. Comply to authority body rules and regulation ix. Carry out building electrical component functionality test x. Confirm building electrical component		50 hours		

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		as per specification xi. Adhere to building electrical component safety and regulation xii. Carry out housekeeping work	*Attitude*: i. Systematic, meticulous and timely in replacing building electrical component *Safety:* i. Adhere to all safety and regulation and SOP in replacing building electrical component *Environment:* i. Adhere to DOE standards and guidelines in replacing building electrical component			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
6. Report building electrical maintenance work	i. Organisation structure ii. Building finishes maintenance work status iii. Close work order submission method			4 hours		i. Building electrical maintenance work status updated ii. Work order completed and submitted
		i. Determine organisation structure ii. Update building electrical maintenance work status iii. Close work order Submit close work order to supervisor	*Attitude:* i. Meticulous in updating building electrical maintenance work status report ii. Adhere to report submission dateline	8 hours		

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Distribution board	1:5
2. Sub distribution board	1:5
3. Electrical fittings and accessories	As per required
4. As built plan- electrical drawing	1:5
5. Electrical Hand tools	1:1
6. Power tools	1:5
7. Electrical Testing tools	1:5
8. Electrical Measuring tools	1:5
9. Electrical Cable	As per required
10. Miniature Circuit Breaker (MCB)	As per required
11. Earth Leakage Circuit Breaker (ELCB)	As per required
12. Residual Current Circuit Breaker (RCCB)	As per required
13. Trunking	As per required
14. Conduit	As per required
15. Cable tray	As per required
16. Cable ladder	As per required
17. Consumable material	As per required
18. PPE (helmet, goggle, protective glove, safety boot, safety apron)	1:1
19. Switch socket outlet electrical accessories	As per required
20. Lightning arrestor	As per required
21. Light fitting	As per required
22. Electrical sensor	As per required
23. Electrical protection devices	As per required
24. Electrical motor	1:5
25. Signage	As per required
26. Ladder / scaffolding	1:10

REFERENCES

1. ThiagarajanViswanathan, Telecommunication Switching Systems And Networks, Phi Learning Pvt. Ltd., 1992, Isbn: 8120307135, 9788120307131
2. Barney L. Capehart, Lynne C. Capehart, Web Based Enterprise Energy and Building Automation Systems, The Fairmont Press, Inc., 2007, ISBN: 088173537X, 9780881735376
3. Guy W. Gupton, HVAC Controls: Operation and Maintenance, The Fairmont Press, Inc., 2002, ISBN: 0881733415, 9780881733419
4. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
5. Barrie Chanter, Peter Swallow, Building Maintenance Management, John Wiley & Sons, 2008, ISBN: 0470691298, 9780470691298
6. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
7. A C Panchdhari, Maintenance Of Buildings, New Age International, 2006, ISBN: 812241012X, 9788122410129
8. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
9. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
10. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
11. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
12. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
13. R.S. Means Company, Cost planning and estimating for facilities maintenance
RSMeans Series, illustrated, R.S. Means, 1996, the University of Michigan, ISBN: 0876294190, 9780876294192
14. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
15. Raymond C. Matulionis, Joan C. Freitag, Preventive maintenance of buildings, Joan C. Freitag, Van Nostrand Reinhold, 1991, the University of Michigan, ISBN: 0442318669, 9780442318666
16. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	BUILDING AIR CONDITIONING AND MECHANICAL VENTILATION SYSTEM MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure quality of building air conditioning and mechanical ventilation maintenance works are according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify building air conditioning and mechanical ventilation system maintenance requirement • Prepare building air conditioning and mechanical ventilation maintenance tools, equipment and material • Service building air conditioning and mechanical ventilation system and component • Repair building air conditioning and mechanical ventilation system and component • Replace building air conditioning and mechanical ventilation system and component • Report building air conditioning and mechanical ventilation system maintenance work						
Competency Unit ID	BC-070-2:2014 C03	**Level**	2	**Training Duration**	301 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify building air conditioning and mechanical ventilation system maintenance requirement	i. Building air conditioning and mechanical ventilation system maintenance work order ii. Type of building air conditioning and mechanical ventilation system • Centralise ▪ Air cooled ▪ Water cooled ▪ Variable refrigerant			6 hours	Lecture	i. Building air conditioning and mechanical ventilation system maintenance work order detail listed and explained ii. Type of maintenance work confirmed according to

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	volume • Split unit • Package unit iii. Building air conditioning and mechanical ventilation system operation iv. Type of building air conditioning and mechanical ventilation system maintenance work such as • Service • Repair • Replace v. Building air conditioning and mechanical ventilation specification					work order iii. Specification of building air conditioning and mechanical ventilation system maintenance detail out according to work order iv. Building air conditioning and mechanical ventilation system maintenance area/location confirmed according to work order v. Building air conditioning and mechanical ventilation system maintenance duration work confirmed according to work order
		i. Air conditioning and mechanical ventilation system maintenance work order ii. Determine type of air conditioning and mechanical ventilation system iii. Check building air conditioning and mechanical ventilation system condition iv. Determine type of building air conditioning and mechanical ventilation maintenance		15 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		work v. Determine building air conditioning and mechanical ventilation specification vi. Determine building air conditioning and mechanical ventilation maintenance location vii. Determine building air conditioning and mechanical ventilation maintenance duration work	*Attitude*: i. Detail in identifying building air conditioning and mechanical ventilation maintenance requirement			
2. Prepare building air conditioning and mechanical ventilation maintenance tools,	i. Type and function of building air conditioning and mechanical ventilation system maintenance tools such as • Hand tools			4 hours	Lecture	i. Type and function of building air conditioning and mechanical ventilation

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
equipment and material	• Power tools • Manifold gauge • Airflow meter • Humidity meter ii. Type and function of building air conditioning and mechanical ventilation maintenance system equipment such as • Vacuum pump • Recovery machine • Water pressure jet iii. Type and function of building air conditioning and mechanical ventilation system maintenance material such as • Refrigerant ▪ R22 ▪ R134a ▪ R410A ▪ R506 • Copper tube ▪ Hard drawn • Insulation material ▪ PU foam ▪ Armaflex • Chemical/ detergent iv. Type and function of building air conditioning and mechanical ventilation maintenance					maintenance tools listed and explained ii. Type and function of building air conditioning and mechanical ventilation maintenance equipment listed and explained iii. Type and function of building air conditioning and mechanical ventilation maintenance material listed and explained iv. Type and function of building air conditioning and mechanical ventilation maintenance PPE listed and explained v. Building air

