



National Certificate of Level-2 in Construction Material Sampler



National Certificate of Level -2 in Construction Material Sampler

CURRICULUM



**NATIONAL VOCATIONAL AND TECHNICAL TRAINING COMMISSION (NAVTTTC)
GOVERNMENT OF PAKISTAN**



National Certificate of Level-2 in Construction Material Sampler



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1. Introduction

Materials which are used for construction purposes are known as the engineering materials or building materials or construction materials. A wide range of building materials are available for the construction of rural buildings and structures. The proper selection of materials to be used in a particular building or structure can influence the Safety, original cost, maintenance, ease of cleaning, durability and, of course, appearance. Usually, construction materials are classified into natural construction material (Water, Mud, Stone, Sand, Wood, Leaves, Lime, Fiber and etc.) and artificial construction material (cement, Brick, Tiles, Glass, Metals, Plastic and etc.). It is necessary for the Civil Engineers/Civil Technologist/Lab Engineers/Lab Assistant to have knowledge about materials, properties and their standard testing methods.

Construction Materials Testing have significant role in the life of every human being, though one may not truly sense its importance in our daily routine. Thus, the importance of civil engineering may be determined according to its usefulness in our daily life. Therefore, industry expectations for skilled workforce are also dynamic which can only be managed through setting relevant competency standards in collaboration with the leading industries. Being familiar of this fact, National Vocational & Technical Training Commission (NAVTTC) developed competency standards for Construction Material Testing Technology under National Vocational Qualifications Framework (NVQF). These competency standards have been developed by a Qualifications Development Committee (QDC) and validated by the Qualifications Validation Committee (QVC) having representation from the leading Construction, Real States & Builder industry of the country.

2. Purpose of the Qualification:

The purpose of this qualification is to set high professional standards for construction Materials Testing technology sector. The specific objectives of developing these qualifications are as under:

- Improve the professional competence of the trainees
- Provide opportunities for recognition of skills attained through non-formal or informal pathways
- Improve the quality and effectiveness of training and assessment for construction Materials Testing industry
- Enable the existing workforce to capacitate themselves in new technologies and methods



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3. Overall objectives of training program

The Construction Material Sampler qualification of level 2 consists of both the theoretical and practical details and having the following Occupations

- | | | |
|----|-----------------------------------|---------|
| 1. | Building Materials Sampler | Level 2 |
| 2. | Highway Materials Testing Sampler | Level 2 |

It includes the following qualifications as well:

- | | | |
|----|--|---------|
| 1. | Certificate in Construction Materials Sampler | Level 2 |
| 2. | Certificate in Construction Materials Assistant | Level 3 |
| 3. | Certificate in Construction Materials Technician | Level 4 |
| 4. | Diploma in Construction Materials Supervisor | Level 5 |

4. Date of Validation

The level 2 of National qualification on construction Materials Sampler has been validated by the Qualifications Development Committee (QDC) members on **06-12-2021 to 10-12-2021** and will remain valid for 10 years

5. Entry level of trainees

The entry for National Certificate level 2, in Construction Material Testing Technology are

1. A person having Matric certificate with Science subjects for entry into level 2.

6. Minimum qualification for teachers

- B. Tech in Civil Technology 4 Years
- B.Sc. / B.E. in Civil Engineering 4 Years
- D. A. E. in Civil Technology with 3 Years teaching experience
- Must be able to communicate effectively

Medium of instruction



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English, and Urdu.

7. Duration of the course:

The proposed curriculum is composed of 145 modules that will be covered in 3617 Learning hours. Duration of the course is proposed to be Three years. The total weightage for technical modules is 3617 hours. A total of 1183 hours have been reserved for allied subjects i.e. Islamic studies, English, Mathematics, Physics and Chemistry.

The details of technical modules are given as under:

Level - 2 = 6 months.

Level - 3 = 6 months.

Level - 4 = 1 Year.

Level - 5 = 1 Year.

The overall distribution of contact hours and Credit Hours is given below:

Total.	3617 hours. & 361.7 Credits
Theory.	847 hours (23.42 %)
Practical.	2770 hours (76.58 %)

The distribution of contact hours and credit hours in each level is given below:

Level - 2 = 6 months (16 weeks)

Total.	610 hours. & 61 Credits
Theory.	115 hours (18.85 %)
Practical.	495 hours (81.15 %)

Level - 3 = 6 months (16 weeks)

Total.	607 hours. & 60.7 Credits
Theory.	121 hours (19.93 %)



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Practical. 486 hours (80.07%)

Level - 4 = 1 Year (16 weeks + 16 Weeks)

Total. 1200 hours. & 120 Credits

Theory. 234 hours (19.5 %)

Practical. 966 hours (80.5 %)

Level - 5 = 1 Year (16 weeks + 16 Weeks)

Total. 1200 hours. & 120 Credits

Theory. 377 hours (31.42 %)

Practical. 823 hours (68.58 %)

8. Description and structure of the course

Following is the structure of the course:

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11.1 Sampling of Materials

Module Code	Name of Competency	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.01.1	Maintain the Sampling field Testing Tools	Core	2	5	21	26	2.6
11.01.2	Perform sampling of construction materials.	Core	2	12	48	60	6.0
11.01.3	Perform sampling of construction process & products.	Core	2	11	54	65	6.5
11.01.4	Perform water sampling	Core	2	8	36	44	4.4
11.01.5	Perform Site Investigation Activities	Core	2	11	48	59	5.9
11.01.6	Observe Safety at construction site	Generic	2	17	78	95	9.5
Total				64	285	349	34.9



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11.2 Basic Drawing

Module Code	Name of Competency	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.02.1	Construct Scales for Drawing	Core	2	2	12	14	1.4
11.02.2	Construct Geometrical Figures	Core	2	4	21	25	2.5
11.02.3	Produce Orthographic Projections	Core	2	3	21	24	2.4
11.02.4	Perform Dimensioning on Drawings	Core	2	2	6	8	0.8
11.02.5	Develop Symbols of Engineering Drawings	Core	2	3	18	21	2.1
11.02.6	Interpret construction plans/ coordinate	Core	2	4	12	16	1.6
Total				18	90	108	10.8

11.03 Workshop Practices

Module Code	Name of Competency	Category	Level	Contact Hour			Credit
				Th	Pr	Total	
11.03.1	Apply Wooden hand tools	Core	2	2	9	11	1.1
11.03.2	Perform wooden joinery work	Core	2	2	21	23	2.3
11.03.3	Apply wooden fastenings	Core	2	3	9	12	1.2
11.03.4	Perform cutting, threading & reaming of pipes	Core	2	3	9	12	1.2
11.03.5	Join pipes & fittings	Core	2	4	21	25	2.5
11.03.6	Install plumbing fixtures	Core	2	3	18	21	2.1
11.03.7	Construct Sewers	Core	2	4	9	13	1.3
11.03.8	Perform Basic Electric Installations	Core	2	12	24	36	3.6
Total				33	120	153	15.3
Grand Total of Level 2				115	495	610	61



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9. Overview of the Curriculum.

Construction Material Sampler (Level-2)

S#	Clusters of Competencies	Numbers of Module	Theory	Practice	Duration
11.01	Sampling of Materials	6	64	285	349
11.02	Basic Drawing	6	18	90	108
11.03	Workshop Practices	8	33	120	153
	Total	20	115	495	610

10. Scheme of Studies

National Qualification Certificate in “Construction Material Sampler” level-2,

Code	Name of Subjects	Category	Contact Hour			Credit	Periods per week		
			Th	Pr	Total		Th	Pr	Total
	Sampling of Materials	Technical	64	285	349	34.9	4	18	22
	Basic Drawing	Technical	18	90	108	10.8	1	6	7
	Workshop Practices	Technical	33	120	153	15.3	2	8	10
	Total		115	495	610	61	7	32	39



11. Detail of Modules

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11.1. Sampling of Materials

11.1.1. Maintain the sampling and field-testing tools

Objective: This module covers the skills and knowledge required to Select tools for specific sampling job, maintain the tools & equipment and Follow the standard housekeeping procedures in lab and field.

Duration: 26 Hours

Theory: 05 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Select tools for specific sampling job.	Trainee will be able to: - Identify the sampling & field-testing tools. - Select the tools and apparatus required for sampling of water and for allied field tests. - Select the set of tools and instruments required for aggregate sampling. - Select the tools and apparatus	- Define the Sampling - Explain the use of the tools and equipment required for the sampling of Water, Aggregates, Cement, Concrete, Soil and bitumen. - Explain the importance of Stores, inventory and the procedure to store the tools and apparatus in safe condition. Practical Activity:	Theory-02Hrs Practice-09Hrs Total- 11Hrs	Sample container Weighing balance Sieve set Filters Slump test apparatus Thermometer Humidity meter Metallic tape Beaker Pipette Indicator	Class Room Lab



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	required for cement and concrete sampling and field testing. • Select the set of tools and apparatus required for collection of soil sample and its field testing. • Select the set of tools and equipment required for collection of samples of bitumen and its products. • Collect the tools from the store for specific job. • Clean and lubricate the tools. • Place tools at appropriate place.	1. Prepare list of the required tools to use for sampling of concrete, soil, water and aggregates. 2. Perform the activity to clean and Lubricate the tools and apparatus as per Standard		solutions Straight edge Sieve shaker Shovels with handle Core cutter apparatus portable colorimeters Burette First aid kit Lubrication oil Mortar Pan Platform scale Wheel barrow	
LU2. Maintain the tools & equipment.	Trainee will be able to: • Check Physical Condition of Tools & Equipment before use • Perform measurements with the measuring tools such as; measuring tape, measuring jar, metal gauge, vernier caliper, micrometer, weighing balance, pressure gauges and thermometer etc. • Perform routine maintenance as per standards.	• State Basic measuring units and it's inter conversion • Describe the Types of Measuring tools and its Use Practical Activity: 1. Perform routine check to ascertain the Physical Condition of Tools & Equipment before use. 2. Assemble the Tools and Equipment.	Theory-02Hrs Practice-06Hrs Total-08Hrs	Measuring tools Sample container Sieve set Filters Slump test apparatus Thermometer Humidity meter Beaker Pipette Indicator solutions Straight edge	Class Room & Lab



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	• Clean the tools & equipment after use • Place tools and equipment at appropriate place after use.			Sieve shaker Shovels with handle portable colorimeters Burette Mortar Pan Platform scale	
LU3. Follow the standard housekeeping procedures in lab and field	Trainee will be able to: • Arrange the testing tools and equipment at appropriate positions in store. • Protect instrument and equipment from heat, dust and moisture. • Carry and store loose and fluid materials like chemical admixtures as per standard safety practices. • Identify and label the damaged and out of order tools and equipment. • Maintain the inventory record of tools, instruments and equipment. • Prepare the maintenance log sheet of tools & equipment.	• State Preventive and corrective measures for tools and equipment against vulnerability. • Explain the importance of safe storage of tools and equipment and easy to identify at place. Practical Activity: 1. Perform maintenance of tools and equipment as per standards. 2. Perform housekeeping of the laboratory.	Theory-01Hrs Practice-06Hrs Total- 07Hrs	Weighing balance Sample container, Thermometer, Humidity meter Sieve set, Core cutter apparatus Platform scale Slump Test Apparatus Wheel Barrow Bucket Straight Edge Shovels with handle Mortar Pan Metallic Tape sampling containers, filters and	Class Room Lab



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				sieves portable colorimeters Beaker Burette Pipette Erlenmeyer flasks Indicator solutions	
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11.1.2. Perform sampling of construction materials.

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, collect aggregates samples, Extract soil samples, pack, label and store as per standard procedures, Collect the bricks, tiles and marble/stone samples., Prepare the cement test samples, Preserve and document the sampling, Handle, store and transport the samples and Maintain a safe work environment.

