STANDARD KEMAHIRAN PEKERJAAN KEBANGSAAN
(NATIONAL OCCUPATIONAL SKILLS STANDARD)

WATERPROOFING APPLICATION
LEVEL 2

JPK

JABATAN PEMBANGUNAN KEMAHIRAN
KEMENTERIAN SUMBER MANUSIA, MALAYSIA

WATERPROOFING APPLICATION LEVEL 2

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STANDARD PRACTICE

NATIONAL OCCUPATIONAL SKILLS STANDARD (NOSS) FOR BUILDING & CONSTRUCTION

WATERPROOFING APPLICATION LEVEL 2

1. INTRODUCTION

This is a waterproofing NOSS developed for CIDB. There is a high demand for skilled personnel in this field as the industry is developing rapidly. The waterproofing works intend to propel Malaysia to be at par with international construction industry.

The term "Waterproofing" describes objects relatively unaffected by water or resisting the ingress of water under specified conditions. In building construction, a structure needs waterproofing since concrete itself will not be watertight on its own. Hence, waterproofing acts as a barrier between the water and the building structure, preventing the passage of water.

Waterproofing works are implemented in both building and civil structure internally and externally in Malaysia. It is carried out to new and existing structure to provide comfortable and safe condition. When applied correctly, the structure can be long lasting and conducive to users.

Waterproofing is a necessary pre requisite for water exposed surface and hence there is a need for properly trained personnel at NOSS competency level 2 and 3. Having a competent workforce will renounce Malaysia as a centre of excellence in the region and help towards inward investment in the country.

Consequently, the development of this NOSS at Level 2 and 3, 'Waterproofing Works' is essential to ensure the sub sector will have complete standards and guidelines to be used by the industry.

2. PRE-REQUISITES

Based on the workshop findings, it was decided that the minimum requirement for those interested to enrol into this course are as follows:

- 17 years of age or older.
- Good eyesight.
- Medically and physically fit.
- Able to read, write and do simple calculation.

These pre-requisites are in line with minimum requirements set by Construction Industry Development Board (CIDB) and Department of Occupational Safety and Health (DOSH). With respect to the regulating bodies, the role is as follows:

Construction Industry Development Board (CIDB)

As waterproofing is an essential aspect of the construction industry, the Board has taken into concentration all functions related to waterproofing practices. The functions as laid down under subsection 4 (1) of Act 520 are as follows:

- To promote and stimulate the development, improvement and expansion of Waterproofing Works;
- To advise and make recommendations to the Federal Government and the State Governments on matters affecting or connected with Waterproofing Works;
- To promote, stimulate and undertake research into any matter related to Waterproofing Works;
- To promote, stimulate and assist in the export of service related to Waterproofing Works;
- To provide consultancy and advisory services with respect to Waterproofing Works;
- To promote quality assurance in Waterproofing Works;
- To initiate and maintain Waterproofing Works information systems;
- To encourage the standardisation and improvement of Waterproofing Works techniques and materials;
- To provide, promote, review and coordinate training programmed organized by the public and private construction training centres for skilled construction workers and construction site supervisors;
- To accredit and register contractors and to cancel, suspend or reinstate the registration of any registered contractor; and
- To accredit and certify skilled Waterproofing Works personnel.

Department of Occupational Safety and Health (DOSH)

As a regulatory body which enforces the occupational safety and health aspects in Malaysia, the role of DOSH is to study and review the policies and legislations of occupational safety and health. This in particular is enforced in risky occupations such as in the Waterproofing Works. The following acts are been enforced by DOSH:

a) Occupational Safety and Health Act 1994 and its regulations.
b) Factories and Machinery Act 1967 and its regulations.
c) Part of Petroleum Act 1984 (Safety Measures) and its regulations.
d) Guidelines, codes of practice, circulars.