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	PPE such as • Helmet • Goggle • Glove • Safety boot • Face mask v. Requisition procedure vi. Building air conditioning and mechanical ventilation maintenance tools equipment and material vii. Building air conditioning and mechanical ventilation maintenance tools, equipment functionality and condition					conditioning and mechanical ventilation system maintenance tools equipment and material sorted and prepared according to maintenance requirement
		i. Determine type and function of building air conditioning and mechanical ventilation system maintenance tools ii. Determine type and function of building air conditioning and mechanical ventilation maintenance system equipment iii. Determine type and function of building air conditioning and mechanical ventilation		8 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		system maintenance material iv. Determine type and function of building air conditioning and mechanical ventilation system maintenance PPE v. Follow requisition procedure vi. Arrange building air conditioning and mechanical ventilation maintenance tools equipment and material vii. Check building air conditioning and mechanical ventilation maintenance tools, equipment functionality and condition				
3. Service building air conditioning and mechanical ventilation system and component	i. Mechanical ventilation maintenance such as • Indoor fan motor • Outdoor condenser fan motor • Diffuser • Air filter • Cooling tower • Air conditioning drive unit • Air conditioning starter ii. Air conditioning			18 hours	Lecture	i. Electrical drawing listed and detailed out ii. Site prepared and arranged according to building maintenance standard practices iii. Building air conditioning and mechanical

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	electrical drawing • Single line diagram • Wiring diagram • Schematic diagram iii. Site preparation such as • Signage • Announcement/ memo • Safety and security • Scaffolding iv. Method of building air conditioning and mechanical ventilation system servicing v. Building air conditioning and mechanical ventilation system servicing procedure vi. Building air conditioning and mechanical ventilation maintenance servicing work • Refill split unit air conditioning refrigerant • Refill air conditioning lubrication • Clean air conditioning filter and coil • Check air conditioning electrical component functionality and condition					ventilation system and component serviced according to work order and maintenance quality iv. Building finishes repair work safety and regulation adhered v. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	vii. Building air conditioning and mechanical ventilation system servicing technique viii. Authority body rules and regulation • JABATAN ALAM SEKITAR ix. Building air conditioning and mechanical ventilation system functionality test x. Housekeeping work requirement					
		i. Confirm type of mechanical ventilation maintenance ii. Interpret electrical drawing iii. Carry out site preparation iv. Follow building air conditioning and mechanical ventilation system servicing procedure v. Carry out building air conditioning and mechanical ventilation maintenance servicing work vi. Apply building air conditioning and mechanical ventilation		42 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		system servicing technique vii. Comply to building air conditioning and mechanical ventilation system servicing time duration viii. Adhere to building air conditioning and mechanical ventilation system servicing work safety and regulation ix. Comply to authority body rules and regulation x. Carry out building air conditioning and mechanical ventilation system functionality test xi. Carry out housekeeping work	*Attitude*: i. Accurate, systematic, meticulous in servicing building air conditioning and mechanical ventilation maintenance *Safety:* i. Adhere to all safety regulation and SOP in servicing			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			building air conditioning and mechanical ventilation maintenance *<u>Environment:</u>* i. Adhere to DOE standards and guidelines in servicing building air conditioning and mechanical ventilation maintenance			
4. Repair building air conditioning and mechanical ventilation system and component	i. Operation of building air conditioning and mechanical ventilation component such as • Blower fan motor • Condenser fan motor • Remote control (wired/wireless) • Indoor fan motor • Outdoor condenser fan motor • Cooling tower • Air conditioning drive unit • Air conditioning starter ii. Building air conditioning			32 hours	Lecture	i. Type and function of building air conditioning and mechanical ventilation system and component listed and explained ii. Air conditioning electrical drawing interpreted and detailed out iii. Site prepared and arranged according to

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	and mechanical ventilation system and component repair method iii. Building air conditioning and mechanical ventilation system and component repair procedure iv. Building air conditioning and mechanical ventilation system and component repair work such as • Motor jammed • Piping leak • Faulty electrical wiring v. Building air conditioning and mechanical ventilation system and component repair technique					building maintenance standard practices iv. Building air conditioning and mechanical ventilation system and component repaired according to work order specification and maintenance quality v. Work area tidied up
		i. Confirm type of building air conditioning and mechanical ventilation system and component ii. Interpret air conditioning electrical drawing iii. Carry out site preparation iv. Follow building air conditioning and mechanical ventilation		74 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		system and component repair procedure v. Carry out building air conditioning and mechanical ventilation system and component repair work vi. Comply to building air conditioning and mechanical ventilation system and component repairing time duration vii. Apply building air conditioning and mechanical ventilation system and component repair technique viii. Comply to authority body rules and regulation ix. Carry out building air conditioning and mechanical ventilation maintenance functionality test x. Carry out housekeeping work	*Attitude*: i. Systematic, meticulous and timely in repairing building air conditioning and			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			mechanical ventilation system and component *Safety:* i. Adhere to all safety regulation and SOP in repairing building air conditioning and mechanical ventilation system and component *Environment:* i. Adhere to DOE standards and guidelines in repairing building air conditioning and mechanical ventilation system and component			
5. Replace building air conditioning and mechanical ventilation system and component	i. Cooling capacity calculation ii. Building air conditioning and mechanical ventilation system and component replacement method			28 hours	Lecture	i. Specification of building air conditioning and mechanical ventilation system and component

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	iii. Building air conditioning and mechanical ventilation system and component replacement procedure iv. Building air conditioning and mechanical ventilation system and component replacement work v. Building air conditioning and mechanical ventilation system and component replacement technique					checked and confirmed as per required ii. Site prepared for replacement work iii. Building air conditioning and mechanical ventilation system and component replaced according to work order specification and maintenance quality iv. Authority body rules and regulation complied v. Building air conditioning and mechanical ventilation system and component functionality test carried out according to maintenance standard practice
		i. Confirm type of building air conditioning and mechanical ventilation system and component ii. Carry out site preparation iii. Calculate cooling capacity iv. Confirm building air conditioning and mechanical ventilation system and component replacement method v. Follow building air conditioning and mechanical ventilation system and component replacement procedure vi. Carry out building air		62 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		conditioning and mechanical ventilation system and component replacement work vii. Comply to building air conditioning and mechanical ventilation system and component replacement time duration viii. Apply building air conditioning and mechanical ventilation system and component replacement technique ix. Comply to authority body rules and regulation x. Carry out building air conditioning and mechanical ventilation system and component functionality test xi. Carry out housekeeping work	*Attitude*: i. Systematic, meticulous and timely in replacing building air conditioning and mechanical ventilation system and			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			component *Safety:* i. Adhere to all safety and regulation and SOP in replacing building air conditioning and mechanical ventilation system and component *Environment:* i. Adhere to DOE standards and guidelines in replacing building air conditioning and mechanical ventilation system and component			
6. Report building air conditioning and mechanical ventilation system maintenance	i. Organisation structure ii. Building finishes maintenance work status iii. Building electrical maintenance reporting method • Updating checklist			4 hours	Lecture	i. Building air conditioning and mechanical ventilation maintenance work status updated ii. Work order

