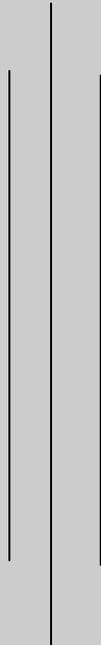


CURRICULUM

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**Domestic Installations
Repairer**
(SHORT COURSE)



Council for Technical Education and Vocational Training
CURRICULUM DEVELOPMENT DIVISION
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Introduction

The competency based and market oriented curriculum for **Domestic Installations Repairer** is designed to produce employable plumbing and electrical installations repairing technicians equipped with knowledge, skills and attitudes related to the occupation. In this curriculum, the trainees will practice skills of repairing works in the related industries. Once the trainees acquired the competencies they will have ample opportunity for employment and self-employment through which they will contribute in the national streamline of poverty reduction in the country. The skills and knowledge included in this curriculum improve their knowledge and skills and make them skilled technicians related to plumbing and electrical installations needed for the occupation. *The major feature of the curriculum is to incorporate the drop-out youths who have only primary level schooling experience.*

Aim

The main aim of this program is to produce employable skilled **Domestic Installations Repairer** who could provide plumbing and electrical installations repairing services with in private and public buildings in the country and abroad.

Objectives

After completion of training the trainees will be able to:

1. Identify tools, equipment and fitting materials, fixtures related to plumbing and sanitation
2. Identify tools, equipment, installation devices and fixtures related to house wiring
3. Identify various repairable and replaceable parts of components of plumbing fixtures
4. Identify various repairable and replaceable parts of components and devices of the wiring system
5. Handle plumbing and wiring related tools and equipment
6. Acquire basic skills related plumbing and wiring system.
7. Replace, repair and maintain the components of installations and fixtures of plumbing system
8. Replace, repair and maintain the components and devices of fixtures and wiring system

Course Description

This course is designed to equip trainees with the skills and knowledge on domestic installation repairing works especially focusing to wiring and plumbing fixtures. The curriculum comprises with two parts, the first part intends to provide skills and knowledge on plumbing fixtures repairing and second part intends to provide skills and knowledge on fixtures repairing related to domestic wiring.

The first part deals with, concept of plumbing, identification of plumbing tools; equipments and materials; identification of symbols; safety rules; bench work; GI, CI and PVC joining and connecting works; and fixtures repairing works.

Similarly, the second parts deals with concept of electricity; measurement of current, voltage resistance, power; handling of electrical instruments; identification of symbols; safety rules; and maintaining and repairing of wiring fixtures domestic wiring.

Trainees will practice & learn skills using typical tools, equipment, machines and materials necessary for the program.

Duration

The total duration of the course extends over 3 months (i.e. 3x130 hours equal to 390 hours).

Target Group

The target group for this training program will be all interested individuals with educational prerequisite of minimum class five pass.

Target location

The target group for this training program will be all over Nepal.

Group Size

The group size of this training program will be maximum 30, provided all necessary resources to practice the tasks/ competencies as specified in this curriculum guide.

Medium of Instruction

The medium of instruction for this program will be Nepali or English or both.

Pattern of Attendance

Trainee should have 90% attendance during the training period to get the certificate.

Focus of Curriculum

This is a competency-based curriculum. This curriculum emphasizes on competency performance. 80% time is allocated for performance and remaining 20% time is for related technical knowledge. So, the main focus will be on performance of the specified competencies in the curriculum.

Entry Criteria

Individuals who meet the following criteria will be allowed to enter this curricular program:

- Minimum of five class pass or equivalent
- Nepali citizen
- Minimum of 15 years of age
- Should pass entrance examination

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- **Printed Media Materials** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- **Non-projected Media Materials** (Display, Models, Flip chart, Poster, Writing board etc.).
- **Projected Media Materials** (Opaque projections, Overhead transparencies, Slides etc.).
- **Audio-Visual Materials** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- **Computer-Based Instructional Materials** (Computer-based training, Interactive video etc.).

Teaching Learning Methodologies

The methods of teachings for this program will be a combination of several approaches. Such as Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work.
Practical: Demonstration, Observation, Guided practice and Self-practice.

Follow up Provision

First follow up: Six months after the completion of the program

Second follow up: Six months after the completion of the first follow up

Follow up cycle: In a cycle of one year after the completion of the second follow up for five years

Grading System

The trainees will be graded as follows based on the marks in percentage secured by them in tests/ evaluations.