Duration: 60 Hours

Theory: 12 Hours

Practice: 48 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities.	Trainee will be able to: - Confirm the sampling location, number and type of samples, timing and frequency of sampling from the sampling plan. - Identify site and sampling hazards associated with the sample preparation, test methods, reagents and equipment. - Select & arrange the sampling equipment, sample container and accessories. - Prepare all solutions / reagents	- Explain pre-requisite measures prior to proceed for Sampling in field. - Define hazards; prepare a list of hazards associated with sample preparation. - Define the Calibration and its importance. - Explain the procedure of Calibration of relevant tools and equipment. <u>Practical Activity:</u> Prepare a sample board of materials required for the specific job	Theory-1.5Hrs Practice-3.0Hrs Total- 4.5Hrs	Sampling equipment Sample container Accessories	Class Room Lab



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	ready for field use. • Perform pre-use and safety checks in accordance with relevant instrumental procedures. • Identify faulty or unsafe components and equipment and report to appropriate personnel • Check calibration status of instruments and report any out-of-calibration items to appropriate personnel. • Plan work sequences for optimum efficiency and safety for collection of multiple samples.				
LU2. Collect aggregates samples.	Trainee will be able to: • Locate sampling site. • Assemble and check operations of all sampling & field-testing equipment & accessories. • Clean/decontaminate the sample container and sampling tools • Select and collect the required quantity of aggregates samples	• Define Fine aggregates and Coarse aggregates. • Explain Physical, Chemical and Mechanical Properties of aggregates. • Define ASTM D75 / D75M • Explain Methods of collecting test samples of Aggregates based upon the type of test and aggregates.	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Sieve shaker Safety Helmets Safety goggles Safety shoes	Class Room Lab



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	from the piles/stacks as per sampling plan & standard sampling procedures. • Take photos/snaps of sampling sites and samples. • Perform sample preparations, such as washing, weighing, & sieving the required quantity of material as per standard sampling procedure • Record the results of tests in the sampling document • Record sample appearance, environmental conditions and any other factors that may impact on sample integrity.	<u>Practical Activity:</u> Prepare a sample board of collected aggregates according to relevant code and standard procedure.			
LU3. Extract soil samples, pack, label and store as per standard procedures	Trainee will be able to: • Locate sampling site. • Assemble and check operations of all sampling & field-testing equipment & accessories. • Clean/decontaminate the sample container and sampling tools	• Define Soil, Adhesive Soil, Sandy Soil, Loam and Clay. • Define ASTM D4700 • Explain Methods of collecting test samples of Soil based upon the type of test and Soil.	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Spirit level Straight edge Containers Safety Helmets Safety goggles	Class Room Lab



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	- Perform soil sample extraction, using core cutter or other methods, as per standard procedure - Take photos/snaps of sampling sites and samples. - Carry out weighing, measuring and determine bulk density and moisture content of samples as per specified procedures. - Record the results of tests in the sampling document - Record sample appearance, environmental conditions and any other factors that may impact on sample integrity.	<u>Practical Activity:</u> Prepare a sample board of collected soil according to relevant code and standard procedure.		Safety shoes	
LU4. Collect the bricks, tiles & marble/stone samples.	Trainee will be able to: - Locate sampling site. - Assemble and check operations of all sampling equipment & accessories i.e. sample container, weighing balance, etc. - Clean/decontaminate the sample	- Define Brick, Tile, Marble and Stone. - Define ASTM C67 / C67M - Explain Methods of collecting test samples of Bricks, tiles and marble based upon the type of test and stated material.	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Safety Helmets Safety goggles Safety shoes Containers Shovels	Class Room Lab



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	container and sampling tools • Select and collect the required quantity of bricks/tiles/marble/stone samples from the stacks as per sampling plan & standard sampling procedures. • Take photos/snaps of sampling sites and samples. • Perform test as per standard procedure for determining the physical properties of bricks/tiles/marble/stone. • Carry out weighing and packing of sample a as per standard sampling procedure • Record the results of tests in the sampling document • Record sample appearance, environmental conditions and any other factors that may impact on sample integrity	<u>Practical Activity:</u> Prepare a sample board of collected bricks, tiles and marble/stone according to relevant code and standard procedure.		Trowels Brushes	
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LU5. Prepare the cement test samples.	Trainee will be able to: • Locate sampling site. • Assemble and check operations of all sampling equipment & accessories i.e. sample container, weighing balance, thermometer and humidity meter • Clean/decontaminate the sample container and sampling tools • Select and collect the required quantity of cement samples from the stacks as per sampling plan & standard sampling procedures. • Take photos/snaps of sampling sites and samples. • Carry out weighing and packing of sample and note the ambient temperature and humidity etc as per standard sampling procedure. • Record the results of tests in the sampling document • Record sample appearance,	• Define Binding Materials. • Define Cement. • Enlist the Types of Cement • Define ASTM C183/C183M • Explain the methods of collecting test samples of cement <u>Practical Activity:</u> Sampling the Cement in accordance with the Purpose, relevant code and Standard procedure.	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Weighing balance Tamping rod Straight edge Safety Helmets Safety goggles Safety shoes Face Mask Containers	Class Room Lab
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	environmental conditions and any other factors that may impact on sample integrity.				
LU6. Preserve and document the sampling.	Trainee will be able to: - Take photos/snaps of sampling sites and samples. - Prepare sub-samples and back-up sub-samples that are representative of the source. - Pack and seal the sample & sub-samples in the presence of witnesses according to sampling rule and procedure - Label samples in accordance with traceability requirements. - Complete the sampling document; fill in the sample date, time, weight/volume, sample ID, preservative used, sample location and sampler name etc.	- Explain the importance of sample preservation - Explain the standard practice of tagging/numbering/labeling the collected samples. <u>Practical Activity:</u> Label the samples and sub-samples to satisfy traceability requirements of the enterprise / accreditation.	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Sieve shaker Containers Shovels Trowels Brushes Weighing balance Tamping rod Straight edge Thermometers Funnels Vernier calipers	Class Room Lab



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LU7. Handle, store and transport the samples.	Trainee will be able to: - Store the sub-samples in accordance with the sampling procedure and rules for maintaining the sample integrity and traceability. - Deliver samples to reception point in accordance with standard operating procedures. - Record details of sample exchange in relevant sections of chain of custody forms. - Report any hazard to supervisor.	- Explain the Standard procedures of packing of test samples for transportation. - Explain the Standard practice for storing and stacking the test samples of various materials as per standards. <u>Practical Activity:</u> Handle, store and transport the cement, brick and aggregate samples	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Enameled trays Trolley Samples Sieve shaker Containers Shovels Trowels Brushes Weighing balance Tamping rod Straight edge Thermometers Funnels Vernier calipers Safety Helmets Safety goggles Safety shoes Face Mask	Class Room Lab
LU8. Maintain a safe work environment	Trainee will be able to: - Use defined safe work practices and personal protective equipment to ensure personal safety and that of others. - Clean all equipment, containers	- Explain the importance of safe work practice for self, persons and environment protection. - Enlist the steps to protect the tools and apparatus against the damages. - Explain the standards to dispose of	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Desiccators Safety Helmets Safety goggles Safety shoes Face Mask	Class Room Lab



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	and work area according to workplace procedures • Rehabilitate sampling site to render it safe and minimize environmental impacts. • Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures • Clean and care all equipment and check serviceability of equipment before storage.	the waste. <u>Practical Activity:</u> Prepare a list of equipment to be used while performing the samples of materials for self and for the safety of tools.			
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11.1.3. Perform sampling of construction process & products.

Objective: This competency standard covers the skills and knowledge required to collect, prepare and preserve test samples of cement concrete and asphalt concrete and performing simple field tests required for preparation of specific material samples.

Duration: 65 Hours

Theory: 11 Hours

Practice: 54 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities	Trainee will be able to: - Confirm the sampling location, number and type of samples, and timing and frequency of sampling from the sampling plan. - Identify site and sampling hazards associated with the sample preparation, test methods, reagents and equipment. - Select & arrange the sampling & field-testing equipment, and accessories. - Perform pre-use and safety checks in accordance with relevant instrumental procedures. - Identify faulty or unsafe components and equipment and report to appropriate personnel	- Explain pre-requisite measures prior to proceed for Sampling of Concrete in field. - Define hazards, prepare a list of hazards associated with Concrete sample preparation. <u>Practical Activity:</u> - Draw Flow diagram exhibiting the Plan work sequence to collect the Samples of Concrete in accordance with relevant code and Standard procedure. - Prepare the sampling documents for Concrete such as fill in the sample date and time	Theory-1Hrs Practice-6Hrs Total- 7Hrs	Note book Pencil	Class Room Lab



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	• Check calibration status of instruments and report any out-of-calibration items to appropriate personnel. • Plan work sequences for optimum efficiency and safety for collection of multiple samples.	and weight/measure, temperature, pH value, sampler name, sample tag/ ID#, preservative used, sample location and sampling equipment etc.			
LU2. Prepare concrete samples, (cast cube/cylinder) at site as per standard procedures and sampling rules.	Trainee will be able to: • Identify locations for sample collection in accordance with sampling plan and test method. • Set up, check and operate test equipment safely and in accordance with workplace procedures and test method • Collect samples of fresh concrete from a desired batch as per sampling plan sampling rules. • Perform slump test as per standard procedures • Take sufficient test measurements to ensure reliable data • Record the results of slump tests in the	• Define Cement Concrete • State the ingredients of Cement Concrete • State Physical, chemical and mechanical properties of Cement Concrete • State different factors affecting the workability of Cement concrete. • Explain different methods of mix design, transportation of fresh Cement concrete it's placing and compaction. • Define Cubic and Cylindrical strength of Cement Concrete • State the different	Theory-03Hrs Practice-09Hrs Total- 12Hrs	Sample container Sieves set Mortar pan Bucket Shovels with handle Platform scale Straight Edge Wheel barrow PPEs	Class Room Lab Field visit



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	sampling document • Cast concrete cubes/cylinders in required quantity as per standard procedure. • Label the concrete cubes/cylinders and engrave identification mark on it. • Store concrete cubes/cylinders in humidity chamber as per standard procedure. • Recognize and record sample appearance, environmental conditions and any other factors that may impact on sample integrity. • Re-instate all disturbed surfaces in accordance with workplace procedures	recommended values of slumps for various conditions of placements • Explain Methods of collecting test samples of Cement Concrete based upon the type and standards. Practical Activity: Sampling the Cement Concrete in accordance with the Purpose, relevant code and Standard procedure.			
LU3. Extract asphalt concrete test samples at site as per standard procedures and sampling rules	Trainee will be able to: • Identify locations for sample collection in accordance with sampling plan & test method. • Set up, check and operate test equipment safely and in accordance with workplace procedures and test method • Collect the required numbers of asphalt	• Define Asphalt and Asphalt Concrete • State the ingredients of asphalt Concrete • State Physical, chemical & mechanical properties of Asphalt Concrete. • Explain Methods of collecting test samples of Asphalt	Theory-02Hrs Practice-09Hrs Total- 11Hrs	• Asphalt • PPEs	Class Room Lab Field visit



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	concrete layer cores by core cutter from the selected locations as per sampling plan. • Carry out weighing and determine bulk density of sample and note the ambient temperature and humidity etc as per standard sampling procedure • Record the results of tests in the sampling document • Record sample appearance, environmental conditions and any other factors that may impact on sample integrity • Re-instate all disturbed surfaces in accordance with workplace procedures	Concrete based upon the type of test <u>Practical Activity:</u> Sampling the Asphalt Concrete in accordance with the Purpose, relevant code and Standard procedure.			
LU4. Extract concrete test samples at site as per standard procedures and sampling rules	Trainee will be able to: • Identify locations for sample collection in accordance with sampling plan and test method. • Assemble and check operations of all sampling equipment and accessories i.e. sample container, weighing balance,	• Explain Methods of collecting test samples of Concrete based upon the type of test at Site. <u>Practical Activity:</u> Sampling the Concrete in accordance with the Purpose, relevant code and Standard procedure at Site	Theory-2Hrs Practice-09Hrs Total- 11Hrs	• Concrete • PPEs	Class Room Lab Field visit



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	thermometer and humidity meter etc. • Collect the required numbers of cement concrete slab cores by core cutter from the selected locations as per sampling plan. • Carry out weighing and packing of sample and note the ambient temperature and humidity etc as per standard sampling procedure. • Perform field test by Rebound hammer for ascertaining the strength of concrete structure. • Take sufficient test measurement of Rebound hammer to ensure reliable data. • Record the results of tests in the sampling document • Recognize and record any information about site conditions that may impact on sample integrity.				
LU5. Preserve and document the sampling	Trainee will be able to: • Take photos/snaps of sampling sites and samples.	• Explain the Importance of Concrete Sample preservation. • Explain Concrete Sample preservation method.	Theory-01Hrs Practice-06Hrs Total- 07Hrs	Aggregate Cement Sand Water	Class Room Lab



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	• Prepare sub-samples and back-up sub-samples that are representative of the source. • Pack and seal the sample and sub-samples in the presence of witnesses according to sampling rule and procedure • Label samples in accordance with traceability requirements. • Complete the sampling document; fill in the sample date, time, weight/volume, sample ID, preservative used, sample location and sampler name etc.	• Explain the standard practice of tagging/numbering/labeling the collected samples of Concrete <u>Practical Activity:</u> Label the Concrete samples and sub-samples to satisfy traceability requirements of the enterprise / accreditation.		PPEs Note book Pencil	
LU6. Handle, store and transport the samples	Trainee will be able to: • Organize their safe curing, storage and transport of samples/sub-samples in accordance with sampling procedure and rules. • Deliver samples to reception point in accordance with standard operating procedures. • Record details of sample exchange in relevant sections of chain of custody	• Explain the Standard procedures of packing of test samples of Concrete for transportation. • Explain the Standard practice for storing and stacking the test samples of Concrete as per standards. <u>Practical Activity:</u> Draw the flow diagram to Select and check all required field	Theory-01Hrs Practice-09Hrs Total- 10Hrs	• Wheel barrow • Enamel d trays • PPEs	Class Room Lab