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
work	• Updating logbook • Verbal report • Writing report					completed and submitted
		i. Determine Organisation structure ii. Update air conditioning and mechanical ventilation system maintenance work status iii. Close work order iv. Submit close work order to supervisor	*Attitude:* i. Meticulous in updating air conditioning and mechanical ventilation maintenance work status report ii. Adhere to report submission dateline	8 hours	Demonstration & Observation	

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet toexchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Performance Appraisal Form	1:1
2. Training Needs Analysis format	1:1
3. Career Development And Succession Planning format	1:1
4. Personal File	1:1
5. Service Score Rating report	1:1
6. Training schedule	1:1
7. Training module	1:1
8. Lesson Plan	1:20
9. Audio Visual Aids	1:20
10. Computer	1:3
11. Stationery	1:1
12. ISO Compliance report	1:1
13. Established Policies & Procedures	1:1
14. Department Standard Operating Procedure	1:1

REFERENCES

1. ThiagarajanViswanathan, Telecommunication Switching Systems And Networks, Phi Learning Pvt. Ltd., 1992, Isbn: 8120307135, 9788120307131
2. Barney L. Capehart, Lynne C. Capehart, Web Based Enterprise Energy and Building Automation Systems, The Fairmont Press, Inc., 2007, ISBN: 088173537X, 9780881735376
3. Guy W. Gupton, HVAC Controls: Operation and Maintenance, The Fairmont Press, Inc., 2002, ISBN: 0881733415, 9780881733419
4. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
5. Barrie Chanter, Peter Swallow, Building Maintenance Management, John Wiley & Sons, 2008, ISBN: 0470691298, 9780470691298
6. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
7. A C Panchdhari, Maintenance Of Buildings, New Age International, 2006, ISBN: 812241012X, 9788122410129
8. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
9. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
10. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
11. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
12. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
13. R.S. Means Company, Cost planning and estimating for facilities maintenance
    RSMeans Series, illustrated, R.S. Means, 1996, the University of Michigan, ISBN: 0876294190, 9780876294192
14. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
15. Raymond C. Matulionis, Joan C. Freitag, Preventive maintenance of buildings, Joan C. Freitag, Van Nostrand Reinhold, 1991, the University of Michigan, ISBN: 0442318669, 9780442318666
16. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	PLUMBING SYSTEM MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure quality of plumbing maintenance works are according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify plumbing system maintenance requirement • Prepare plumbing system maintenance tools, equipment and material • Service plumbing system and component • Repair plumbing system and component • Report plumbing system maintenance work						
Competency Unit ID	BC-070-2:2014 C04	**Level**	2	**Training Duration**	116 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify plumbing system maintenance requirement	i. Work order • Preventive maintenance • Corrective maintenance • Schedule maintenance ii. Plumbing system condition iii. Type of plumbing system maintenance work iv. Plumbing system maintenance specification			4 hours	Lecture	i. Plumbing system maintenance work order detail listed and explained ii. Type of maintenance work confirmed according to work order iii. Specification of plumbing system maintenance

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	v. Plumbing system maintenance location vi. Plumbing system maintenance duration work					detail out according to work order iv. Plumbing system maintenance area/location confirmed according to work order v. Plumbing system maintenance duration work confirmed according to work order
		i. Determine work order ii. Check plumbing system condition iii. Determine type of plumbing system maintenance work iv. Determine plumbing system maintenance specification v. Determine plumbing system maintenance location vi. Determine plumbing system maintenance duration work	*Attitude*: i. Accurate in identifying plumbing system maintenance requirement	8 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
2. Prepare plumbing system maintenance tools, equipment and material	i. Type and function of plumbing system maintenance tools such as • Hand tools • Power tools • Special tools ▪ Ratchet ▪ Die ▪ Choking rod ii. Type and function of plumbing system maintenance equipment such as • Welding set • Water jet • Water pickup • Portable submersible pump iii. Type and function of plumbing system maintenance material such as • White tape • Plumbing glue • Pipes and accessories • *Tali guni* iv. Type and function of plumbing system maintenance PPE • Helmet • Goggle • Glove			4 hours	Lecture	i. Type and function of plumbing system maintenance tools listed and explained ii. Type and function of plumbing system maintenance equipment explained iii. Type and function of plumbing system maintenance material/parts listed and explained iv. Type and function of plumbing system maintenance PPE listed and explained v. Plumbing system maintenance tools equipment and material

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Safety boot • Face mask v. Requisition procedure vi. Plumbing maintenance tools and equipment vii. Plumbing maintenance tools, equipment functionality and condition					sorted and prepared according to maintenance requirement
		i. Determine type and function of plumbing system maintenance tools ii. Determine type and function of plumbing system maintenance equipment iii. Determine type and function of plumbing system maintenance material iv. Determine type and function of plumbing system maintenance PPE v. Follow requisition procedure vi. Arrange plumbing maintenance tools and equipment vii. Check plumbing maintenance tools, equipment functionality and condition		12 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			Attitude: i. Systematic in preparing plumbing system maintenance tools, equipment and material ii. Meticulous in preparing plumbing system maintenance tools, equipment and material iii. Timely in preparing plumbing system maintenance tools, equipment and material			
3. Service plumbing system and component	i. Type of plumbing system and component such as • Sanitary fitting/accessories ▪ Gauge ▪ Meter • Water filter • Grease trap • Floor trap • Water tank • Water pump • Swimming pool /fountain water retention structure			12 hours	Lecture	i. Type of plumbing system and component explained ii. Plumbing system drawing explained iii. Site preparation implemented iv. Plumbing system and component