With regard to the respective acts, DOSH comes forward to apply the functions as to:

- Conduct research and technical analysis on issues related to occupational safety and health at the workplace.
- Carry out promotional and publicity programs to employers, workers and the general public to foster and increase the awareness of occupational safety and health.
- Carry out promotional and publicity programs to employers, workers and the general public to foster and increase the awareness of occupational safety and health.
- Become a secretariat for the National Council regarding occupational safety and health

3. OCCUPATIONAL ANALYSIS (OA)

SECTOR	BUILDING & CONSTRUCTION
SUB SECTOR	**CIVIL ENGINEERING**
LEVEL/ AREA	**WATERPROOFING**
LEVEL 5	- *Not Available* -
LEVEL 4	WATERPROOFING WORKS QUALITY ASSURANCE INSPECTOR
LEVEL 3	WATERPROOFING WORKS SUPERVISOR
LEVEL 2	WATERPROOFING APPLICATOR
LEVEL 1	- *Not Available* -

Figure 1.1 Occupational Structure For Waterproofing

4. OCCUPATIONAL AREA ANALYSIS (OAA)

SECTOR	BUILDING & CONSTRUCTION
SUB SECTOR	CIVIL ENGINEERING
LEVEL/ AREA	WATERPROOFING
LEVEL 5	- *Not Available* -
LEVEL 4	WATERPROOFING WORKS QUALITY ASSURANCE
LEVEL 3	WATERPROOFING WORKS SUPERVISION
LEVEL 2	WATERPROOFING APPLICATION
LEVEL 1	- *Not Available* -

Figure 1.2 Occupational Area Structure for Waterproofing

5. DEFINITION 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 control 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.

6. MALAYSIAN SKILL CERTIFICATION

The pre-requisite to pursue this course include possessing good reading, writing and communicating skills, besides physically and mentally healthy. All candidates must undergo on job training to attain knowledge and skills in Building & Construction.

Verified competent candidates who full fill Malaysian Skill Certification requirements shall be awarded with Level 2 and Level 3 certificate.

Assessment must be in accordance with the following:

NOSS outlines competency unit and competency profile in the Waterproofing working environment as required by the industry and has been developed as well as documented following extensive collaboration across key Malaysian organisations. It is imperative that the duties and tasks outlined follow a high standard as well as consistency throughout the assessment process. This can only be done by stipulating a precise framework in which the assessment of competency unit and curriculum of competency unit must be conducted. The training & assessment of Waterproofing personnel must be committed in accordance with *JPK* policy and in adherence to Building & Construction rigorous process and standard as follows:

a) The final assessment of competency must include the combination of documented continuous assessment conducted by the facilitator during training and the results of post-training examination;
b) The post-training examination must be practical in nature and involve demonstration & application of the duties and tasks utilizing real equipment and real-world examples;
c) The competency and curriculum unit as outlined in this NOSS must be assessed throughout the training program and during a post-training examination;
d) The learning environment and facilities need to be in accordance with the requirements of the Building & Construction;
e) The development and assessment of the competency and curriculum unit profile must demonstrate transferable skills;
f) The development and assessment of the competency unit & competency profile must include documentation by candidates both during training and examination; and
g) All training and assessment materials must be mapped and verified to be in accordance with the NOSS Waterproofing Works by a panel of industry subject matter experts appointed by JPK with the support of the Building & Construction industry.

7. JOB COMPETENCIES

a) *Waterproofing Application* personnel in Level 2 are competent in performing core competency units:

- Waterproofing Surface Preparation
- Waterproofing Material Application

b) *Waterproofing Supervision* personnel in Level 3 are competent in performing core competency units:

- Waterproofing Testing & Commissioning
- Waterproofing Verification Works
- Waterproofing Material Handling

Optionally *The Waterproofing* personnel in Level 2 are competent in performing the following Elective competencies:-

- Supervisory Functions

8. WORKING CONDITIONS

Generally, a waterproofing personnel work is in accordance with work schedules and is responsible to meet contract requirements. He is also responsible to adhere to construction site regulations and waterproofing operating procedures and specifications. He must keep abreast with the rapidly changing waterproofing technology.

He normally works in a team and is required to adhere to safety and security procedures under working environment by OSHA.

9. EMPLOYMENT PROSPECTS

A skilled local waterproofing personnel has a high employment prospect both locally and internationally. A CIDB-recognised local expertise personnel is considered highly skilled and knowledgeable in waterproofing construction industry in other countries.

This in turn increases the demand for skilled personnel in this field to be employed globally.

As Malaysia moves towards standard minimum wages according to specialisation of works, waterproofing works competency recognition will increase employment prospects and support the growth.

Employment growth in the waterproofing industry is significant and is in current demand. The industry is growing rapidly in Malaysia and there is a shortage of well-trained personnel in this area.