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	forms. Complete site safety plans, equipment logs and test reports in accordance with workplace procedures	equipment, instruments and materials and safely transporting them to and from site for Concrete.			
LU7. Maintain a safe work environment	Trainee will be able to: - Use defined safe work practices and personal protective equipment to ensure personal safety and that of others. - Clean all equipment, containers and work area according to workplace procedures - Rehabilitate sampling site to render it safe and minimize environmental impacts. - Collect the dispose off all waste in accordance with environmental requirements and workplace procedures - Clean and care all equipment and check serviceability of equipment before storage.	- Explain the importance of safe work practice for self, persons and environment protection while performing Concrete works. - Enlist the steps to protect the tools and apparatus for Concrete sampling against the damages. - Explain the standards to dispose of the waste of Concrete <u>Practical Activity:</u> Prepare a list of equipment to be used while performing the samples of Concrete for self and for the safety of tools.	Theory-01Hrs Practice-06Hrs Total- 07Hrs	PPEs Sample container Sieves set Mortar pan Bucket Shovels with handle Platform scale Straight Edge Wheel barrow	Class Room Lab



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11.1.4. Perform water sampling

Objective: This module covers the skills and knowledge required to Carry out initial preparatory activities, Conduct sampling of water, perform field tests and preserve the sample, Handle, store & transport the samples and Maintain a safe work environment.

Duration: 44 Hours

Theory: 08 Hours

Practice: 36 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Carry out initial preparatory activities	Trainee will be able to: - Confirm the sampling location, number and type of samples, and timing and frequency of sampling from the sampling plan. - Identify site and sampling hazards and review workplace safety procedures. - Select and check the sampling and field-testing equipment, sample container and accessories. - Prepare all solutions / reagents ready for field use. - Plan work sequences for optimum efficiency and safety for collection of multiple samples.	- Explain pre-requisite measures prior to proceed for Sampling of Water in field. - Define hazards and prepare a list of hazards associated with Water sample preparation. <u>Practical Activity:</u> - Draw Flow diagram exhibiting the plan work sequence to collect the Samples of Water in accordance with relevant code and standard procedure. - Prepare the sampling documents for water such as fill in the sample date and time and weight/measure, temperature, pH	Theory-01Hrs Practice-06Hrs Total- 07Hrs	Sample container Accessories Testing equipment First aid kit	Class Room Lab Field



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		value, sampler name, sample tag/ ID#, preservative used, sample location and sampling equipment			
LU2. Conduct sampling of water.	Trainee will be able to: • Locate sampling site. • Assemble and check operations of all sampling equipment and accessories. • Clean/decontaminate the sample container and sampling tools • Collect samples according to sampling plan and standard sampling procedures • Take photos/snaps of sampling sites and samples. • Record all information and label samples in accordance with traceability requirements. • Record sample appearance, environmental conditions and any other factors that may impact on sample integrity.	• Explain contaminated water and its adverse consequences to construction works. • Explain scientific terminology regarding water chemistry. • Explain Physical and chemical properties of water and contaminations. • Explain Methods of collecting test samples of Water based upon the type and standards. <u>Practical Activity:</u> Sampling the Water in accordance with the Purpose, relevant code and Standard procedure	Theory-02Hrs Practice-09Hrs Total- 11Hrs	Beaker Burette Pipette Erlenmeyer flask Filters Portable colorimeter First aid kit	Class Room Lab Field



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LU3. Perform field tests and preserve the sample.	Trainee will be able to: • Take the temperature of sample and ambient temperature. • Prepare apparatus (Multi-probe meter) for determining; pH, Turbidity, Dissolved oxygen and Electrical conductivity as per Standard operating procedure. • Perform test as per standard procedure for determining the physical properties of water and wastewater. • Record the results of tests in the sampling document. • Preserve the samples by adopting appropriate preservation method keeping in view the purpose of sampling. • Prepare sub-samples and back-up sub-samples that are representative of the source. • Pack and seal the sample & sub-samples in the presence of witnesses	• Describe pH value of water • Explain Methods of collecting test samples of Water based upon the type of test in field. <u>Practical Activity:</u> Sampling the Water in accordance with the Purpose, relevant code and Standard procedure in field	Theory-01Hrs Practice-09Hrs Total- 10Hrs	Beaker Burette Pipette Erlenmeyer flask Filters Portable colorimeter First aid kit	Class Room Lab Field
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	according to sampling rule and procedure • Complete the sampling document; fill in the sample date, time, weight/volume, sample ID, preservative used, sample location and sampler name etc.				
LU4. Handle, store and transport the samples.	Trainee will be able to: • Store the sub-samples in accordance with the sampling procedure and rules for maintaining the sample integrity and traceability. • Place samples at the required controlled temperature environment in the specified container. • Deliver samples to reception point in accordance with standard operating procedures. • Record details of sample exchange in relevant sections of chain of custody forms. • Report any misadventures to supervisor.	• Explain the Standard procedures of packing of test samples of Water for transportation. • Explain the Standard practice for storing and stacking the test samples of Water as per standards. <u>Practical Activity:</u> Draw the flow diagram to Select and check all required field equipment, instruments and materials and safely transporting them to and from site for Water.	Theory-02Hrs Practice-09Hrs Total- 11Hrs	• Wheel barrow • Enamelled trays • PPEs	Class Room Lab



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LU5. Maintain a safe work environment	Trainee will be able to: • Use PPEs and apply safe work practices. • Rehabilitate sampling site and minimize generation of wastes. • Collect and/or dispose of all waste in accordance with environmental requirements and workplace procedures • Clean and care all equipment and check serviceability of equipment before storage.	• Explain the importance of safe work practice for self, persons and environment protection while performing Water Sampling. • Enlist the steps to protect the tools and apparatus for Water sampling against the damages. • Explain the standards to dispose of the waste of Water <u>Practical Activity:</u> Prepare a list of equipment to be used while performing the samples of water for self and for the safety of tools	Theory-02Hrs Practice-03Hrs Total- 05Hrs	PPEs Sample container Bucket Platform scale Paper pencil	Class Room Lab
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11.1.5. Perform Site Investigation Activities

Objective: This module covers the skills and knowledge required to Prepare for on-site operations, Conduct excavation of boreholes, test pits and/or trenches, Conduct Site sampling, Conduct site testing, Complete site operations, Maintain Records and Maintain safe work environment.

Duration: 59 Hours

Theory: 11 Hours

Practice: 48 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare for on-site operations	Trainee will be able to: - Confirm details of the job, location, work instructions, appropriate sampling/test procedures and safety requirements with supervisor - Identify likely site hazards, personal protective equipment (PPE) and safety procedures that are specified for the job and materials used - Collect, check and stow all tools, equipment and materials required at the site - Confirm site access requirements, such as entry permits and participate in safety induction as	- Explain pre-requisite measures prior to proceed for Site investigation activities. - Define hazards prepare a list of hazards associated with site investigation sample preparation. <u>Practical Activity:</u> - Draw Flow diagram exhibiting the Plan work sequence to collect the Samples to investigate the Site/Ground in accordance with relevant code and Standard procedure. - Prepare the sampling documents for Site investigation activities such as fill in the sample date and time and weight/measure, temperature, pH value,	Theory-01Hrs Practice-06Hrs Total- 07Hrs	PPEs Measuring Tape Metallic Tri-Square Spirit level Thermometers Straight edge Cylindrical metal container Tamping rod Materials	Class Room Lab Field



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	required	sampler name, sample tag/ ID#, preservative used, sample location and sampling equipment etc			
LU2. Conduct excavation of boreholes, test pits and/or trenches	Trainee will be able to: - Confirm specified sampling/testing locations with supervisor - Excavate to the specified sampling/testing depth, minimising disturbance and potential contamination of the site - Ensure materials from different strata are kept separate - Identify materials and record changes of the strata and the test results	- Explain the necessity of bore holes to conduct site/ground investigation. - Describe the purpose of Site investigation. Practical Activity: Perform a bore hole at site or visit any industrial site individually or conduct group activity and write the Conceived practical knowledge. (assignment)	Theory-02Hrs Practice-12Hrs Total-14Hrs	Spade Pickaxe Excavators First aid kit Safety Helmets Safety goggles Safety shoes Face Mask Wheel barrow	Class Room Lab Field visit
LU3. Conduct Site sampling.	Trainee will be able to: - Prepare and check sampling equipment and materials - Take disturbed and undisturbed samples as directed and in accordance with workplace methods and procedures	- State the equipment used to collect Soil investigation sample. - Describe methods of collecting test samples to investigate the site/Ground based upon the type of test in field. Practical Activity:	Theory-01Hrs Practice-12Hrs	Safety Helmets Safety goggles Safety shoes Face Mask Stationary	Class Room & Lab



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	Label samples and record samples/site conditions in accordance with workplace methods and procedures	Perform Sampling to investigate the site/ground in accordance with the purpose, relevant code and standard procedure	Total- 13Hrs		
LU4. Conduct site testing	Trainee will be able to: - Conduct pre-use checks of test equipment - Perform basic tests as directed and in accordance with test methods or workplace procedures - Record data in accordance with test methods or workplace procedures - Recognise obvious errors or atypical data and seek advice	- Explain test procedure related to Soil Investigation at site in accordance with standard codes and Practice. - State site measurements, including location and depth. <u>Practical Activity:</u> Perform the test at site to investigate the site/Ground in accordance with the Purpose, relevant code and Standard procedure	Theory-1.5Hrs Practice-09Hrs Total- 10.5Hrs	Safety Helmets Safety goggles Safety shoes Face Mask Soil Testing Kits. Soil Testers. Sampling Auger. Cone Penetrometer. Soil Analyzer Kit. Sand Testing Equipment. Core Cutter Apparatus. Bitumen Penetrometer	Class Room Lab Field visit



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LU5. Complete site operations	Trainee will be able to: - Reinstate the site in accordance with instructions - Clean all equipment (and vehicle as necessary) avoiding environmental damage, stormwater contamination or spread of pests - Check all equipment and materials prior to re-stowing them for safe transport - Handle and transport samples in accordance with workplace procedures - Notify appropriate site personnel on completion of tasks and prior to leaving site (if unsupervised) - Check serviceability of test equipment before storage	- State the importance of reinstatement the site after the completion of operation. - Explain the importance of safe work practice for self, persons and environment protection while performing Site investigation activities - Enlist the steps to protect the tools and apparatus for Soil investigation, against the damages. - Explain the standards to dispose of the waste because of soil investigation activities. <u>Practical Activity:</u> Prepare a list of equipment to be used while performing the Site investigation for self and for the safety of tools	Theory-2.5Hrs Practice-03Hrs Total- 5.5Hrs	soil Auger Sampling Outfit Standard Penetration Test Apparatus Split Spoon Sampler Dynamic Cone Penetration Test Apparatus Static Cone Penetrometer Hand Operated Static Cone Penetrometer Engine Driven	Class Room Lab Field visit
LU6. Maintain Records	Trainee will be able to: Record details of site sampling, testing and material types in accordance with workplace	- Define data - Describe the importance to record the Data - Explain the copy right and confidentiality of	Theory-02Hrs Practice-03Hrs Total- 05Hrs	Note book Stationary	Class Room Lab



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	procedures • Maintain confidentiality of workplace information in accordance with workplace procedures	data. • Explain the use of site investigation data. <u>Practical Activity:</u> Prepare a data sheet enlisting the important features to interpret the site investigation data.			
LU7. Maintain safe work environment	Trainee will be able to: • Use safe work procedures and PPE to ensure personal safety and that of others • Minimise environmental impacts of testing/sampling and generation of waste • Collect and dispose off all waste in accordance with workplace procedures	• Explain the importance of safe work practice for self, persons and environment protection while performing Site investigation Activities. • Enlist the steps to protect the tools and apparatus use for Site Investigation activities, against the damages. • Explain the standards to dispose off the waste during site investigation activities. <u>Practical Activity:</u> Maintain safe work environment	Theory-01Hrs Practice-03Hrs Total- 04-Hrs	Safety Helmets Safety goggles Safety shoes	Class Room Lab



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11.1.6. Observe Safety at Construction Site.