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Plumbing valve • Water heater • Solar panel ii. Plumbing system drawing • Single line drawing • Layout piping drawing • Water reticulation plan iii. Site preparation such as • Signage • Announcement/ memo • Safety and security • Temporary structure (Scaffolding/ladder) iv. Plumbing system and component servicing method v. Plumbing system and component servicing procedure vi. Plumbing system maintenance servicing work such as • Cleaning • Greasing • Alignment • Water treatment vii. Plumbing system and component servicing time duration viii. Plumbing system and					servicing procedure followed v. Plumbing system and component servicing work executed vi. Plumbing system and component servicing technique applied vii. Plumbing system and component servicing time duration followed viii. Authority body rules and regulation complied ix. Plumbing system and component functionality test executed x. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	component servicing technique ix. Authority body rules and regulation • SPAN • IWK • DOE x. Plumbing system and component servicing safety and regulation xi. Plumbing system and component functionality test • Pressure • Leak xii. Housekeeping work					
		i. Determine type of plumbing system and component ii. Interpret plumbing system drawing iii. Carry out site preparation iv. Confirm plumbing system and component servicing method v. Follow plumbing system and component servicing procedure vi. Carry out plumbing system maintenance servicing work vii. Apply plumbing system and component		24 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		servicing time duration viii. Apply plumbing system and component servicing technique ix. Comply to authority body rules and regulation x. Adhere to plumbing system and component servicing safety and regulation xi. Carry out plumbing system and component functionality test xii. Carry out housekeeping work	*Attitude*: i. Meticulous in servicing plumbing system and component ii. Systematic in servicing plumbing system and component iii. Timely in servicing plumbing system and component *Safety:* i. Adhere to all safety regulation and SOP in servicing			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			plumbing system and component *<u>Environment:</u>* i. Adhere to DOE standards and guidelines in servicing plumbing system and component			
4. Repair plumbing system and component	i. Type of plumbing system and component such as • Cold water ▪ Piping ▪ Fitting ▪ Accessories • Sanitary ▪ Piping ▪ Fitting ▪ Accessories • Sewerage ▪ Piping ▪ Main hole • Water tank • Water pump • Fountain system • Swimming pool system • Drinking water system • Water harvesting system			12 hours	Lecture	i. Type and function of plumbing system and component listed and explained ii. Plumbing system drawing interpreted and detailed out iii. Site prepared and arranged according to building maintenance standard practices iv. Plumbing system and component repaired according to work order

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	ii. Plumbing system drawing • Single line drawing • Layout piping drawing • Water reticulation plan • Sewerage layout drawing iii. Site preparation such as • Signage • Announcement/ memo • Safety and security • Temporary structure (scaffolding/ladder) iv. Plumbing system and component repair/replace method v. Plumbing system and component repair/replace procedure vi. Plumbing system and component repair/replace time duration vii. Repair/replace work • Choked/clogged/ pipe • Fix • Remove and install part and component • Repair part and component					specification and maintenance quality v. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Seal viii. Plumbing system and component functionality test such as • Pressure • Leaking • Flow ix. Plumbing system and component repairing/replacing technique x. Authority body rules and regulation xi. Safety and regulation xii. Housekeeping work					
		i. Determine type of plumbing system and component ii. Interpret plumbing system drawing iii. Carry out site preparation iv. Confirm plumbing system and component repair/replace method v. Follow plumbing system and component repair/replace procedure vi. Apply plumbing system and component repair/replace time duration vii. Carry out		28 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		repair/replace work viii. Carry out plumbing system and component functionality test ix. Apply plumbing system and component repairing/replacing technique x. Comply to authority body rules and regulation xi. Adhere to safety and regulation xii. Carry out housekeeping work	*Attitude*: i. Meticulous in repairing plumbing system and component ii. Systematic in repairing plumbing system and component iii. Timely in repairing plumbing system and component *Safety:* i. Adhere to all safety regulation and SOP in repairing			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			plumbing system and component *<u>Environment:</u>* i. Adhere to DOE standards and guidelines in repairing plumbing system and component			
5. Report plumbing system maintenance work	i. Organisation structure ii. Building plumbing system maintenance work status iii. Close work order submission method			4 hours		I. Plumbing system maintenance work status updated II. Work order completed and submitted
		i. Determine Organisation structure ii. Update plumbing system maintenance work status iii. Close work order iv. Submit close work order to supervisor	*<u>Attitude:</u>* i. Meticulous in updating plumbing system maintenance work status report ii. Adhere to report submission dateline	8 hours		

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Hand tools	1:1
2. Power tools	1:1
3. Special tools	1:1
4. Welding set	1:1
5. Water jet	1:1
6. Water pickup	1:1
7. Portable submersible pump	1:1
8. White tape	1:1
9. Plumbing glue	1:20
10. Pipes and accessories	1:20
11. *Tali guni*	1:3
12. PPE	1:1
13. Plumbing system drawing	1:1
14. Signage	1:1
15. Temporary structure (Scaffolding/ ladder)	1:1
16. Authority body rules and regulation	1:1

REFERENCES

1. Thiagarajan Viswanathan, Telecommunication Switching Systems And Networks, Phi Learning Pvt. Ltd., 1992, Isbn: 8120307135, 9788120307131
2. Barney L. Capehart, Lynne C. Capehart, Web Based Enterprise Energy and Building Automation Systems, The Fairmont Press, Inc., 2007, ISBN: 088173537X, 9780881735376
3. Guy W. Gupton, HVAC Controls: Operation and Maintenance, The Fairmont Press, Inc., 2002, ISBN: 0881733415, 9780881733419
4. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
5. Barrie Chanter, Peter Swallow, Building Maintenance Management, John Wiley & Sons, 2008, ISBN: 0470691298, 9780470691298
6. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
7. A C Panchdhari, Maintenance Of Buildings, New Age International, 2006, ISBN: 812241012X, 9788122410129
8. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
9. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
10. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
11. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
12. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
13. R.S. Means Company, Cost planning and estimating for facilities maintenance RSMeans Series, illustrated, R.S. Means, 1996, the University of Michigan, ISBN: 0876294190, 9780876294192
14. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
15. Raymond C. Matulionis, Joan C. Freitag, Preventive maintenance of buildings, Joan C. Freitag, Van Nostrand Reinhold, 1991, the University of Michigan, ISBN: 0442318669, 9780442318666
16. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170
17. Kathryne Louise Larrivee, Collections in the Rain: Maintaining and Protecting Building Collections at Open Air Historic Village Museums, University of Delaware. School of Urban Affairs and Public Policy, ProQuest, 2008, ISBN: 0549812652, 9780549812654