Other related occupations with respect to employment opportunities are:

- Civil & Building Consultant
- Civil Contractor
- Oil and Gas
- Boilers and Pressure vessels
- Shipbuilding
- Construction
- Industrial machinery
- Aerospace
- Automotive
- Vocational training
- Civil & Building Consultant
- Civil Contractor

Other related industries with respect to employment opportunities are:

- Education
- Training Centres
- Lecturers
- Facilitators
- Sales and Marketing
- Building Material Supplier

10. SOURCES OF ADDITIONAL INFORMATION

Construction Industry development Board (CIDB)
Tingkat 7, Grand Seasons Avenue, 72, Jalan Pahang,
53000 Kuala Lumpur
Tel: 603-2617 0200
Fax: 603-2617 0220
Email: cidb@cidb.gov.my
Web: http://www.cidb.gov.my
Department of Occupational Safety and Health (DOSH)

Ministry of Human Resource,
Level 2, 3 & 4, Block D3, Complex D
Federal Government Administrative Centre
62530 W. P. Putrajaya
Tel: 603 - 8886 5000
Fax: 603 - 8889 2443
Email: jkkp@mohr.gov.my
Web: http://www.dosh.gov.my

Department of Standards Malaysia (Standards Malaysia)
Century Square, Level 1 & 2, Block 2300, Jalan Usahawan,
63000 Cyberjaya, Selangor Darul Ehsan, Malaysia
Tel: 603-8318 0002
Fax: 603-8319 3131
Email: central@standardsmalaysia.gov.my
Web: http://www.standardsmalaysia.gov.my

SIRIM Berhad
No. 1, Persiaran Dato' Menteri, Seksyen 2,
Peti Surat 7035, 40700 Shah Alam
Selangor Darul Ehsan
Tel: 603-55446000
Fax: 603-55108095
Email: web@sirim.my
Web: http://www.sirim.my

11. APPROVAL DATE

The National Skills Development Board (MPKK), Ministry of Human Resources has agreed and endorsed this Standard on ……..

12. ACKNOWLEDGEMENT

The Director General of DSD would like to extend his gratitude to the organisations and individuals who have been involved in developing this standard.

13. COMMITTEE MEMBERS FOR DEVELOPMENT OF STANDARD PRACTICE (SP), COMPETENCY PROFILE CHART (CPC) AND COMPETENCY PROFILE (CP)

WATERPROOFING APPLICATION LEVEL 2

PANEL		
1.	En. Mohd Azmi Affendi bin Ahmad Tamizi	Jurutera Projek Teguh Amani Sdn Bhd
2.	Ir. Tn. Hj. Md. Noor bin Mahmud	Pengarah Jabatan Kejuruteraan Majlis Perbandaran Kajang
3.	Dr. Razif bin Muhammed Nordin	Pensyarah Bahagian Polimer Fakulti Sains Gunaan UiTM Perlis
4.	Dr. Mohd Yazah bin Mat Raschid	Dekan Jabatan Senibina Fakulti Rekabentuk & Senibina UPM Serdang
5.	En. Juminan bin Samad	Pengarah Jabatan Rekabentuk Bandar & Bangunan, DBKL
6.	Sr. Norizan binti Sulaiman	Juruukur Bangunan Jabatan Rekabentuk Bandar& Bangunan, DBKL
7.	Profesor Madya Dr. Zakiah Ahmad	Pengarah Institut Kejuruteraan Infrastruktur & Pengurusan Mampan Fakulti Kejuruteraan Awam UiTM Shah Alam
8.	En. Johari bin Ahmad	Ketua Pen. Pengarah Kanan (Senggara) JKR W.P. Kuala Lumpur
9.	En. Mukhtar bin Mat Ali	Pengajar ABM Wilayah Timur
10.	En. Yeo Yew Boon	Pengurus Repair Resources Sdn Bhd
11.	En. Soh Teck Hin	Pengurus Binaan Zelan Holdings (M) Sdn Bhd
12.	Tn. Hj. Azman bin Wan Ab. Rahman	Jurutera Daerah JKR Seremban
13.	Profesor Dr. Azmi bin Ibrahim	Dekan Fakulti Kejuruteraan Awam Universiti Teknologi Mara
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11.	Pn. Siti Rohanah Binti Ahmad	CIDB Kuala Lumpur
CO-FACILITATOR		
12.	En. Mohd Fadil bin Muhamad	CIDB Kuala Lumpur
13	En. Mohd Azry bin Mohd Ariffin	CIDB Kuala Lumpur