Objective: This competency standard covers the skills and knowledge required to work according to personal health, safety and environment protocol at construction site.

Duration: 95 Hours

Theory: 17 Hours

Practice: 78 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Maintain safe condition at work site	Trainee will be able to: - Recognize the safety signs and symbols - Identify physical hazards at work site - Erect barricades hoardings, signage's in the hazardous areas - Identify the risk of slip, trip and fall at work place - Clean the effected floor - Remove obstacles from work area. - Perform fall protection measures as per job requirements - Label and store chemicals as per Material Safety Data Sheet (MSDS)	- Explain the Importance of safety sign and symbols. - Enlist different types of hazards involved at Site - Explain the risk register and enter the risks e.g. slip, trip and fall at work place. - Explain the importance to know prior history of accidents and causes. <u>Practical Activity:</u> Label and store chemicals according to safety data sheet	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Safety Helmets Safety goggles Hand gloves Safety Shoes (Assorted size) Ear Plug Face mask First aid Kit Stretcher Safety harness Safety Belts	Class Room Lab



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LU2. Select and wear the PPEs	Trainee will be able to: - Identify risk associated with job to be done - Select appropriate PPEs for the purpose - Wear the PPEs - Demonstrate mock performance for doing the job.	- Explain the importance to wear the PPEs - State use of Appropriate personal protective equipment for different situations - State Safety relevant to tools, tackles, and requirement as per applicability. <u>Practical Activity:</u> Prepare a list of PPEs for the different jobs according to safety standard	Theory-1.5Hrs Practice-3.0Hrs Total- 4.5Hrs	Safety Helmets Safety goggles Hand gloves Safety Shoes (Assorted size) Ear Plug Face mask First aid Kit Stretcher Safety harness Safety Belts	Class Room Lab
LU3. Perform safety practices while using hand and power tools	Trainee will be able to: - Select appropriate tools for specific to the job - Check physical working condition of the tools - Wear required PPEs - Assemble according to safety standards - Operate tools accordingly	- Explain the importance of safety measures while using hand and power tools - State the difference between OHSAS 18001 and ISO 45001. - Explain the safety measures in accordance with the Safety standards <u>Practical Activity:</u> Perform safety practice while using various hand and power tools	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	Safety Helmets Safety goggles Hand gloves Safety Shoes Ear Plug Face mask First aid Kit Soil Testers. Sampling Auger. Cone Penetrometer. Soil Analyzer	Class Room Lab



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				Kit. Sand Testing Equipment. Core Cutter Apparatus. Bitumen Penetrometer	
LU4. Handle Loads (Manually)	Trainee will be able to: • Judge the weight of load to be handle • Bend the knee while lifting as well as placing load manually • Check back bone straight during activity	• Define ISO 11228 Standard related to Manual handling: • Explain the standard practice of safety codes while handling the Load Manually Practical Activity: Perform group practice to handle load manually according to safety standards.	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs		Class Room Lab
LU5. Handle heavy load by chain hoist (Chain Pully)	Trainee will be able to: • Judge the weight of load to be lifted • Select lifting equipment accordingly • Assemble the lifting equipment • Clamp the load with sling • Check load balance. • Operate chain pulley block without jerk • Use hand signal while lifting and placing load	• Define ISO 16872 standard to handle the heavy load by Chain Hoist. • Explain the standard practice of safety codes while handling the heavy load by Chain Hoist Practical Activity: Assess the risks while handling the heavy load by Chain Hoist according to safety standards.	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Chain pulley Chain hoist	Class Room Lab



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LU6. Carried out basic first aid treatment	Trainee will be able to: - Identify elements for first aid kit - Check expiry date of medicines - Perform first aid treatment for a mock bone fracture - Perform first aid treatment for a mock swear bleeding - Perform first aid treatment in simulated condition for eye injury	- Define first aid - Explain first aid process - Explain the importance of first aid kit at construction sites <u>Practical Activity:</u> Draw a process flow diagram to use a systematic approach in all medical emergencies	Theory-1.5Hrs Practice-6.0Hrs Total- 7.5Hrs	First aid kit	Class Room Lab
LU7. Perform fire fighting	Trainee will be able to: - Identify type of fire - Select appropriate fire extinguishers - Check air direction - Perform spray on fire - Locate exist point	- Define ISO Standard ISO TC 21 - Explain the methods to perform firefighting according to safety standards. <u>Practical Activity:</u> Draw a flow diagram to perform the firefighting according to standards.	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Fire Extinguishers Fire Buckets Safety Helmets Safety goggles Hand gloves Safety Shoes Ear Plug Face mask First aid Kit	Class Room Lab
LU8. Perform emergency response activity	Trainee will be able to: - Identify nature of emergency - Raise fire alarm - Inform rescue department	- Explain Emergency safety control measures - State Use of fire extinguisher - State Reporting procedure to the	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Fire Extinguishers Safety Helmets Safety goggles	Class Room Lab



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	- Control fire by fire extinguishers - Evacuate the work place - Gather the assembly point - Perform head count - Rescue the trapped injured person - Provide first aid to the rescue person	concerned authority in emergency situations - Describe the incident management process <u>Practical Activity:</u> 1. Prepare the incident management plan and process flow diagram. 2. Identify safety risks that affect the health.		Hand gloves Safety Shoes Ear Plug Face mask First aid Kit Stretcher	
LU9. Ensure electricity safely at work place	Trainee will be able to: - Check earthing of power equipment - Determine safest supply and route for electrical supply - Select leads & switch boards accordingly. - Conduct check on power board visually - Check leads and equipment for tags and visual damage - Report electrical hazards	- Familiarize to the NFPA 70E Standard for Electrical Safety in The Workplace - Explain management process plan to make ensure the electricity safety at work as per the standard. <u>Practical Activity:</u> Prepare the report on electricity safety Plan for management to take corrective action.	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Safety Helmets Safety goggles Hand gloves Safety Shoes Ear Plug Face mask First aid Kit	Class Room Lab



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LU10. Treat electric shock	Trainee will be able to: • Turn off source of electricity • Move the victims away from source • Check responsiveness of the victims • Perform CPR procedure • Apply bandage on burn areas	• Explain the Standard Methods to provide instantaneous response to treat the electric shock. <u>Practical Activity:</u> Prepare the Process flow diagram to treat the electric shock.	Theory-1.5Hrs Practice-9.0Hrs Total- 10.5Hrs	Safety Helmets Safety goggles Hand gloves Safety Shoes Ear Plug Face mask First aid Kit	Class Room Lab
LU11. Perform safe disposal of wastes	Trainee will be able to: • Identify different type of waste bin • Segregate the waste • Handle the hazardous waste as per MSDS • Dispose of waste according to safety procedure.	• Explain the importance of safe work practice. • State Standard procedure of handling, storing and stacking material. • Explain types of waste and their disposal • Explain the standards to dispose off the waste during execution at Construction Site. <u>Practical Activity:</u> Prepare a report of safe disposal of waste.	Theory-02Hrs Practice-06Hrs Total- 08Hrs	Stationary Note book	Class Room Lab



11.2. Basic Drawing

11.2.1: Construct Scales for Drawing

Objective: This module covers the skills and knowledge required to draw reducing scales in MKS and FPS Units.

Duration: 14 Hours

Theory: 2 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Construct a plain scale of RF 1: 5 and 1:20 showing meters and decimeters on half imperial drawing sheet.	Trainee will be able to: • Observes local standards for basics of drawing. • Distribute space in required parts. • Draw scale of RF = 1:5 and 1:20 using principle of parallel lines. • Draw title strip and title block for drawing sheet.	• Define scale and its types • Describe importance of scale • Differentiate between the open-ended scale and full divided scales • Explain the procedure of constructing plane scales. Practical Activity: Construct a plain scale of RF 1: 5 and 1:20 showing meters and decimeters on half imperial drawing sheet.	Theory 1.5 Hrs Practice 03- Hrs Total- 3.5 Hrs	Drawing Sheets Drafting pencils Eraser Sharpener Graph Papers Stencil Paper Tools Drawing Board Tee Square Set Square French Curves Masking tape Calculator	• Drafting room • Class room
LU2. Construct a plain scale of RF	Trainee will be able to: • Observes local standards for	Practical Activity: Construct a plain scale of RF 1:6 and		Drawing Sheets Drafting pencils	• Drafting room



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1:6 and 1: 48 showing yard, feet and inches on half imperial drawing sheet.	basics of drawing. • Distribute space in required parts. • Draw scale of RF = 1:6 and 1:48 using principle of parallel lines. • Draw tile strip and title block for drawing sheet.	1: 48 showing yard, feet and inches on half imperial drawing sheet.	Theory 0.0 Hrs Practice-3 Hrs Total- 3.0 Hrs	Eraser Sharpener Graph Papers Stencil Paper Tools Drawing Board Tee Square Set Square Masking tape Calculator	
LU3. Construct a Diagonal scale of RF 1: 50 showing meters, decimeters and centimeters, of RF1:500 showing km, hectometers and decameters on A3 drawing sheet.	Trainee will be able to: • Observes standards for basics of drawing. • Distribute space in required parts. • Draw scale of RF = 1:50 using principle of parallel lines and diagonals. • Draw scale of RF = 1:500 using principle of parallel lines and diagonals. • Draw tile strip and title block for drawing sheet.	<u>Practical Activity:</u> Construct a diagonal scale of RF 1:50 showing meters, decimeters and centimeters, of RF1:500 showing km, hectometers and decameters on sheet.	Theory-0 Hrs Practice-3 Hrs Total- 03 Hrs	Drawing Sheets Drafting pencils Eraser Sharpener Drawing box Drawing Board Tee Square Set Square Masking tape Calculator	• Drafting room



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LU4. Construct a Diagonal scale of RF 1:36 showing yards, feet and inches and of RF 1: 96 showing mile and furlong and 1/8 furlong on A3 drawing sheet.	Trainee will be able to • Observes standards for basics of drawing. • Distribute space in required parts. • Draw scale of RF = 1:36 using principle of parallel lines and diagonals. • Draw scale of RF = 1:96 using principle of parallel lines and diagonals. • Draw tile strip and title block for drawing sheet.	• Describe the importance of diagonal scale • Explain implementation procedure for diagonal scale. • Explain the procedure of constructing diagonal scales. Practical Activity Compose a diagonal scale of RF 1:36 showing yards, feet and inches and of RF 1:96 showing mile and furlong and 1/8 furlong on A3 drawing sheet.	Theory 0.5 Hrs Practice-3 Hrs Total- 3.5 Hrs	Drafting Pencils Eraser Sharpener Drawing box Drawing Board Drawing sheet Tee Square Set Square Masking tape Calculator	• Drafting room
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11.2.2: Construct Geometrical Figures

Objective: This module covers the knowledge and skills required to draw triangles, quadrilaterals, polygons- inscribed & circumscribed, draw prisms, draw pyramids, conic sections, circle, ellipse, parabola hyperbola and solid figures.