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	FIRE PROTECTION SYSTEM MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure quality of fire protection system maintenance works are according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify fire protection system maintenance requirement • Prepare fire protection system maintenance tools, equipment and material • Carry out fire protection system functionality check • Test fire protection system • Report fire protection system maintenance work						
Competency Unit ID	BC-070-2:2014 C05	**Level**	2	**Training Duration**	116 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify fire protection system maintenance requirement	i. Fire protection system maintenance work order • Preventive maintenance • Corrective maintenance • Schedule maintenance ii. Fire protection system condition iii. Type of fire protection system such as • Hose reel • Sprinkler			4 hours	Lecture	i. Fire protection system maintenance work order detail listed and explained ii. Type of maintenance work confirmed according to work order iii. Specification of fire protection system

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria

	• Wet riser
	• Dry riser
	• Fixed fire extinguisher
	• Portable fire extinguisher
	• Alarm panel
	• Manual call point
	  ▪ Alarm bell
	  ▪ Break glass
	• Central Monitoring System (CMS)
	iv. Fire protection system maintenance Specification
	v. Fire protection system maintenance Location
	vi. Fire protection system maintenance Duration work
						maintenance detail out according to work order
						iv. Fire protection system maintenance area/location confirmed according to work order
						v. Fire protection system maintenance duration work confirmed according to work order

		i. Determine fire protection system maintenance Work order ii. Check fire protection system condition iii. Determine Type of fire protection system iv. Determine fire protection system maintenance Specification v. Determine fire protection system		8 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		maintenance Location vi. Determine fire protection system maintenance Duration work	<u>*Attitude*</u>: i. Accurate in identifying fire protection system maintenance requirement			
2. Prepare fire protection system maintenance tools, equipment and material	i. Type and function of fire protection system maintenance tools such as • Hand tools • Power tools ii. Type and function of fire protection system maintenance equipment such as • Powder recovery machine • Co2 refilling machine iii. Type and function of fire protection system maintenance material such as • Consumable material • Type of foam ▪ Dry powder ▪ Co2			4 hours	Lecture	i. Type and function of fire protection system maintenance tools listed and explained ii. Type and function of fire protection system maintenance listed and explained iii. Type and function of fire protection system maintenance material/parts listed and explained iv. Type and

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Type of fire iv. Type and function of fire protection system maintenance PPE • Helmet • Goggle • Glove • Safety boot • Face mask • Fire jacket v. Requisition procedure vi. Fire protection system maintenance tools, equipment and material vii. Fire protection system tools, equipment functionality and condition					function of fire protection system maintenance PPE listed and explained v. Fire protection system maintenance tools equipment and material sorted and prepared according to maintenance requirement
		i. Determine type and function of fire protection system maintenance tools ii. Determine type and function of fire protection system maintenance equipment iii. Determine type and function of fire protection system maintenance material iv. Determine Type and function of fire		12 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		protection system maintenance PPE v. Follow requisition procedure vi. Arrange fire protection system maintenance tools, equipment and material vii. Check fire protection system tools, equipment functionality and condition	*Attitude*: i. Systematic in preparing fire protection system maintenance tools, equipment and material ii. Accurate in preparing fire protection system n maintenance tools, equipment and material iii. Timely in preparing fire protection system maintenance tools, equipment and material			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
3. Carry out fire protection system functionality check	i. Type of fire protection system such as • Fire extinguisher ▪ Portable ▪ Fixed • Hose reel • Detector ▪ Smoke ▪ Heat • Manual call point ▪ Break glass ▪ Alarm bell • Sprinkler • Fire alarm panel • Fire tank • Fire pumping system • Fire curtain • Fire intercom system ▪ Central Monitoring System (CMS) ▪ Fireman intercom • Fireman switches ii. Fire protection system drawing • Electrical diagram • Piping diagram • Mimic diagram iii. Fire protection system functionality checking method			12 hours	Lecture	i. Type of fire protection system explained ii. Fire protection system functionality checking procedure followed iii. Fire protection functionality checked iv. Fire protection system functionality checking technique applied v. Fire protection system functionality checking time duration followed vi. Authority body rules and regulation complied vii. Safety and regulation adhered to viii. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	iv. Fire protection system functionality checking procedure v. Fire protection system functionality checking time duration vi. Fire protection functionality • Physical appearance • Validity period/expiry date • Pressure • Leak • Operational • Life span vii. Fire protection system functionality checking technique viii. Authority body rules and regulation • JABATAN BOMBA DAN PENYELAMAT ix. Safety and regulation x. Housekeeping work regulation					
		i. Determine type of fire protection system ii. Confirm fire protection system functionality checking method iii. Follow fire protection system functionality		24 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		checking procedure iv. Apply fire protection system functionality checking time duration v. Check fire protection functionality vi. Apply fire protection system functionality checking technique vii. Comply to authority body rules and regulation viii. Adhere to safety and regulation ix. Carry out housekeeping work	*Attitude*: i. Meticulous and patient in checking fire protection system functionality ii. Timely in checking fire protection system functionality *Safety:* i. Adhere to all safety regulation and SOP in checking fire protection system functionality			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			Environment: i. Adhere to JABATAN BOMBA DAN PENYELAMAT standards and guidelines in checking fire protection system functionality			
4. Test fire protection system	i. Fire protection system testing method ii. Fire protection system testing procedure iii. Hose reel test • Functionality • Pressure • Fire pump test i. Sprinkler test • Functionality • Pressure • Fire pump test ii. Fire detector functionality test • Smoke test • Heat test iii. Fire alarm panel test • Central Monitoring System (CMS) • fireman intercom • Manual call point iv. Fire protection system testing technique v. Safety and regulation vi. Housekeeping work			12 hours	Lecture	i. Fire protection system testing procedure explained ii. Hose reel test executed according to building maintenance standard practices iii. Sprinkler test executed according to building maintenance standard practices iv. Fire detector functionality test executed according to building maintenance standard