8. COMMITTEE MEMBERS FOR DEVELOPMENT OF STANDARD PRACTICE (SP), COMPETENCY PROFILE CHART (CPC) AND COMPETENCY PROFILE (CP)

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2.	Ir. Tn. Hj. Md. Noor bin Mahmud	Pengarah Jabatan Kejuruteraan Majlis Perbandaran Kajang
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9. COMMITTEE MEMBERS FOR DEVELOPMENT OF STANDARD PRACTICE (SP), COMPETENCY PROFILE CHART (CPC), COMPETENCY PROFILE (CP) AND CURRICULUM OF COMPETENCY UNIT (CoCU).

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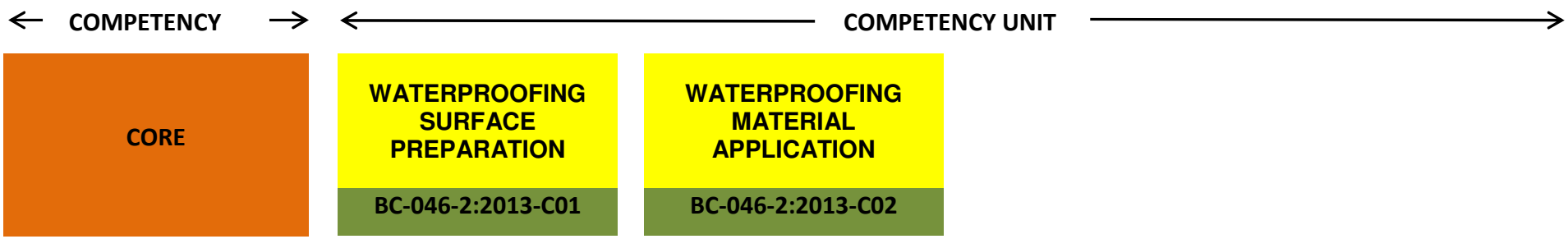
13	En. Mohd Azry bin Mohd Ariffin	CIDB Kuala Lumpur

COMPETENCY PROFILE CHART (CPC)

SECTOR	**BUILDING & CONSTRUCTION**		
SUB SECTOR	**CIVIL ENGINEERING**		
JOB AREA	**WATERPROOFING APPLICATION**		
JOB LEVEL	**LEVEL 2**	**JOB AREA CODE**	**BC-046-2-2013**



COMPETENCY PROFILE (CP)

Sub Sector	**CIVIL ENGINEERING**
Job Area	**WATERPROOFING APPLICATION**
Level	**LEVEL 2**

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
1. Waterproofing Surface Preparation		This competency unit describes the skills, knowledge and attitude requirements in waterproofing surface preparation. This process is to prepare construction surfaces to receive waterproofing materials for absolute bonding. Failure to achieve this will render reoccurrence of leakages. Consequently, causing waste of materials, labour and time. The person who is competent in waterproofing surface preparation shall be able to:- Set out, clean, treat and check waterproofing surface preparation works in accordance with manufacturer's requirements. The outcome of this CU will render the construction surface ready to receive waterproof layer	1. Set out waterproofing work surface. 2. Clean waterproofing work surface area	1.1 The work area appropriately identified and confirmed as per construction drawing. 1.2 The work area measured with conforming measuring tools 1.3 The identified work area boundaries marked in accordance with construction drawing. 2.1 Loose, solid, greasy, wet and protruding contaminants are identified 2.2 Brush, grind and vacuum cleaning methods are selected 2.3 Cleaning tools, equipment, and materials conforming to the job are prepared.