Duration: 25 Hours

Theory: 4Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw sketches of different types of triangles according to side length and angles free hand and to scale.	Trainee will be able to: • Observes standards for basics of drawing. • Distribute space in required parts. • Draw equilateral triangle of side length 2". • Draw isosceles triangle with base 5 cm and height = 6 cm • Draw scalene triangle of lengths 2", 1.5", 1". • Draw acute angled triangle. • Draw right angles triangle. • Draw obtuse angled triangle. • Draw tile strip and title block for drawing sheet	• Define free hand sketches • What are the five types of triangle? • Differentiate between Plane and solid figure angles • What is scalene triangle? <u>Practical Activity:</u> Draw free hand sketches of different types of triangles on A3 size sheet	Theory 0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Graph Papers • Drawing Board • Tee Square • Set Square • French Curves • Masking tape	Drafting room Class room



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LU2. Draw sketches of polygons, circle, semi-circle, segment of circle, sector of circle and zone of circle free hand and to a scale.	Trainee will be able to: • Observe local standards for basics of drawing. • Draw a regular pentagon of side length = 4 cm. • Draw hexagon inscribes in a circle and circumscribed about a circle of 3 inches diameter. • Draw circle, semi-circle, segment of circle, sector of circle and zone of circle of diameter 1.5 “. • Draw tile strip and title block for drawing sheet	• Enlist the types of Polygon • Differentiate between inscribed and circumscribed figures. • Sketch and label different lines and arcs in a circle. <u>Practical Activity:</u> 1. Draw sketches of pentagon having 1” sides. 2. Draw hexagon inside a circle having radius 5 cm. 3. Draw a heptagon outside the circle of diameter 3 inches. 4. Draw a 1” dia circle, semi-circle, segment of circle of chord length 1”, 70-degree sector of circle and zone of circle when top plane is at 0.2” above center and bottom plane at 0.6” below from center.	Theory 0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	• Drawing Sheets • Duster • Pencils • Eraser • Sharpener • Graph Papers • Drawing Board • Tee Square • Set Square • French Curves • Masking tape	Drafting room Class room
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LU3. Draw sketches of all six types of quadrilaterals free hand to a scale	Trainee will be able to: • Observes standards for basics of drawing. • Distribute space in required parts. • Draw square of side length 2". • Draw rectangle with length 5 cm and width= 3 cm • Draw rhombus of side length=2 cm and internal angle= 45° • Draw parallelogram of length 6 cm, width= 3 cm and internal angle= 45° • Draw trapezoid of parallel sides' length 4 cm and 6 cm spaced at a distance of 3 cm. • Draw trapezium of side lengths 5 cm, 4 cm, 6 cm and 3 cm. • Draw tile strip and title block for drawing sheet	• Define Quadrilaterals • What are the five quadrilaterals? • What is the difference between rhombus and parallelogram? • How many types of trapezoid are there? • What are the four types of parallelogram? <u>Practical Activity:</u> Draw seven types of quadrilaterals on A3 size sheet with title.	Theory 0.5 Hrs Practice-3 Hrs Total- 3.5 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Stencils • Drawing box • Drawing Board • Tee Square • Set Square • Masking tape	• Drafting room • Class room
LU4. Draw conic sections with cutting plane at different angles	Trainee will be able to • Draw conic section resulting in a circle. • Draw conic section resulting in an ellipse.	• What Is cone and its properties? • What are the four types of conic sections? • What are the five types of angles? <u>Practical Activity:</u>	Theory 0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	• Drawing Graph Sheets • Drafting Pencils • Eraser	• Drafting room • Class room



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	• Draw conic section resulting in a parabola. • Draw conic section resulting in a hyperbola.	Draw conic sections with cutting plane at different angles having base of 5 cm dia and height of 17 cm		• Sharpener • Drawing Board • Tee Square • Set Square • French Curves • Masking tape	
LU5. Draw full scale ellipses major axis = 10 cm and minor axis = 8 cm with four methods.	Trainee will be able to • Draw ellipse by four centers method. • Draw ellipse by basic method. • Draw ellipse by parallelogram method. • Draw ellipse by off-set method in concentric circles.	• Define ellipse • Describe the importance of Ellipse • Enlist the types of ellipse • Describe the procedure to draw ellipse by all methods <u>Practical Activity:</u> • Draw full scale ellipses major axis = 10 cm and minor axis = 8 cm with four centers methods. • Draw ellipse by parallelogram method, Off-set method, and basic method.	Theory 0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Graph Papers • Stencils • Masking tape • Drawing Board • Tee Square • Set Square • French Curves	Drafting room
LU6. Draw full scale parabola major axis = 10 cm and minor axis = 8 cm with four	Trainee will be able to • Draw parabola by basic method. • Draw parabola by tangent method.	• Define parabola • Explain the method to draw parabola • Enlist the types of parabola	Theory 0.5 Hrs Practice-03 Hrs Total-3.5 Hrs	• Drawing Sheets • Drafting pencils	Drafting room



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methods.	Draw parabola by rectangle method	<u>Practical Activity:</u> - Draw full scale parabola having 8 cm major and 5 cm minor axis with tangent methods - Draw parabola by rectangle method		- Eraser - Sharpener - Graph Papers - Masking tape - Tee Square - Set Square - French Curves	
LU7. Draw sketched of prisms, cylinders, pyramids, cones in isometric views free hand and to a scale.	Trainee will be able to - Draw right and oblique rectangular prism. - Draw right and oblique cylinders. - Draw right and oblique hexagonal pyramids. - Draw right and oblique cones.	- Define Prism - Explain the procedure to draw prism - What is Isometric view? - Define pyramids and its types - Define cylinder and its types <u>Practical Activity:</u> - Draw isometric view of square prism having triangular cut. - Draw a square pyramid having sides 2" and Height 4-1/2" - Draw circular cylinder having dia 5 cm and height 11 cm - Draw cone having 2.5" dia and height 8 inches	Theory 1.0 Hrs Practice-03 Hrs Total- 04-Hrs	- Drawing Graph Sheets - Drafting pencils - Eraser - Sharpener - Stencils - masking Tape - Drawing Board - Tee Square - Set Square - French Curves	Drafting room



11.2.3: Produce Orthographic Projection

Objective: This module covers the skills and knowledge required to draw orthographic projections, First angle projections, third angle projections of vee block, hollow concrete block, wooden cut blocks and draw missing view.

Duration: 24 Hours

Theory: 3 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Draw orthographic projections of Vee Block in first angle projection system.	Trainee will be able to: • Apply basic operations on A3 size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of v block with drawing instruments.	• What are the six basic principle orthographic views? • What is orthographic projection plan? • Explain first and third angle of projections for different 3-D objects • State and differentiate between dihedral and trihedral angles <u>Practical Activity:</u> Draw first angle orthographic projections for v-block as per given dimensions.	Theory 0.5 Hrs Practice-06Hrs Total- 6.5 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Graph Papers • Masking Tape • Tee Square • Set Square • French Curves • Protector	Drafting room Class room



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LU2. Draw orthographic projections of hollow concrete Block in first angle projection system.	Trainee will be able to: • Apply basic operations on A3 size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of hollow concrete block drawing instruments.	• Define orthographic view. • State the types of orthographic projection • Differentiate between orthographic view and isometric view <u>Practical Activity:</u> Compose a sheet of A3 size with title and draw orthographic projections for hollow concrete block	Theory 0.5 Hrs Practice-06Hrs Total- 6.5 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Sand paper • Graph Papers • Stencil Paper • Masking tape • Tee Square • Set Square • French Curves • Protector	Drafting room Class room
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LU3. Draw orthographic projections of wooden cut block in first angle projection system.	Trainee will be able to: • Apply basic operations on A3 size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of wooden cut block drawing instruments.	• Define plane • State the principles of orthographic projection • What is the purpose of orthographic projection? <u>Practical Activity:</u> Compose a sheet and draw first angle orthographic projections for wooden cut L-shape block as per given dimensions.	Theory 1.0 Hrs Practice-06Hrs Total- 07 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Graph Papers • Stencils • Masking Tape • Tee Square • Set Square • French Curves • Protector	Drafting room Class room
LU4. Complete missing views when two views are given.	Trainee will be able to • Apply basic operations on A3 size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of missing views with drawing instruments.	What are the four standard types of views? What is multi view? State the purpose of orthographic drawing <u>Practical Activity:</u> Compose A3 size sheet and draw third angle orthographic projection for wooden cut block	Theory1.0 Hrs Practice-03Hrs Total- 04 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Tee Square • Set Square • French Curves • Protector • Masking tape	Drafting room Class room



11.2.4: Perform Dimensioning on Drawings

Objective: This module covers the knowledge and skills required to dimension a drawing by adopting Uni-directional and bi-directional dimensioning, Base line dimensioning system, continuous dimensioning system, location dimensioning.

Duration: 08 Hours

Theory: 2 Hours

Practice: 06 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare a Dimensioned drawing by adopting Uni-directional and bi-directional dimensioning.	Trainee will be able to: • Apply basic operations on A3 size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of Vee block. • Dimension the drawing Uni-directionally. • Dimension the drawing bi-directionally.	• Define dimensioning • State the types of dimensions • What are the two major methods of dimensioning? • State the need of dimensioning drawings Practical Activity: Compose A3 size sheet and prepare Dimensioned drawing of v-block with title bar	Theory-1.0 Hrs Practice-03Hrs Total- 4.0 Hrs	• Drawing Sheets • Drafting pencils • Eraser • Sharpener • Graph Papers • Stencils • Tee Square • Set Square • French Curves • Protector	Drafting room
LU2. Prepare a Dimensioned drawing	Trainee will be able to: • Apply basic operations on A3	• Define base line dimensioning		Drawing Sheets	Drafting room



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by adopting Base line dimensioning system, continuous dimensioning system, location dimensioning.	size sheet and divide space. • Distribute space by calculations. • Draw front, top and side views of Vee block with holes. • Dimension the drawing as per base line dimensioning system. • Dimension the drawing as per continuous dimensioning system. • Dimension the drawing location of center of holes • Draw system of dimensioning • Draw dimensioning of holes • Draw dimensioning of arc • Draw dimensioning circles • Draw dimensioning of angles	• What is the difference between continuous and location dimensions • Differentiate between linear and angular dimensioning • What is the use of arrow heads in dimensioning? • Dimension a given drawing using standard notations and desired system of dimensioning <u>Practical Activity:</u> Compose a sheet and draw dimension for location and size of holes, arcs, circles.	Theory-1.0 Hrs Practice-03Hrs Total- 4.0 Hrs	• Drafting pencils • Eraser • Sharpener • Stencils • Drawing Board • Tee Square • Set Square • French Curves • Calculator	
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11.2.5: Develop Symbol of Engineering Drawing

Objective: This module covers the knowledge and skills required to to prepare report on the health and safety considerations while preparing drawings, draw symbols of Engineering materials, components of building in plan, elevation & section, draw symbols of electrical installations, water supply installation, gas installations, sanitary installations.

Duration: 21 Hours

Theory: 3 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Investigate and prepare a short report on the health and safety considerations in preparing drawings.	Trainee will be able to: - Observe Considerations: light (natural, artificial), - CAD (Computer screens, electrical protection devices) - Observe neatness and cleanliness of drawing	- Enlist the electrical protection devices - Differentiate between natural and artificial light <u>Practical Activity:</u> Prepare safety preparation report on HSE before to draw a drawing sheet as per your drawing lab facilities.	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Paper Pencils Eraser Sharpener Graph Papers Stencils	Drawing room



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LU2. Draw symbols of engineering materials.	Trainee will be able to: • Select the suitable instruments to draw symbols. • Distribute space of drawing sheet. • Draw symbols duly hatched as per local standards of Sand, ballasts, metals, timbers, soil-natural, cutting, filling, fabrics, rock, glass, ceramics, plastics and asbestos.	• Enlist the drawing instruments • What are engineering symbol? • Which symbol is use for sand • Why are symbols used on drawings and plans? <u>Practical Activity:</u> Compose a sheet with title bar and draw symbols of engineering materials: ballasts, timbers, rock, glass, natural soil and plastics	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Drawing sheets Drafting pencils Eraser Sharpener Tee Square Set Square French Curves Triangular scale Masking tape	Drawing room
LU3. Draw symbols of building components in plan, elevation and section.	Trainee will be able to: • Select the suitable instruments to draw symbols. • Distribute space of drawing sheet. • Draw symbols in plan, elevation, and section duly hatched as per local standards of brick work, stone work, block work, doors, windows, ventilators, RCC work, R.B. work, PCC, DPC, Lintels and stairs	• Enlist different symbols and sketches of Engineering materials: Sand, ballasts, metals, timbers, natural soil, cutting, filling, fabrics, rock, glass, ceramic and plastics • What does DPC stands for? • State materials used to prepare RRC <u>Practical Activity:</u> Compose A3 size sheet with seal and draw plan, elevation and section of R.B,	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Drawing sheet Drafting Pencils Eraser Sharpener Tee Square Set Square French Curves Masking tape	drawing room



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		RRC, DPC, PCC, lintels and stairs			
LU4. Draw symbols of electrical installations for ceiling and walls.	Trainee will be able to • Select the suitable instruments to draw symbols. • Distribute space of drawing sheet. • Draw symbols duly hatched as per local standards of energy meter, main switches, sub-main switches, circuit breakers, kit kat fuse, panel box, DFB, tube lights, holders, fans, bulbs, switches, socket, boards, and circuit diagram	• Enlist and sketch symbols of • What is the panel box? • What does DFB stands for? • Describe the use of kit kat fuse <u>Practical Activity:</u> Draw sketches of main switches, circuit breaker, socket, sub-main switches on A3 size sheet.	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Drawing sheet Drafting Pencils Eraser Sharpener Tee Square Set Square French Curves Triangular scale Masking tape	Drawing room
LU5. Draw symbols of water supply and gas installations.	Trainee will be able to • Select the suitable instruments to draw symbols. • Distribute space of drawing sheet. • Draw symbols duly hatched as per local standards of water pipe lines, mixers, valves, cocks, taps, showers, pump, meter, and cooler. Gas pipe line, Gas meter, gas heater, gas light, gas geezer and gas burner.	• What is water supply pipe? • State the gas installation equipment <u>Practical Activity:</u> Draw different symbols for Gas and water supply installation on A3 sheet.	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5- Hrs	Drawing sheets Drafting pencils Eraser Sharpener Tee Square Set Square French Curves Triangular scale	Drawing room



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LU6. Draw symbols of sanitary installations.	Trainee will be able to • Select the suitable instruments to draw symbols. • Distribute space of drawing sheet. • Draw symbols duly hatched as per local standards of- sewer lines, wash hand basins, water closets, bath tubs, urinals, sinks, dish washers, looking mirror, toilet paper holder, soap dish, shelf, towel rail, vent pipe, manhole, intercepting chambers, traps, and grating.	• State the equipment used for sanitary installation • Differentiate between Indian and European W.C • Differentiate between lamp hole and manhole <u>Practical Activity:</u> Compose A3 size sheet with seal and draw different Sanitary Installation symbols	Theory-0.5 Hrs Practice-03 Hrs Total- 3.5 Hrs	Drawing Sheets Drafting pencils Eraser Sharpener Tee Square Set Square French Curves Triangular scale	Drawing room
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11.2.6: Interpret Construction Plan / Coordinates

Objective: This module covers the skills and knowledge required to produce construction plan and interpret the coordinate system for taking samples from specific locations.