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		i. Confirm fire protection system testing method ii. Follow fire protection system testing procedure iii. Carry out Hose reel test iv. Carry out sprinkler test v. Carry out Fire detector functionality test vi. Carry out Fire alarm panel test vii. Apply fire protection system testing technique viii. Adhere to safety and regulation ix. Carry out housekeeping work	*Attitude*: i. Meticulous and patient in testing fire protection system ii. Timely in checking fire protection system *Safety:* i. Adhere to all safety regulation and SOP in checking fire protection system *Environment:* i. Adhere to	28 hours	Demonstration & Observation	practices v. Fire alarm panel test executed according to building maintenance standard practices iv. Fire protection system functionality checked according to work order specification and maintenance quality v. Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			JABATAN BOMBA DAN PENYELAMAT standards and guidelines in checking fire protection system			
5. Report fire protection system maintenance work	i. Organisation structure ii. Building fire protection system maintenance work status iii. Close work order submission method			4 hours		i. Fire protection system maintenance work status updated ii. Work order completed and submitted
		i. Determine Organisation structure ii. Update fire protection system maintenance work status iii. Close work order iv. Submit close work order to supervisor	*Attitude:* i. Meticulous in updating fire protection system maintenance work status report ii. Adhere to report submission dateline	8 hours		

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Performance Appraisal Form	1:1
2. Training Needs Analysis format	1:1
3. Career Development And Succession Planning format	1:1
4. Personal File	1:1
5. Service Score Rating report	1:1
6. Training schedule	1:1
7. Training module	1:1
8. Lesson Plan	1:20
9. Audio Visual Aids	1:20
10. Computer	1:3
11. Stationery	1:1
12. ISO Compliance report	1:1
13. Established Policies & Procedures	1:1
14. Department Standard Operating Procedures	1:1

REFERENCES

1. Barney L. Capehart, Lynne C. Capehart, Web Based Enterprise Energy and Building Automation Systems, The Fairmont Press, Inc., 2007, ISBN: 088173537X, 9780881735376
2. Guy W. Gupton, HVAC Controls: Operation and Maintenance, The Fairmont Press, Inc., 2002, ISBN: 0881733415, 9780881733419
3. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
4. Barrie Chanter, Peter Swallow, Building Maintenance Management, John Wiley & Sons, 2008, ISBN: 0470691298, 9780470691298
5. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
6. A C Panchdhari, Maintenance Of Buildings, New Age International, 2006, ISBN: 812241012X, 9788122410129
7. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
8. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
9. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
10. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
11. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
12. R.S. Means Company, Cost planning and estimating for facilities maintenance
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13. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
14. Raymond C. Matulionis, Joan C. Freitag, Preventive maintenance of buildings, Joan C. Freitag, Van Nostrand Reinhold, 1991, the University of Michigan, ISBN: 0442318669, 9780442318666
15. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170
16. Kathryne Louise Larrivee, Collections in the Rain: Maintaining and Protecting Building Collections at Open Air Historic Village Museums, University of Delaware. School of Urban Affairs and Public Policy, ProQuest, 2008, ISBN: 0549812652, 9780549812654

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	BUILDING TELECOMMUNICATION SYSTEM MAINTENANCE						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure quality of building telecommunication system maintenance works are according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify building telecommunication system maintenance requirement • Prepare building telecommunication system maintenance tools and material • Carry out telecommunication system maintenance • Report telecommunication system maintenance						
Competency Unit ID	BC-070-2:2014 C06	**Level**	2	**Training Duration**	176 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify building telecommunication system maintenance requirement	i. Building telecommunication system maintenance • Preventive maintenance • Corrective maintenance • Schedule maintenance ii. Building telecommunication system condition iii. Type of building telecommunication system maintenance			4 hours	Lecture	i. Building telecommunication system maintenance work order detail listed and explained ii. Type of maintenance work confirmed according to work order iii. Specification of building telecommunicat

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	work • Check • Service • Repair/ replace iv. Building telecommunication system maintenance specification v. Building telecommunication system maintenance location vi. Building telecommunication system maintenance duration of work					ion system maintenance detail out according to work order iv. Building telecommunication system maintenance area/location confirmed according to work order v. Building telecommunication system maintenance duration work confirmed according to work order
		i. Determine building telecommunication system maintenance ii. Check building telecommunication system condition iii. Determine type of building telecommunication system maintenance work iv. Determine building telecommunication system maintenance specification v. Determine building telecommunication system maintenance		12 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		location vi. Determine building telecommunication system maintenance duration of work	<u>*Attitude*</u>: i. Accurate in identifying building telecommunication system maintenance requirement			
2. Prepare building telecommunication system maintenance tools, and material	i. Type and function of building telecommunication system maintenance tools such as • Hand tools • Power tools • Communication tools • Cable detector • Soldering iron • Cable jointer • Testing tools ii. Type and function of building telecommunication system maintenance material such as • Consumable material			12 hours	Lecture	i. Type and function of building telecommunication system maintenance tools listed and explained ii. Type and function of building telecommunication system maintenance listed and explained iii. Type and function of building telecommunicat

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Cable • Cable tray • Trunking • Conduit iii. Type and function of building telecommunication system maintenance PPE • Helmet • Goggle • Glove • Safety boot iv. Requisition procedure v. Building telecommunication system maintenance tools and material vi. Building telecommunication system maintenance tools, functionality and condition					ion system maintenance material/parts listed and explained iv. Type and function of building telecommunication system maintenance PPE listed and explained v. Building telecommunication system maintenance tools equipment and material sorted and prepared according to maintenance requirement
		i. Determine type and function of building telecommunication system maintenance tools ii. Determine type and function of building telecommunication system maintenance material iii. Determine type and		24 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		function of building telecommunication system maintenance PPE iv. Follow requisition procedure v. Arrange building telecommunication system maintenance tools and material vi. Check building telecommunication system maintenance tools, functionality and condition	*Attitude*: i. Systematic in preparing building telecommunication system maintenance tools, equipment and material ii. Accurate in preparing building telecommunication system maintenance tools, equipment and material iii. Timely in preparing building telecommunication system maintenance			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
			tools, equipment and material			
3. Carry out telecommunication system maintenance	i. Type of building telecommunication components such as • Socket • Service box • Junction box • Cabling - • Telephone set • Antenna/ satellite disc • Arrestor • Audio visual system ▪ Public address system (PA) ▪ teleconferencing ▪ Projector ▪ Intercom ▪ Television ▪ Booster ii. Building telecommunication system drawing • Single line diagram • Wiring diagram • Schematic diagram iii. Site preparation such as • Signage • Announcement/ memo			32 hours	Lecture	i. Type of building telecommunication components listed and explained ii. Building telecommunication components drawing interpreted and detailed out iii. Site prepared and arranged according to building maintenance standard practices iv. Building telecommunication components maintenance executed according to work order specification and maintenance quality v. Building