COMPETENCY PROFILE (CP)

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
		in accordance with British Standard (BS) or equivalent.		2.4 Flawless, smooth and debris free work surface area obtained and inspected. 2.5 Waste materials disposed at legally designated disposal site.
			3. Treat waterproofing work surface area	3.1 Surface defects determined. 3.2 Rectification methods identified 3.3 Surface defects treated.
			4. Check water proofing surface preparation completion	4.1 Relevant standard work inspection checklist obtained 4.2 Completed waterproofing surface preparation inspected in accordance with BS. 4.3 Waterproofing work surface preparation completion checklist submitted for approval

COMPETENCY PROFILE (CP)

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
2. Waterproofing Material Application		This competency unit describes the skills, knowledge and attitude requirements in waterproofing material application. This process constitutes laying of waterproofing materials to construction surfaces to render them waterproofed. It involves various application methods and materials. The person who is competent in waterproofing material application shall be able to :- Prepare waterproofing materials and application equipment, quantify waterproofing material components, mix waterproofing components, apply waterproofing materials, and cure and inspect waterproofing layer in accordance with manufacturer's specification. The outcome of this CU is to produce waterproofed surfaces in accordance with British Standard (BS) or equivalent.	1. Prepare waterproofing materials and application equipment 2. Quantify waterproofing material components. 3. Mix waterproofing components.	1.1 Types and capacity of materials application equipment selected and acquired. 1.2 Materials application equipment contaminant-free. 1.3 Materials application equipment moisture-free. 2.1 Quantity of waterproofing component identified and acquired in accordance with drawing specification. 2.2 Types and capacity of measuring and cutting equipment selected and acquired. 2.3 Ratio or area of waterproofing component compounded/measured in accordance with manufacturer's specification. 3.1 Waterproofing components mixtures poured into the container with care and in

COMPETENCY PROFILE (CP)

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
				orderly manner. 3.2 Waterproofing mixture thoroughly stirred to lump-free condition. 3.3 Component mixtures homogenously mixed for workability.
			4. Apply waterproofing materials	4.1 Types and capacity of laying tools conforming to job requirements identified. 4.2 Membrane/liquid materials obtained in accordance with job specification. 4.3 Specified adhesive applied to waterproofing work surface area as per manufacturer's requirement. 4.4 Waterproofing material laid homogeneously within pot-life as per manufacturer's requirement

COMPETENCY PROFILE (CP)

CU Title	CU Code	CU Descriptor	CU Work Activities	Performance Criteria
			5. Inspect waterproofing layer	5.1 Curing process monitored from tampering, temperature, humidity and precipitation. 5.2 Specific waterproofing surface thickness measuring tools as per manufacturer's specifications 5.3 Specified thickness measured as per manufacturer's specifications. 5.4 Consistent finish waterproofing surface defects free which include surface unevenness, puncture and bubble. 5.5 Inspection work completion reported in accordance with job requirement.

CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	**CIVIL ENGINEERING**						
Job Area	**WATERPROOFING**						
Competency Unit Title	**WATERPROOFING SURFACE PREPARATION**						
Learning Outcome	The person who is competent in this CU shall be able to render the construction surface ready to receive waterproof layer in accordance with British Standard (BS) or equivalent. Upon completion of this competency unit, trainees will be able to: - • Set out waterproofing work surface • Clean waterproofing work surface area • Treat waterproofing work surface area • Check waterproofing surface preparation completion						
Competency Unit ID	**BC-046-2:2013-C01**	**Level**	2	**Training Duration**	260 Hours	**Credit Hours**	26

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Set out waterproofing work surface	i. Work area identification ii. Specific work area inspection iii. Types of basic measuring tools: • Manual • Digital iv. Types of marking tools: • Portable • Fixed			10	Lecture	i. Work areas indicated on plans ii. Correct measuring tools listed iii. Total work areas summed up iv. Work area demarcated on site v. Precise final waterproofing work surface setting out data submitted
		i. Identify work areas ii. Select measuring tools iii. Calculate work areas iv. Mark work area boundaries v. Notify waterproofing		30	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
		work surface setting out completion	*Attitude* i. Set out waterproofing working area as per construction drawing ii. Responsible for own work and work areas iii. Skilful in using measuring tools iv. Systematic in implementing setting out *Safety* i. Maintain good condition of measuring equipment and marking tools ii. Comply with proper Personnel Protective Equipment (PPE) requirements *Environment* i. Ensure material recycled			