Duration: 16 Hours

Theory: 4.0 Hours

Practice: 12 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare construction plan of water supply & sanitary installations for A class bath on A4 sheet.	Trainee will be able to: • Observe local standards for basics of drawing. • Distribute space in required parts. • Draw detailed plan. • Draw water supply installations. • Draw sanitary installations. • Perform dimensioning, lettering and printing of drawings. • Draw seal for drawing sheet.	• Explain construction plan • What are the types of water supply? • What are the main parts of water supply system? <u>Practical Activity:</u> Draw Sanitary and water supply free hand sketch installation plan on drawing sheet.	Theory-1.0Hrs Practice-3.0Hrs Total- 4.0Hrs	Drawing sheets Drafting Pencils Eraser Sharpener Tee Square Set Square French Curves Triangular scale	Drawing Hall
LU2. Prepare detailed plan of water supply gas & sanitary installations for C type residence on A3 sheet.	Trainee will be able to: • Observe local standards for basics of drawing. • Distribute space in required parts. • Draw detailed plan of C type residence.	• Define building services • Define C-Type residence • What are the main parts of gas installation <u>Practical Activity:</u>	Theory-1.0Hrs Practice-3.0Hrs Total- 4.0Hrs	Drawing Sheets Pencils Eraser Sharpener Tee Square Set Square	Drawing Hall



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	• Draw water supply installations. • Draw gas installations. • Draw sanitary installations. • Prepare schedule of installations. • Perform dimensioning, lettering and printing of drawings. • Draw title strip for drawing sheet.	Draw detail plan for water supply, gas and sanitary installation on drawing sheet			
LU3. Prepare detailed plan of electrical installations & Circuit diagram for C type residence on A3 sheet.	Trainee will be able to: • Observe local standards for basics of drawing. • Distribute space in required parts. • Draw detailed plan of C type residence. • Draw electrical installations. • Draw Circuit diagram • Prepare schedule of installations. • Perform dimensioning, lettering & printing of drawings. • Draw title strip for drawing sheet.	• How do you draw a circuit diagram? • State the types of buildings <u>Practical Activity:</u> Draw Electric installation drawing for given building	Theory-1Hr Practice-3Hrs Total- 4Hrs	Drawing Sheets Drafting Pencils Eraser Sharpener Tee Square Set Square Triangular scale	Drawing Hall



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LU4. Interpret Coordinate system to locate place of collecting samples	Trainee will be able to: • Observe local standards for basics of drawing. • Exercise rectangular coordinate system. • Exercise independent/absolute rectangular coordinates • Exercise relative rectangular coordinates • Mark rectangular coordinates on drawing of framed structure building. • Mark coordinates of a big building block. • Mark coordinates of a complete construction site.	• Define coordinate system • Define samples • Explain the procedure of sample collecting • How to mark coordinates on drawing. <u>Practical Activity:</u> Locate coordinates for framed structure building or large building block with complete construction site on the drawing sheet.	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Drawing Sheets Drafting pencils Eraser Sharpener Tee Square Set Square Triangular scale Compass Protractor	Drawing Hall
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11.3. Workshop Practices

11.3.1 Apply wooden hand tools

Objective: This module covers the knowledge and skills required to identify, select hand tools, use tools & clean the tools.

Duration: 11 Hours

Theory: 2 Hours

Practice: 9 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify and select hand tool	Trainee will be able to: - Identify and select hand, power and pneumatic tools, their functions, operations and limitations - Recognize OHS requirements for using hand tools	- State categories of wood hand tools - Describe use of all wood hand tools <u>Practical Activity:</u> Identify hand tools and prepare the list for marking, measuring, planning, drilling and sawing tools	Theory-0.5Hrs Practice-3.0Hrs Total- 3.5Hrs	Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room Workshop
LU2. Apply wood tools	Trainee will be able to: - Use hand tools appropriate to the task - Use suitable materials according to OHS requirements - Sharpen and maintain tools	- Describe procedure of cutting and drilling tools - Enlist the marking and measuring tools - What are the basic safety rules for using hand tools? <u>Practical Activity:</u> Use tools for marking, measuring, smoothing, drilling and sawing for timber section of 2 feet x 2 inches x 1.25 inches	Theory-1Hrs Practice-3Hrs Total- 4Hrs	Wood hand tool Measuring tool Marking tools Holding tool Cutting tool Planning tool Timber PPEs	Class Room Wood work shop



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LU3. Clean up the work site area	Trainee will be able to: • Clear work area • Dispose off materials (reused or recycled) in accordance with legislation, regulations, and codes of practice and job specification. • Clean, check, maintain and store tools according to requirement	• State the purpose of cleaning and maintaining the working area. • Describe disposal off waste material & storing of tools <u>Practical activity:</u> Perform cleaning, maintenance and storage of used tools & equipment's for the above job.	Theory-0.5Hrs Practice-3.0Hrs Total- 3.5Hrs	Dusting clothes Mopes Oil and grease Disposal box Disposal bucket Vipers Brushes	Class Room Wood work shop
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11.3.2. Perform wooden joinery work

Objective: This module covers the knowledge and skills required to make butt, biscuit, miter, edge, dovetail, dado joint mortise and tenon joint.

Duration: 23 Hours

Theory: 2 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Make butt joints	Trainee will be able to: - Identify butt joint - Cut timber according to requirement of butt joint - Join cut pieces according to requirement	- State types of joints - Describe the uses of butt joint - Describe procedure for making a butt joint <u>Practical activity:</u> Prepare butt joint of wooden piece 2 inches x 1.25 inches	Theory-0.25Hrs Practice-3.00Hrs Total- 3.25Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room wood workshop
LU2. Perform biscuit joinery	Trainee will be able to: - Identify biscuit joint - Cut timber according to requirement of biscuit joint - Join cut pieces according to requirement	- Describe the uses of biscuit joint - Describe procedure for making a biscuit joint <u>Practical activity:</u> Prepare biscuit joint of wooden piece 2 inches x 1.25 inches	Theory-0.25Hrs Practice-3.00Hrs Total- 3.25Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room Wood workshop
LU3. Make Miter joint	Trainee will be able to: - Identify miter joint - Cut timber according to requirement of	- Describe the uses of mitre joint - Describe procedure for making a miter joint	Theory-0.25Hrs	Timber Nails German glue Wood tool	Class Room wood



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	miter joint Join cut pieces according to requirement	Practical activity: Prepare miter joint of wooden piece 2 inches x 1.25 inches	Practice-3.00Hrs Total- 3.25Hrs	Measuring tool Marking tools Holding tool Cutting tool Planning tool	workshop
LU4. Make Edge joint	Trainee will be able to - Identify edge joint - Cut timber according to requirement of edge joint - Join cut pieces according to requirement	- Describe the uses of edge joint - Describe procedure for making an edge joint Practical activity: Prepare edge joint of wooden piece 2 inches x 1.25 inches	Theory-0.25Hrs Practice-3.00Hrs Total- 3.25Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room wood workshop
LU5. Make dove tail joint	Trainee will be able to - Identify dove tail joint - Cut timber according to requirement of dove tail joint - Join cut pieces according to requirement	- Describe the uses of dove tail joint - Describe procedure for making a dove tail joint Practical activity: Prepare dove tail joint of wooden piece inches x 1.25 inches	Theory-0.25Hrs Practice-3.00Hrs Total- 3.25Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room wood workshop
LU6. Make Mortise & tenon joint	Trainee will be able to - Identify Mortise & tenon joint - Cut timber according to requirement of mortise & tenon joint - Join cut pieces according to	- Describe the uses of Mortise and tenon joint - Describe procedure for making a Mortise and tenon joint Practical activity:	Theory-0.5Hrs Practice-3.0Hrs Total- 3.5Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool	Class Room wood workshop



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	requirement	Prepare Mortise and tenon joint of wooden piece 2 inches x 1.25 inches		Cutting tool Planning tool	
LU7. Make dado joint	Trainee will be able to - Identify dado joint - Cut timber according to requirement of dado joint - Join cut pieces according to requirement	- Describe the uses of a dado joint - Describe procedure for making a dado joint Practical activity: Prepare dado joint of wooden piece 2 inches x 1.25 inches	Theory-0.25Hrs Practice-3.00Hrs Total- 3.25Hrs	Timber Nails German glue Wood tool Measuring tool Marking tools Holding tool Cutting tool Planning tool	Class Room wood workshop



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11.3.3. Apply fastenings

Objective: This module covers the knowledge and skills required to prepare hole, identify fastenings and apply fastenings.

Duration: 12 Hours

Theory: 3 Hours

Practice: 9 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare hole	Trainee will be able to: - Identify and select power and pneumatic tools for making hole - Perform boring to make hole in accordance with OHS requirement	- State the types of power tools - Enlist the types of pneumatic tools - Explain the procedure for boring <u>Practical Activity:</u> Make holes to install fasteners for Tenon and mortise joint, dado joint, butt joint, biscuit joint, mite joint, edge joint, and dovetail joint.	Theory-2Hrs Practice- 3Hrs Total- 5Hrs	Fasteners Boring machine	Class Room wood workshop
LU2. Identify fasteners	Trainee will be able to: - Identify and select appropriate fasteners - Identify and select tools for fasteners	- Enlist the types of fasteners - State the uses of fasteners <u>Practical Activity:</u> Identify fasteners for Tenon and mortise joint, dado joint, butt joint, biscuit joint, mite joint, edge joint, and dovetail joint.	Theory-0.5Hrs Practice-3.0Hrs Total- 3.5Hrs	Fasteners Boring machine	Class Room wood workshop



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LU3. Apply fasteners	Trainee will be able to: • Insert fasteners in hole prepared before • Use tools for fasteners	• Explain the procedure for inserting fastening in hole <u>Practical Activity:</u> Apply fasteners in hole for Tenon and mortise joint, dado joint, butt joint, biscuit joint, mite joint, edge joint, and dovetail joint.	Theory-0.5Hrs Practice-3.0Hrs Total- 3.5Hrs	Fasteners Boring machine	Class Room wood workshop
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11.3.4. Perform cutting, threading & reaming of pipes

Objective: This module covers the knowledge and skills required to perform pipe cutting, its threading and reaming.

Duration: 12 Hours

Theory: 03 Hours

Practice: 09 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform pipe cutting.	Trainee will be able to: - Identify tools for cutting. - Secure work piece firmly - Measure required Length - Use cutter OR Hacksaw - Loose the cutting Piece - Check length for cutting piece - Observe OHSA	- State the purpose of plumbing tools - Explain safety precautions for using pipe cutting tools - Differentiate between hacksaw and pipe cutter <u>Practical Activity:</u> 1- Perform cutting of pipe ½” dia 2- Perform cutting of pipe ¾ ” dia 3- Perform cutting of pipe 1” dia	Theory-1Hrs Practical-3Hrs Total- 4Hrs	Pipe cutter Plumbing pliers Pipe wrenches Spanners Reamers Hacksaw Bench vice PPEs	Class Room workshop
LU2. Perform pipe threading.	Trainee will be able to: - Identify tools for threading. - Adopt safety measures - Fix work piece firmly - Clamp Threading die - Prepare threading - Unclamp the threading die	- Describe calibration of threading tools - Explain safety precaution for tools used for threading - State different type of Dies - Explain the procedure to use threading die	Theory-1.5Hrs Practical-3.0Hrs Total- 4.5Hrs	Plumbing pliers Plumbing wrenches Plumbing spanners Threading die Threading Tools PPEs	Class Room workshop



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	Observe OHSA	<u>Practical Activity:</u> 1- Perform threading of pipe ½” dia 2- Perform threading of pipe ¾” dia 3- Perform threading of pipe 1” dia			
LU3. Perform pipe reaming	Trainee must be able to: - Identify tools for Reaming. - Adopt safety measures - Fix work piece firmly - Clamp Threading pipe piece - Use reamer - Unclamp pipe piece - Observe OHSA	- State safety precaution for using reaming tools - Explain the procedure of using reamer - State work place clean up procedure <u>Practical Activity:</u> 1- Perform reaming of pipe ½” dia 2- Perform reaming of pipe ¾” dia 3- Perform reaming of pipe 1” dia	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Plumbing pliers Plumbing wrenches Plumbing spanners Reaming tools PPEs	Class Room workshop



11.3.5. Join pipes & fittings

Objective: This module covers the knowledge and skills required to prepare for different type of pipe joints and it's fitting on residential and commercial plumbing works.