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	• Safety and security • Temporary structure (Scaffolding/ladder) iv. Telecommunication system maintenance method v. Telecommunication system maintenance procedure vi. Telecommunication system maintenance technique vii. Building telecommunication system maintenance work time duration viii. Building telecommunication system • Check • Service • Repair/replace ix. Authority body rules and regulation • Suruhanjaya Komunikasi Dan Multimedia Malaysia (SKMM) x. Building telecommunication system functionality test xi. Safety and regulation xii. Housekeeping work requirement					telecommunication components maintenance work safety and regulation adhered Work area tidied up

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		i. Determine type of building telecommunication components ii. Interpret building telecommunication system drawing iii. Carry out site preparation iv. Confirm telecommunication system maintenance method v. Follow telecommunication system maintenance procedure vi. Apply telecommunication system maintenance technique vii. Apply building telecommunication system maintenance work time duration viii. Maintain building telecommunication system ix. Comply to authority body rules and regulation x. Carry out building telecommunication system functionality test		76 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		xi. Adhere to safety and regulation xii. Carry out housekeeping work	*Attitude*: i. Meticulous in executing telecommunication system maintenance ii. Systematic in executing telecommunication system maintenance iii. Timely in executing telecommunication system maintenance *Safety:* i. Adhere to all safety regulation and SOP in servicing telecommunication system maintenance *Environment:* i. Adhere to SKMM rules and regulation in telecommunication system maintenance			

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
4. Report telecommunication system maintenance	i. Organisation structure ii. Telecommunication system maintenance work status iii. Close work order submission method			4 hours	Lecture	i. Telecommunication system maintenance work status updated ii. Work order completed and submitted
		i. Determine Organisation structure ii. Update telecommunication system maintenance work status iii. Close work order iv. Submit close work order to supervisor	*Attitude:* i. Meticulous in telecommunication system maintenance work status report ii. Adhere to report submission dateline	12 hours	Demonstration & Observation	

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Performance Appraisal Form	1:1
2. Training Needs Analysis format	1:1
3. Career Development And Succession Planning format	1:1
4. Personal File	1:1
5. Service Score Rating report	1:1
6. Training schedule	1:1
7. Training module	1:1
8. Lesson Plan	1:20
9. Audio Visual Aids	1:20
10. Computer	1:3
11. Stationery	1:1
12. ISO Compliance report	1:1
13. Established Policies & Procedures	1:1
14. Department Standard Operating Procedures	1:1

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1. Thiagarajan Viswanathan, Telecommunication Switching Systems And Networks, Phi Learning Pvt. Ltd., 1992, Isbn: 8120307135, 9788120307131
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10. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
11. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
12. R.S. Means Company, Cost planning and estimating for facilities maintenance
    RSMeans Series, illustrated, R.S. Means, 1996, the University of Michigan, ISBN: 0876294190, 9780876294192
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CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	BUILDING MAINTENANCE						
Job Area	BUILDING OPERATION & MAINTENANCE						
NOSS Title	BUILDING OPERATION & MAINTENANCE SERVICES						
Competency Unit Title	BUILDING SERVICES CONTRACT						
Learning Outcome	The person who is competent in this competency unit shall be able to ensure quality of building services contract works are according to work order and regulatory body requirement. Upon completion of this competency unit, trainees will be able to:- • Identify building services contract requirement • Interpret building services contract schedule • Monitor building services contract • Report building services contract work						
Competency Unit ID	BC-070-2:2014 C07	**Level**	2	**Training Duration**	116 Hours	**Credit Hours**	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Identify building services contract requirement	i. Building services contract work order ii. Type of building services contract • Hygiene services • Pest control • Cleaning work • Landscape work • Waste disposal • Vertical transportation ▪ Lift ▪ Escalator • Gondola services iii. Type of building			4 hours	Lecture	i. Building services contract work order explained ii. Specification of building services contract work detail out according to work order iii. Building services contract

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
	services contract work schedule iv. Building services contract specification v. Building services contract location vi. Building services contract duration work					area/location confirmed according to work order iv. Building services contract duration work confirmed according to work order
		i. Determine building services contract work order ii. Determine type of building services contract iii. Determine type of building services contract work schedule iv. Determine building services contract specification v. Determine building services contract location vi. Determine building services contract duration work	*Attitude*: i. Meticulous in identifying building services contract requirement	12 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
2. Interpret building services contract schedule	i. Type of building services contract ii. Building services contract frequency iii. Scope of building services contract work iv. Building services contract work permit			12 hours	Lecture	i. Type of building services contract explained ii. Building services contract frequency elaborated iii. Scope of building services contract work identified iv. Building services contract work permit identified
		i. Determine type of building services contract ii. Determine building services contract frequency iii. Determine scope of building services contract work iv. Determine building services contract work permit	*Attitude*: i. Meticulous in interpreting building services contract schedule	24 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
3. Monitor building services contract	i. Type of services contractor such as • Hygiene services • Pest control • Cleaning work • Landscape work • Waste disposal • Vertical transportation ii. Numbers of contractors' manpower iii. Building services contract tools, equipment, PPE and material iv. Quality of building services contract work v. Safety and environmental, local authority rules and regulation compliance vi. Building services contract agreement compliances			14 hours	Lecture	i. Type of service contractor explained ii. Building services contract tools, equipment, PPE and material explained iii. Quality of building services contract work checked iv. Safety and environmental, local authority rules and regulation compliance checked v. Building services contract agreement compliances checked
		i. Determine type of services contractor ii. Determine numbers of contractors' manpower iii. Determine building services contract tools, equipment, PPE and material iv. Check quality of building services contract work		34 hours	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude / Safety / Environmental	Training Hours	Delivery Mode	Assessment Criteria
		v. Check safety and environmental, local authority rules and regulation compliance vi. Check building services contract agreement compliances	*Attitude*: i. Meticulous and patient in monitoring building services			
4. Report building services contract work	i. Organisation structure ii. Building services contract work status iii. Close work order submission method			4 hours	Lecture	i. Building services contract work status update ii. Job sheet completed and submitted
		i. Determine Organisation structure ii. Update building services contract work status iii. Close job sheet iv. Submit completed job sheet to supervisor	*Attitude:* i. Meticulous in updating building services contract report ii. Adhere to report submission dateline	12 hours	Demonstration & Observation	