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
2. Clean waterproofing work surface area	i. Types of cleaning tools and equipments: • Broom • Air compressor • Water jet • Dustbin • Scoop • Cleaning chemical ii. Types of contaminants: • Grease • Dust • Oil • Loose materials			15	Lecture	i. Types of contaminant listed ii. Correct type of cleaning method chosen iii. Selected cleaning tools, equipment and materials gathered iv. Surface free of contaminants confirmed v. Work site cleared from waste and recorded vi. Final waterproofing work surface area cleaning data submitted
		i. Identify types of contaminant ii. Select type of cleaning method iii. Prepare cleaning tools, equipment and materials iv. Remove contaminants v. Inspect cleaned surface vi. Dispose of waste materials vii. Notify waterproofing work surface area cleaning completion	*Attitude* i. Ensure appropriate cleaning tools of waterproofing working area	45	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
			ii. Knowledgeable in using measuring tools iii. Responsible for own work and work areas *Safety* i. Ensure good condition of cleaning equipment ii. Comply with proper Personnel Protective Equipment (PPE) requirements *Environment* i. Housekeeping to be done to maintain cleanliness of work area			
3. Treat waterproofing work surface area	i. Types of surface defects: • Cracks and crevices • Holes • Uneven surface • Concrete joints between horizontal and vertical surface ii. Types and method of			25	Lecture	i. Waterproofing surface defects listed ii. Correct rectification method chosen iii. Surface free of defects confirmed iv. Final

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
	rectification works: • Mortar • Plaster • Sealer • Grout • Liquid iii. Method of surface defect treatments					waterproofing work surface area treatment data submitted
		i. Identify waterproofing surface defects ii. Select rectification methods iii. Repair waterproofing surface defects iv. Inspect repaired surface defects v. Notify waterproofing work surface area treatment completion	*Attitude* i. Ensure appropriate cleaning tools of waterproofing working area ii. Knowledgeable in using measuring tools *Safety* i. Ensure good condition of cleaning equipment ii. Comply with	60	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
			proper Personnel Protective Equipment (PPE) requirements *Environment* i. Housekeeping to be done to maintain cleanliness of work area			
4. Check water proofing surface preparation completion	i. Types and function of inspection • Visual • Swipe ii. Work completion confirmation			25	Lecture	i. Correct work surface inspection checklist produced ii. Final inspection checklist filled out iii. Final waterproofing surface preparation checklist received
		i. Obtain work surface inspection checklist ii. Inspect completed surface preparation work iii. Submit waterproofing surface preparation checklist	*Attitude* i. Ensure identified supervisory personnel verbally informed *Safety* i. Ensure inspection process properly	60	Demonstration & Observation	

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

Employability Skills

Core Abilities		Social Skills
01.01	Identify and gather information	1. Communication skills
01.02	Document information, procedures or processes	2. Conceptual skills
01.03	Utilise basic IT application	3. Interpersonal skills
02.01	Interpret and follow manuals, instructions and SOP	4. Learning skills
02.02	Follow telephone/telecommunication procedures	5. Leadership skills
02.03	Communicate clearly	6. Multitasking and prioritising
03.02	Demonstrate integrity and apply ethical practices	7. Self-discipline
03.03	Accept responsibility for own work and work area	8. Teamwork
03.04	Seek and act constructively upon feedback about performance	
03.5	Demonstrate safety skills	
03.6	Respond appropriately to people and situations	
03.7	Resolve interpersonal conflict	
06.1	Understand systems	
06.2	Comply with and follow chain and command	
06.4	Adapt competencies to new situation/systems	
01.4	Analyse information	
03.8	Develop and maintain a cooperation within workgroup	
04.1	Organise own work activities	
04.2	Set and revise own objectives and goals	
04.3	Organise and maintain own workplace	
06.5	Analyse technical systems	
06.6	Monitor and correct performance of system	
06.3	Identify and highlight problem	

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Broom	1:5
2. Brush	1:5
3. Air compressor	1:20
4. Water jet	1:20
5. Sealing tape	1:5
6. Mortar	As per required
7. Plaster	As per required
8. Grout	As per required
9. Special liquid (chemical)	As per required

References

REFERENCES

1. Cochran, J. (2010) General Specifications for Concrete and Reinforced Concrete: Including Finishing and Waterproofing: FQ Pub Books. (ISBN - 10: B004QZA1UY)
2. Cushing, W.C. (2011) Protecting and Water-proofing Solid Floor Bridges: Lighting Sources UK Ltd. (ISBN - 10: 1245153226)
3. Koning, P. (2006) The Waterproofing of Buildings: Tandym Print. (ISBN -10: 0620363886)
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CURRICULUM of COMPETENCY UNIT (CoCU)