Duration: 25 Hours

Theory: 4 Hours

Practice: 21 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Undertake pipe fitting and Installation	Trainee will be able to: - Observe basic principles for pipe fittings - Identify and select materials for task - Identify tools and equipment for task - Attach Pipe with fittings - Locate fixtures properly - Undertake pipe leakage test - Use PPEs	- Explain signs and symbols for water supply system - Explain method for different type of pipe joints - Explain different types of joints in pipe - Explain test to check pipe leakage <u>Practical Activity:</u> Join with ½" dia pipe one end with water tap and other end via union with water supply line.	Theory-1.0Hrs Practical-3.0Hrs Total- 4.0Hrs	Pipe Benders Pipe Cutting Tools Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Hacksaw with blade Different Fittings Safety Valve PPRC pipe and fittings PPEs	Class Room Work shop
LU2. Install Hot and Cold Water Supply Pipes	Trainee will be able to: - Observe basic principles for pipe fitting - Identify and select materials for task	Describe the safety requirements for installing cold and hot water pipes in residential buildings.	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Bender Pipe Cutting Tools Deburrers Plumbing pliers Plumbing wrenches	Class Room Workshop



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	- Identify tools and equipment for task - Attach cold Pipe with fittings - Attach Hot Pipe with Geyser and fittings - Locate cross over properly - Locate drainage pipes - Undertake pipe leakage test - Use PPEs	- Enlist fittings attach with hot water - Explain specifications for cold and hot water connections - Explain safety values use in geysers <u>Practical Activity:</u> Install of hot pipe line with geyser and cold-water pipe with normal water supply line ½" dia G.I. pipes		Plumbing spanners Pressure testing kits PPEs Hot water fittings Hot water accessories G.I. and Cost Iron Pipes according to specifications Pipe Vice Hacksaw with blade Different Fittings Geyser Safety Valve	
LU3. Joining Cast iron pipes	Trainee must be able to: - Place the spigot end of a pipe inside the bell end of another pipe making sure that both are clean and dry. - Inert the gasket into the hub of joint using yarning iron and then pack to the proper depth by using the packing iron. - Pour the molten lead into the joint up to the top of the hub. - Perform caulking after the lead has solidified and cooled	- Define cast iron pipes - Explain the equipment for installing and fittings of cast iron pipes - Describe the uses of cast iron pipes - Name different types of cast iron pipes <u>Practical Activity:</u> Join 2 inches dia cast iron pipe lead caulked joint	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Hack Saw with blade Different Fittings Safety Valve Cost Iron Pipe Lead Caulking Tools PPEs	Class Room Workshop



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	- Align the pipe - Undertake pipe leakage test - Use PPEs				
LU4. Join G.I Pipes	Trainee must be able to - Observe basic principles for G.I. pipes - Select materials for task - Identify tools and equipment for task - Perform threading and cutting on pipes - Tight pipe with socket - Undertake pipe leakage test - Use PPEs	- Define G.I pipes - Explain the equipment for installing and fittings of G.I pipes. - Define types of G.I pipes Practical Activity - Join of ½" dia G.I pipes in H-shape	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools, Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Hack Saw with blade Different Fittings Safety Valve G.I Pipes PPEs	Class Room Workshop
LU5. Join PPRC Pipes	Trainee must be able to - Observe basic principles for PPRC pipes - Adopt safety measures - Prepare welding machine with required dies of diameter. - Cut the pipes at right angles to the pipe axis using suitable cutter. - Remove any burrs or chips by	- Define PPRC pipes - Explain the equipment for installing and fittings of PPRC pipes. - State the uses of PPRC pipes <u>Practical Activity:</u> Join of PPRC pipes for shower connection.	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Welding heater with sleeves and bushes Pipe Cutting Tools Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Hack Saw with blade Different Fittings Safety Valve PPRC Pipe with	Class Room Workshop



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	cleaning the cutting area. • Heat the pipe and fitting for welding for specified welding depth into the sleeves • Join the pipe and fittings as per standards • Undertake leakage test			fittings Cocking Tools PPEs	
LU6. Joining PVC Pipes	• Clean the ends of pipes to be joined. • Make one end of pipe should be cup/bell/ socket type if they are not in required shape. • Apply jointing solution in the bell/socket and over the spigot end • Insert the spigot end of a pipe into bell/socket of another pipe	• Define PVC pipes and its joints • Explain the equipment for installing and fittings of pipes <u>Practical Activity:</u> Join of PVC 3"/" dia pipes 3 lengths	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Cutting Tools Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Hack Saw with blade Different Fittings PVC pipes Safety Valve PPEs	Class Room Workshop



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LU7. Join Concrete Pipes	• Correctly position and bed the first pipe. • Prepare the bedding for the second pipe. • Apply the seal on the spigot end. • Ensure the joint ring is not twisted and correctly located on spigot. • Centre the socket/bell and fill the gap with cement mortar	• Define concrete pipes and its joints • Explain the equipment for installing and fittings of pipes • Explain drain Pipes <u>Practical Activity:</u> Join of 6" dia concrete pipes	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Trowel Mortar pan shovel Plumbing pliers Plumbing wrenches Plumbing spanners Pressure testing kits Safety Valve Rubber rings Concrete pipes socket and spigot ends PPEs	Class Room Workshop
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11.3.6. Install plumbing fixtures

Objective: This module covers the knowledge and skills required to install plumbing fixtures at work place i-e installation of water closet, flushing cistern, Wash hand Basin, English WC and Urinal.

Duration: 21 Hours

Theory: 03 Hours

Practice: 18 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install Wash Hand Basin	Trainee will be able to: - Identify safety requirements for installation - Identify tools for work - Identify Fixtures - Perform measurements - Mark out Installation point - Fix Pedestal by Drilling - Install Wash hand Basin - Fix Pillar cock, Rubber connection, waste pipes with coupling - Connect to drain pipe	- Define hand basin and its types. - State the use of tools and equipment's for installing wash hand basin. - Explain the joining techniques for hand basin. - State the type of wash hand basin Pedestal - Explain fitting procedure to install wash hand basin <u>Practical Activity:</u> Install wash hand basin including water supply hot and cold connections	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Plungers Drill machine with drills Trowel Mortar pan Hammer Chisel Wash hand basin set Bolt Kit Screws Clamps Tee cock Basin mixer	Class Room Workshop



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				PPEs	
LU2. Install English water closet	Trainee will be able to: - Mark out Installation point - Install the closet flange - Secure it to the subfloor - Connect outlet pipes with water supply - Perform final quality inspection - Check Level	- Define water closet and its types - State the use of tools and equipment's for installing water closet. - Knowledge of joining techniques for water closet - Knowledge of levelling and fixing WC <u>Practical Activity:</u> Install water closet English and Indian	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Plumbing pliers Plumbing wrenches Plumbing spanners Plungers Drill machine with drills Hammer Chisel Trowel Mortar pan P-Trap W.C (Indian and English) PPEs	Class Room Workshop
LU3. Install Flushing Cistern	Trainee must be able to: - Mark out Installation point - Measure height for flushing cistern - Fix flushing pipe - Connect inlet pipe with water supply - Perform final quality inspection - Check Level - Use PPEs	- Define flushing cistern with its types. - State the uses of tools and equipment's for installing flushing cistern - Describe the installation techniques for flushing cistern	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Plungers Drill machine with drills	Class Room Workshop



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		<u>Practical Activity:</u> Install flushing cistern		Hammer Chisel Trowel Mortar pan T cock Plastic connection Flushing cistern PPEs	
LU4. Install Urinal	Trainee must be able to - Mark out Installation point - Measure Height for flushing cistern - Fix Urinal with flushing pipe - Connect inlet pipe with water supply - Perform final quality inspection - Check Level - Use PPEs	- Define urinal and its types - State the use of tools and equipment's for installing urinal - Describe the installation techniques for urinal <u>Practical Activity:</u> Installing urinal wall type with flushing cistern including	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Plungers Drill machine with drills Hammer Chisel Trowel Mortar pan Bolt Kit Urinal Urinal with fitting Urinal Cistern T-Stop cock and plastic connection PPEs	Class Room Workshop



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LU5. Install Sink	Trainee must be able to • Mark out Installation point • Measure height for sink • Fix sink fat trap with drain pipe • Connect inlet pipe with water supply • Perform final quality inspection • Check Level • Conduct Operational Testing • Use PPEs	• Define sink and its types. • State uses of tools and equipment's for installing sink. • Describe the installation techniques for sink. <u>Practical Activity:</u> Installing sink including hot and cold-water connections	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Plungers Drill machine with drills Hammer Chisel Trowel Mortar pan Bolt Kit Sink with mixer Tee cock PPEs	Class Room Workshop
LU6. Install Bath Tub	Trainee must be able to • Mark out Installation point • Measure Height for bath tub • Set and level Bath Tub at designated place • Install a ledger board for supporting tub • Secure the tub to studs according to manufacturer instructions.	• Define bath tub and its types. • State the uses of tools and equipment's for installing bath tub. • Describe the installation techniques for bath tub.	Theory-0.5Hrs Practical-3.0Hrs Total- 3.5Hrs	Pipe Benders Pipe Cutting Tools Pipe vice with stand Deburrers Plumbing pliers Plumbing wrenches Plumbing spanners Plungers PPEs Bolt Kit	Class Room Workshop



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	• Attach drain to tub • Connect the overflow drain • Connect the drain pipe with P-trap • Connect inlet pipe with water supply • Perform leakage test • Perform Safety Precaution • Use PPEs	<u>Practical Activity:</u> Installing bath tub including hot and cold-water connections		Shower Bath Tub with accessories Mallet Tee cock Bath Tub mixer with water connections	
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11.3.7. Construct Sewers

Objective: This module covers the knowledge and skills required to prepare and developed sewers pipes from buildings to lateral sewer. Soil stack pipes of cast iron called soil stack / vent pipes which are connected the sewers system.

Duration: 13 Hours

Theory: 4 Hours

Practice: 09 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU-1. Plan and prepare for work	Trainee will be able to: - Identify work place - Measure safety and other regulatory requirements - Interpret and confirm layout plan - Mark out excavation - Select tools and equipment - Use PPEs - Perform final quality inspection	Different stages for sewer construction Practical Activity: Plan and prepare for laying concrete sewer and soil stack pipe- inspection of site, layout tools selection.	Theory-1.5Hrs Practical-3.0Hrs Total- 4.5Hrs	Measuring tape Kassi String line Shovel Mortar pan Trowel Pipe testing unit complete Compactor Note pad pencil PPEs	Class Room and Environmental Lab
LU-2. Interpret Plan for sewer construction	Trainee will be able to: - Check for Safety Hazards - Perform excavation - Install trench support - Select material for construction - Perform bedding - Lay pipes and joints	- State the safety requirements for installation of sewers - Explain the sewer joints with manholes - How to change of sewer line in case of breakage? Practical Activity:	Theory-1.5Hrs Practical-3.0Hrs Total- 4.5Hrs	Measuring tape Kassi String line Shovel Mortar pan Trowel Pipe testing unit complete Compactor	Class Room and Environmental Lab



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	• Check hydraulic load • Perform pipe test • Back filling and compaction	Interpret Plan for sewer construction laying 6 inches dia concrete sewer in trench including excavation of trench, joining, testing and refilling.		PPEs Rubber ring Cement mortar	
LU-3. Interpret Plan for soil stack pipe	Trainee must be able to: • Check for Safety Hazards • Perform aligning and clamping • Select material • Perform joining and fixing • Check hydraulic load • Perform pipe test	• State the soil stack pipes with its working • State the safety measures to lay sewer pipes <u>Practical Activity:</u> Interpret Plan for soil stack pipe Install soil stack pipe cast iron 2 inches dia for sewer line including excavation of trench, joining, testing and refilling.	Theory-1Hr Practical-3Hrs Total- 4Hrs	Measuring tape Kassi String line Shovel Mortar pan Trowel Pipe testing unit complete Compactor PPEs Cement mortar	Class Room and Environmental Lab



11.3.8. Perform Basic Electric Installations

Objective: This competency standard covers the skills and knowledge required to prepare basic circuits and measurements, interpret electrical related drawing, provide power supply to machines & earthing thereof etc.