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information. 01.02 Document information procedures or processes. 01.03 Utilize basic IT applications. 02.01 Interpret and follow manuals, instructions and SOP's. 02.02 Follow telephone/telecommunication procedures. 02.03 Communicate clearly. 02.04 Prepare brief reports and checklist using standard forms. 02.05 Read/Interpret flowcharts and pictorial information. 03.01 Apply cultural requirement to the workplace. 03.02 Demonstrate integrity and apply practical practices. 03.03 Accept responsibility for own work and work area. 03.04 Seek and act constructively upon feedback about work performance. 03.05 Demonstrate safety skills. 03.06 Respond appropriately to people and situations. 03.07 Resolve interpersonal conflicts. 06.01 Understand systems. 06.02 Comply with and follow chain of command. 06.03 Identify and highlight problems. 06.04 Adapt competencies to new situations/systems. 01.04 Analyse information. 01.05 Utilize the Internet to locate and gather information. 01.06 Utilize word processor to process information. 02.06 Write memos and letters. 02.07 Utilize Local Area Network (LAN)/Intranet to exchange information. 02.08 Prepare pictorial and graphic information. 03.08 Develop and maintain a cooperation within work group. 04.01 Organize own work activities. 04.02 Set and revise own objectives and goals. 04.03 Organize and maintain own workplace. 04.04 Apply problem solving strategies. 04.05 Demonstrate initiative and flexibility. 06.05 Analyse technical systems. 06.06 Monitor and correct performance of systems.	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Multitasking and prioritizing 5. Self-discipline 6. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Performance Appraisal Form	1:1
2. Training Needs Analysis format	1:1
3. Career Development And Succession Planning format	1:1
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1. Thiagarajan Viswanathan, Telecommunication Switching Systems And Networks, Phi Learning Pvt. Ltd., 1992, Isbn: 8120307135, 9788120307131
2. Guy W. Gupton, HVAC Controls: Operation and Maintenance, The Fairmont Press, Inc., 2002, ISBN: 0881733415, 9780881733419
3. Brian Wood, Building Maintenance, illustrated, John Wiley & Sons, 2009, ISBN: 1405179678, 9781405179676
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5. How Son Lee, George C. S. Yuen, Building maintenance technology, Macmillan building and surveying series, Building & Surveying Series, Macmillan, 1993, the University of Michigan, ISBN: 0333489934, 9780333489932
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7. Herbert W. Stanford, Effective Building Maintenance: Protection of Capital Assets, The Fairmont Press, Inc., 2010, ISBN: 0881736392, 9780881736397
8. Jules A. Oravetz, Building Maintenance, 3, reprint, T. Audel, 1977, ISBN: 0672232782, 9780672232787
9. Derek Miles, Paul Syagga, Building Maintenance: A Management Manual, International Labour Office, revised, Intermediate Technology Publications, 1987, ISBN: 0946688923, 9780946688920
10. Roger W. Liska, Judith Morrison Liska, Building Maintenance: Forms, Checklists and Procedures, Craftsman Book Company, 2001, ISBN: 0130935786, 9780130935786
11. Brian Wood, Building Care, Wiley, 2009, ISBN: 1405171677, 9781405171670
12. R.S. Means Company, Cost planning and estimating for facilities maintenance
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13. Abhijit V. Deshmukh, Lorenzo Fedele, Recent Advances in Maintenance and Infrastructure Management, Roberto D. Cigolini, illustrated, Springer, 2009, ISBN: 1848824890, 9781848824898
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15. Jack Rudman, National Learning Corporation, Building Maintenance, Volume 17 of Test Your Knowledge Series, National Learning Corporation, 2005, ISBN: 0837370175, 9780837370170
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SUMMARY OF TRAINING DURATION FOR BUILDING OPERATION & MAINTENANCE SERVICES (LEVEL 2)

NO. ID	COMPETENCY UNIT TITLE	WORK ACTIVITIES	RELATED KNOWLEDGE (A)	RELATED SKILLS (B)	HOURS (A) + (B)	TOTAL (HRS)
1	BUILDING FINISHES MAINTENANCE	Identify building finishes maintenance requirement	4	8	12	**120**
		Prepare building finishes maintenance tools, equipment and material	8	22	30	
		Repair building finishes	20	46	66	
		Report building finishes maintenance work	4	8	12	
2	BUILDING ELECTRICAL SYSTEM MAINTENANCE	Identify building electrical maintenance requirement	4	8	12	**240**
		Prepare building electrical maintenance tools, equipment and material	8	16	24	
		Service building electrical component	12	24	36	
		Repair building electrical component	24	60	84	
		Replace building electrical component	22	50	72	
		Report building electrical maintenance work	4	8	12	
3	BUILDING AIR CONDITIONING AND MECHANICAL VENTILATION SYSTEM MAINTENANCE	Identify building air conditioning and mechanical ventilation system maintenance requirement	6	15	21	**301**
		Prepare building air conditioning and mechanical ventilation maintenance tools, equipment and material	4	8	12	
		Service building air conditioning and mechanical ventilation system and component	18	42	60	
		Repair building air conditioning and mechanical ventilation system and component	32	74	106	
		Replace building air conditioning and mechanical ventilation system and component	28	62	90	
		Report building air conditioning and mechanical ventilation system maintenance work	4	8	12	
4	PLUMBING SYSTEM MAINTENANCE	Identify plumbing system maintenance requirement	4	8	12	**116**
		Prepare plumbing system maintenance tools, equipment and material	4	12	16	
		Service plumbing system and component	12	24	36	
		Repair plumbing system and component	12	28	40	
		Report plumbing system maintenance work	4	8	12	
5	FIRE PROTECTION SYSTEM MAINTENANCE	Identify fire protection system maintenance requirement	4	8	12	**116**
		Prepare fire protection system maintenance tools, equipment and material	4	12	16	
		Carry out fire protection system functionality check	12	24	36	
		Test fire protection system	12	28	40	
		Report fire protection system maintenance work	4	8	12	
6	BUILDING TELECOMMUNICATION SYSTEM MAINTENANCE	Identify building telecommunication system maintenance requirement	4	12	16	**176**
		Prepare building telecommunication system maintenance tools, and material	12	24	36	
		Carry out telecommunication system maintenance	32	76	108	
		Report telecommunication system maintenance	4	12	16	
7	BUILDING SERVICES CONTRACT	Identify building services contract requirement	4	12	16	**116**
		Interpret building services contract schedule	12	24	36	
		Monitor building services contract	14	34	48	

		Report building services contract work	4	12	16	
		TOTAL HOURS (Core Competencies)	360	825	1185	**1185**