Sub Sector	**CIVIL ENGINEERING**						
Job Area	**WATERPROOFING**						
Competency Unit Title	**WATERPROOFING MATERIAL APPLICATION**						
Learning Outcome	The person who is competent in this CU shall be able to produce waterproofed surfaces in accordance with British Standard (BS) or equivalent. Upon completion of this competency unit, trainees will be able to: - • Prepare waterproofing materials and application equipment • Quantify waterproofing material components • Mix waterproofing components • Apply waterproofing materials • Inspect waterproofing layer						
Competency Unit ID	**BC-046-2:2013-C02**	**Level**	2	**Training Duration**	230 Hours	**Credit Hours**	23

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
1. Prepare waterproofing materials and application equipment	i. Types of container and agitator • Size • Material • Shape ii. Function of container and agitator iii. Types of cleaning chemical iv. Functions of cleaning chemical v. Drying temperature vi. Types of waterproofing materials • Membrane • Liquid • Slurry vii. Functions of			15	Lecture	i. Correct waterproofing materials application equipment chosen ii. Materials application equipment free from contaminants iii. Material application equipment free from moisture (No verb)

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
	waterproofing materials • Surface • Penetration					
		i. Select waterproofing materials application equipment ii. Clean materials application equipment iii. Dry materials application equipment	*Attitude* i. Ensure good condition of mixing equipment ii. Clean mixing equipment thoroughly *Safety* i. Ensure good condition of mixing equipment ii. Ensure proper personnel protective equipments *Environment* i. Ensure materials recycled	40	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
2. Quantify waterproofing material components	i. Types of waterproofing material components • Material • Brand • Expiry date ii. Function of measuring and cutting equipment iii. Types of measuring and cutting equipment • Size • Material • Shape iv. Ratio of waterproofing material components per mix by: • Weight • Volume			10	Lecture	i. Waterproofing component quantity listed ii. Correct measuring and cutting equipment chosen. iii. Waterproofing material components quantified
		i. Identify waterproofing component quantity ii. Select measuring and cutting equipment iii. Measure waterproofing material components	*Attitude* i. Ensure good condition of waterproofing material bulk quantity *Safety* i. Ensure proper storage of measuring and	30	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
			cutting equipment ii. Ensure safe handling of measuring and cutting equipment iii. Ensure proper personnel protective equipments <u>*Environment*</u> i. Ensure environmental friendly product ii. Ensure no wastage after laying			
3. Mix waterproofing chemical components	i. Pouring waterproofing material sequence ii. Mixing proportion of waterproofing chemical to pot-life: • Temperature • Speed of distiller • Duration of mixing			10	Lecture	i. Quantified waterproofing components dispensed accordingly without spillage ii. Waterproofing components homogenously mixed and lump-free
		i. Pour quantified waterproofing components ii. Stir waterproofing components iii. Check component mixtures	<u>*Attitude*</u>	20	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
			i. Ensure pouring sequence of waterproofing material during mixing ii. Ensure waterproofing components mixed within specified duration *Safety* i. Ensure safe handling of mixture ii. Ensure proper personnel protective equipments *Environment* i. Ensure no wastage during mixing ii. Ensure waterproofing components mixed within specified duration			

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
4. Apply waterproofing material	i. Types and functions of laying apparatus ii. Types of adhesive • Material • Brand • Expiry date iii. Functions of adhesive: • Method of application iv. Types of surface • Flat • Corners and confined areas • Large vertical and horizontal areas • High vertical walls • Large horizontal surface v. Waterproofing material laying order • Thickness • Number of layers vi. Waterproofing mixture laying work timeframe			20	Lecture	i. Specific laying tools listed ii. Specific membrane/liquid materials acquired iii. Entire waterproofing work surface area covered with specified adhesive iv. Entire work surface area covered with specified waterproofing materials
		i. Identify specific laying tools ii. Obtain membrane/ liquid materials iii. Apply adhesive at waterproofing work surface area iv. Check completed adhesive application v. Lay/apply waterproofing		40	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
		materials vi. Check waterproofing materials laid/applied	*Attitude* i. Ensure good condition of adhesive ii. Ensure sequence of laying process *Safety* i. Ensure proper storage of apparatus ii. Ensure safe handling of measuring and cutting equipment iii. Wear Proper Personal Protection Equipment *Environment* i. Ensure no wastage after laying			
5. Inspect waterproofing layer	i. Types of thickness measuring tool ii. Finished waterproofing surface thickness inspection iii. Finished waterproofing			15	Lecture	i. Curing checklist filled out ii. Waterproofing surface thickness