Duration: 36 Hours

Theory: 12 Hours

Practice: 24 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU.1 Perform basic electric circuits	Trainee will be able to: • Prepare series circuit on work bench using appropriate tools. • Prepare parallel circuit on work bench using appropriate tools. • Prepare series parallel circuit on work bench using appropriate tools. • Prepare Head and Tail Light Circuit on work bench using appropriate tools. • Prepare indicator circuit on work bench using appropriate tools.	• Describe electrical symbols to be used in drawings • Describe electrical wiring material. • Describe instruments tools used in electrical wiring. • Describe cleat wiring. • Explain types of current- AC and DC • State Ohm's Law • Interpret electrical circuit diagrams. • Explain handling techniques of electrical equipment • Describe the different methods of cable testing <u>Practical Activity:</u>	Theory-06Hrs Practical-06Hrs Total-12Hrs	Charts / display boards showing different wiring methods Insulation remover Electrician knife Pliers Thimble press Thimble of different sizes Cables of different sizes Cable jointing kit Different tags PPE's	Class Room Workshop



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		Construct Serial circuit, Parallel circuit, head and tail circuit and indicator circuit on wiring exercise board.			
LU.2 Perform Basic Electrical Measurement	Trainee will be able to: • Measure/ record voltage by using Digital Multi Meter (DMM) • Measure/ record current by using Digital Multi Meter (DMM) • Measure/ record resistance by using Digital Multi Meter. • Measure/ record continuity by using Digital Multi Meter	• Describe the use of digital multi-meter. • Explain L.C.R meter <u>Practical Activity:</u> Measure voltage, current, resistance and check continuity by digital multimeter for appliances.	Theory-1Hr Practical-3Hrs Total-4Hrs	Megger Earth tester Test Lamp AVO Meter Digital multi meter PPEs	Class Room Workshop
LU.3 Interpret Electrical layout	Trainee will be able to: • Interpret layout of the job for installations • Interpret electrical drawing for electrical wirings • Follow drawing to connect components of equipment	• Describe the different types of coding procedures (e.g. colour coding / tagging / numbering) <u>Practical Activity:</u> Interpret the circuit diagrams for power supply to the equipment	Theory-1Hr Practical-3Hrs Total-4Hrs	Charts / display boards showing different wiring methods Insulation remover Electrician knife Pliers PPE's	Class Room Workshop
LU.4 Arrange Power Supply,	Trainee will be able to: • Identify tools	• Describe basic knowledge of electrical appliances (A/C,	Theory-1Hr Practical-3Hrs	Tool Box PPE's	Class Room Lab



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Tools & Equipment	• Arrange tools and material as per job • Arrange work permit for the wiring task • Arrange backup resources for lighting, power and safety purposes as per job requirement	water dispensers, microwave oven etc) <u>Practical Activity:</u> Arrange power supply tools and equipment in store/inventory	Total-4Hrs	Thimble press Thimble of different sizes Megger Earth tester Test Lamp AVO Meter Digital multi meter	
LU.5 Provide Power Supply to machine	Trainee will be able to: • Interpret electrical appliances • Coordinate with concerned departments before installations for feedback • Connect cables with machines as per operation manual • Verify the connections with respect to color coding / tagging / numbering.	• Describe methods of installing the electrical appliances • Explain the procedure to provide power supply to machines. <u>Practical Activity:</u> Perform connecting power supply with machines.	Theory-1Hrs Practical-3Hrs Total-4Hrs	Tool Box PPE's Thimble press Thimble of different sizes Megger Earth tester Test Lamp AVO Meter Digital multi meter	Class Room Lab
LU.6 Perform Earthing	Trainee will be able to: • Identify earthing • Perform earthing of electrical appliances according to calculated load • Perform earth resistance test as per standards	• Explain earthing and testing procedures • Describe working principle of earth tester <u>Practical Activity:</u> Earthing system of equipment near to laboratory and connecting and testing the same for machine	Theory-2Hrs Practical-6Hrs Total-8Hrs	Tool Box PPE's Megger Earth tester Test Lamp AVO Meter Kassi, Showel Raw salt, coal, copper wire, copper plate	Class Room Field Lab



12. List of Tools, Equipment and Consumable

01: Building Materials

S#	Tools and Equipment	S#	Consumable Material
1	Brick Making Machine	1	Sand
2	Brick Molds	2	Sand Dust
3	Hand roller	3	cement
4	Thermometer	4	Lime
5	Umbrella with stand	5	Brick
6	PPEs	6	Stones
7	Calculator	7	Ferrous metal samples
8	Stone masonry instruments	8	Non-Ferrous metal samples
9	Scissor	9	Pencil,
10	Mason Trowel	10	Eraser,
11	Hammer	11	Sharpener,
12	Hammer Forged steel rectangle head	12	Drawing sheet,
13	Lump hammers		
14	Power Tools		
15	Hand Tools		

02: Basic Drawing

S#	Tools and Equipment	S#	Consumable Material
1.	Drafting Table- Portable (Taper Type), Table size 32" x 24"	1.	Lead Pencils
2.	Instruments Box-Special Compass Set	2.	Eraser
3.	Tee Square (600 mm) Transparent	3.	Tracing Sheets
4.	Set Square- Transparent medium size (300 mm)	4.	Tracing Cloth
5.	Templates- Circle Square, Hexagon, Triangle (03 each)	5.	Drawing Sheets
6.	French Curves - Good Quality, medium size	6.	Graph paper
7.	Sharpener Machine	7.	Scotch Tape
8.	Drafting Machine Elbow type- Table size A o complete with all accessories	8.	Handkerchief



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03: Workshop Practice-I (Wood Work)

S#	Tools and Equipment	S#	Consumable Material
1.	Ear Muff, Ear Plug	1.	Timber Deodar
2.	Safety shoes	2.	Timber Partal
3.	Gloves	3.	Nails
4.	Safety Goggles	4.	Screws
5.	Safety Helmet	5.	Gums
6.	Respiratory protective equipment i.e. Masks	6.	Polishes
7.	Life Jacket	7.	Lacquer
8.	High visibility jacket	8.	lac
9.	Safety harness	9.	paraffin and linseed oils
10.	Face shield	10.	methyated spirits
11.	Rubber shoes/ long shoes	11.	rubbers
12.	Compression testing machine	12.	Deodar Wood for Wooden Joints
13.	Digital weighing balance	13.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)
14.	Laboratory oven	14.	Glue 5 Kg
15.	Files	15.	Kail Wood for Door & Frame
16.	Diamond stones	16.	Kerosene Oil
17.	Water stones	17.	Lubricating Oil / Grease
18.	Oil stones	18.	Nails
19.	Ceramic stones	19.	Overall / Apron for Trainees
20.	Wood tool	20.	Safety Shoes for Trainees
21.	Measuring tool	21.	Screw $\frac{3}{4}$ ", 1", 1 $\frac{1}{2}$ " , 2" (2 Packets each)
22.	Marking tools	22.	Sheshum Wood
23.	Holding tool	23.	Veneer Board (4" x 8' x $\frac{3}{4}$ ")
24.	Cutting tool		
25.	Planning tool		
26.	Fastening tools		
27.	Boring machine		



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28.	Fastenings		
29.	Sprayer		
30.	Circular SAW		
31.	W.W, Planer		
32.	Wood Turning lathe		
33.	Spindle		
34.	Boring machine		
35.	Sander		

04: Workshop Practice-II (Electrical Wiring)

S#	Tools and Equipment	S#	Consumable Material
1.	Ear Muff, Ear Plug	1.	Cable 3/0.029, 7/0.029, 7/0.036, flexible,
2.	Safety shoes	2.	single core, double core each
3.	Gloves	3.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)
4.	Safety Goggles	4.	Wiring accessories (switch,
5.	Safety Helmet	5.	sockets,
6.	Respiratory protective equipment i.e. Masks	6.	boards of sizes,
7.	Life Jacket	7.	bulb holders,
8.	High visibility jacket	8.	dimmer,
9.	Safety harness	9.	Ceiling rose,
10.	Face shield	10.	indicators,
11.	Rubber shoes/ long shoes	11.	breakers,
12.	Electrical drawing	12.	main switches,
13.	Computer	13.	two-way switch,
14.	Emergency light	14.	change overs,
15.	Ladder	15.	regulators,
16.	drill machine tool kit	16.	cleats,
17.	Thimble puncher	17.	clips,



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18.	Shroud	18.	insulation tape,
19.	PVC tape	19.	screws of sizes,
20.	HT tape	20.	steel nails etc
21.	Thimbles	21.	pipes,
22.	cable knife	22.	casing and capping,
23.	wire stripper	23.	batten each
24.	drill machine	24.	bulbs,
25.	PPE	25.	tube lights,
26.	Cable tie	26.	energy savers,
27.	Clamps	27.	Circuit Breakers
28.	Plier	28.	Electric Ballasts (40 W)
29.	Cutter	29.	Panel Board
30.	spiral/ flexible pipes	30.	Earthing system materials
31.	tie base		
32.	ravel bolt		
33.	ravel plug		
34.	hilty bolt		
35.	wooden screw		
36.	AVO meter		
37.	test lamp		
38.	earth tester		
39.	line tester		
40.	megger		
41.	Voltmeter		
42.	Ammeter		
43.	Multi meter		
44.	Ohmmeter		
45.	Drawings, operations manuals		



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46.	Layouts, ICT, measuring tools (calipers, cable chart, hand hacksaw, measuring tape, laser gun for length), quality standards, vendor certificate, grinding cutter, drill machines, hammer		
47.	Layouts, lifters, chain-pulley, jacks, sprit level		
48.	Layouts, measuring tools, cutting tools like wire cutter, side cutter, cable cutter, thimble presser, megger, stacker, tags, glands, shrouds, conduits, cable tray etc		
49.	Layouts, cutting tools e.g. wire cutter, side cutter, cable cutter, stacker, tags etc.		
50.	Drawing, layout, manual, fork lifter, drill machine,		
51.	Layouts, lifters, chain-pulley, jacks, tags		
52.	Soldering, earth tester, thimble presser,		
53.	Drawings, multi meters,		
54.	Wiring Boards 3' x 5' Wall Mounted		
55.	Wood Chisel 1"		
56.	Work Benches 4' x 6' x 2.5'		
57.	Single-Phase Electric Motors		
58.	Single-Phase Energy Meter		
59.	Air Conditioners		
60.	3-Phase Electric Motors		
61.	3-Phase Energy Meter		
62.	AVO Meters		
63.	Clamp on Meter		
64.	Cold Chisels 10" Long		
65.	Combination Pliers 8"		
66.	Electric Bells		



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67.	Fluorescent Tubes (with electric choke)		
68.	Hack Saws 15"		
69.	Hand-Drill Machine Electric Two Speeds 3/4" Chuck Heavy Duty		
70	Kerosene Burners		

13. Members of Curriculum Development Committee

The following members participated in the Curriculum development Committee:

S#	Name	Designation	Organization
1	Engr. Azhar Iqbal Shad	Chief Instructor (Civil)	GCT Raiwnd Road, LHR
2	Mr. Imtiaz Ahmed Awan	Sr. Instructor (Civil)	GCT Rasul (Mandi Bahauddin)
3	Mr. Muhammad Amjad Rafique	Sr. Instructor (Civil)	GCT Rasul (Mandi Bahauddin)
4	Mr. Nadeem Zaigham	Sr. Instructor (Civil)	GCT Raiwnd Road, LHR
5	Mr. Tahir Mahmood	Sr. Instructor (Civil)	GTTI Mughalpura Lahore
6	Engr. Norheen Amina	Consultant	Allied Engineering Services Lahore
7	Engr. Hira Ishtiaq	Consultant.	Allied Engineering Services Lahore
8	Engr. Habiba Mohsin	Design Engineer	JERS Engineering Consultants Lahore
9	Engr. Rebab Maria Mahmood	Site Engineer	IMC Lahore/ Industry
10	Engr. Arsalan Hameed Khan	Assistant Manager (Project)	Planning & Project department Lahore Waste Management Company.
11	Engr. Muhammad Usamn Hayder	Project Manager	Muzaffar Sons Construction Private Lahore
12	Engr. Inayat-ur-Rehman	DACUM, Facilitator	Peshawar
13	Mr. Muhammad Ishaq	Director HR	NAVTTTC, Islamabad