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
	surface profile inspection iv. Inspection work completion					measuring tools listed iii. Thickness of waterproofing layer quantified iv. Report on finished surface condition submitted v. Final inspection result submitted
		i. Monitor curing condition ii. Identify waterproofing surface thickness measuring tools iii. Measure waterproofing layer thickness iv. Check finished surface v. Report inspection result	*Attitude* i. Ensure waterproofing membrane thickness gauged with proper tool ii. Ensure waterproofing surface area uniform to existing surface profile iii. Ensure inspection in selected points iv. Ensure identified supervisory personnel verbally informed	30	Demonstration & Observation	

Work Activities	Related Knowledge	Related Skills	Attitude/Safety/ Environmental	Training Hours	Delivery Mode	Assessment Criteria
			Safety i. Ensure inspection process properly supervised			

Employability Skills

Core Abilities	Social Skills
01.01 Identify and gather information 01.02 Document information, procedures or processes 01.03 Utilise basic IT application 02.01 Interpret and follow manuals, instructions and SOP 02.02 Follow telephone/telecommunication procedures 02.03 Communicate clearly 03.02 Demonstrate integrity and apply ethical practices 03.03 Accept responsibility for own work and work area 03.04 Seek and act constructively upon feedback about performance 03.5 Demonstrate safety skills 03.6 Respond appropriately to people and situations 03.7 Resolve interpersonal conflict 06.1 Understand systems 06.2 Comply with and follow chain and command 06.4 Adapt competencies to new situation/systems 01.4 Analyse information 03.8 Develop and maintain a cooperation within workgroup 04.1 Organise own work activities 04.2 Set and revise own objectives and goals 04.3 Organise and maintain own workplace 06.5 Analyse technical systems 06.6 Monitor and correct performance of system 06.3 Identify and highlight problem	1. Communication skills 2. Conceptual skills 3. Interpersonal skills 4. Learning skills 5. Leadership skills 6. Multitasking and prioritising 7. Self-discipline 8. Teamwork

Tools, Equipment and Materials (TEM)

ITEMS	RATIO (TEM : Trainees)
1. Broom	1:5
2. Mortar bucket	1:5
3. Hopper gun	1:5
4. Broom	1:5
5. Mixing drill	1:5
6. Mixing container	1:5
7. Measuring containers	1:5
8. Roller	1:5
9. Cutting knife	1:5
10. Scissors	1:5
11. Steel float	1:5
12. Serrated towel	1:5
13. Rubber gloves	1:1
14. Brushes	1:5
15. Membrane thickness measuring tool	1:20
16. Adhesive	As per required
17. Waterproofing membranes	As per required
18. Waterproofing chemical components	As per required
19. Audio Visual Aids (AVA)	As per required
20. Stationery	As per required

References

REFERENCES

1. Cochran, J. (2010) General Specifications for Concrete and Reinforced Concrete: Including Finishing and Waterproofing: FQ Pub Books. (ISBN - 10: B004QZA1UY)
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SUMMARY OF TRAINING DURATION FOR WATERPROOFING APPLICATION LEVEL 2

CU CODE	COMPETENCY UNIT TITLE	WORK ACTIVITIES	RELATED KNOWLEDGE (A)	RELATED SKILLS (B)	HOURS (A) + (B)	TOTAL (HRS)
BC-046-2:2013-C01	WATERPROOFING SURFACE PREPARATION	Set out waterproofing work surface	10	30	40	260
		Clean waterproofing work surface area	15	35	50	
		Treat waterproofing work surface area	25	60	85	
		Check waterproofing surface preparation completion	25	60	85	
BC-046-2:2013-C02	WATERPROOFING MATERIAL APPLICATION	Prepare waterproofing materials and application equipment	15	40	55	230
		Quantify waterproofing material components	10	30	40	
		Mix waterproofing components	10	20	30	
		Apply waterproofing materials	20	40	60	
		Inspect waterproofing layer	15	30	45	
		TOTAL HOURS (Core Competencies)	145	345	490	**490**