- Distinction: Passed with 80% or above
- First Division: passed with 75% or above
- Second Division: passed with 65% or above
- Third Division: passed with 60% or above

Students Evaluation Details

- Continuous evaluation of the trainees' performance is to be done by the related instructor/ trainer to ensure the proficiency over each competency under each area of the whole course.
- Related technical knowledge learnt by trainees will be evaluated through written or oral tests as per the nature in the institutional phase of training.
- Trainees must secure minimum marks of 60% in an average of both theory and practical evaluations.
- The entrance test will be administered by the concerned training institute.

Trainers' Qualification (Minimum)

- Diploma or TSLC in related field
- Good communicative and instructional skills
- Experience in related field

Trainer-Trainees Ratio

- In theory classes 1(trainer): 20 (trainees)
- In practical classes (in workshop and laboratory) 1(trainer): 10 (trainees)

Suggestions for Instruction

1. Select objectives

- Write objectives of cognitive domain.
- Write objectives of psychomotor domain.
- Write objectives of affective domain

2. Select Subject matter

- Read subject matter in detail.
- Select content related to cognitive domain.
- Select content related to psychomotor domain.
- Select content related to affective domain.

3. Select Instructional Methods

- Teacher centered methods: like lecture, demonstration, question answers inquiry, induction and deduction methods.
- Student initiated methods like experimental, field trip/excursion, discovery, exploration, problem solving, and survey methods.
- Interaction methods like discussion, group/team teaching, microteaching and exhibition.
- Dramatic methods like role play and dramatization

4. Select Instructional method (s) on the basis of objectives of lesson plans and KAS domains.

5. Select appropriate educational materials and apply at right time and place.

6. Evaluate the trainees applying various tools to correspond the KAS domains.

7. Make plans for classroom / field work / workshop organization and management.

8. Coordinate among objectives, subject matter and instructional methods.

9. Prepare lesson plan for theory and practical classes.

10. Deliver /conduct instruction / program.

11. Evaluate instruction/ program.

Special suggestion for the performance evaluation of the trainees

1. Perform task analysis.
2. Develop a detail task performance checklist.
3. Perform continuous evaluation of the trainees by applying the performance checklist.

Suggestion for skill training

1. Demonstrate task performance in normal speed.
2. Demonstrate slowly with verbal description of each and every step in the sequence of activity of the task performance using question and answer techniques.
3. Repeat 2 for the clarification on trainees demand if necessary.
4. Perform fast demonstration of the task.

Provide trainees the opportunities to practice the task performance demonstration

1. Provide opportunity to trainees to have guided practice.
2. Create environment for practicing the demonstrated task performance.
3. Guide the trainees in each and every step of task performance.
4. Provide trainees to repeat and re-repeat as per the need to be proficient on the given task performance.
5. Switch to another task demonstration if and only trainees developed proficiency in the task performance.

Other suggestions

1. Apply principles of skill training.
2. Allocate 20% time for theory classes and 80% time for task performance while delivering instructions.
3. Apply principles of learning relevant to the learners' age group.
4. Apply principles of intrinsic motivation.
5. Facilitate maximum trainees' involvement in learning and task performance activities.
6. Instruct the trainees on the basis of their existing level of knowledge, skills and attitude.

Certificate Requirements

Training institute itself will provide the certificate of "**Domestic Installations Repairer**" to those trainees who successfully complete the prescribed course and conducted evaluation.

Physical Facilities

The theory class rooms at least should have area of 10 square feet per trainee and in the workshop it should be at least of 30 square feet per trainee. All the rooms and laboratory should be well illuminated and ventilated.

- Well equipped workshop with adequate space 1 (No.)
- Well furnished class room with adequate space 1 (No.)
- Office room equipped with modern facilities 1 (No.)
- Principle room equipped with modern facilities 1 (No.)
- Reception room equipped with modern facilities 1 (No.)

Tools, Instruments and Equipment

Tools and equipment required for plumbing fixtures repairing

Cutting tools

Hacksaw (15 nos.)	Mitre saw (3 nos.)	Wooden saw (15 nos.)
Chisel (15 nos.)	Pocket knife (10 nos.)	Pipe cutter (5 nos.)
Reamer (5 nos.)	Scissor (5 nos.)	Pad saw (15 nos.)
Multilayer composite tube cutter (5 sets)	Multilayer composite tube bending (5 sets)	Multilayer composite tube T reamer (5 sets)
Cold chisel (2 nos.)		

Hammering tools

Motion Hammer (15 nos.)	Spin hammer (5 nos.)	Ball hammers (5 nos.)
Pin hammers (15 nos.)		

Vice and Wrenches

Pipe vice (15 nos.)	Chain vice (15 nos.)	Bench vice (15 nos.)
Pipe wrench (30 nos.)	Adjustable wrench (15 nos.)	Spanner set (10 nos.)
Screw driver different sizes (10 nos.)		

File set

Triangles file (5 nos.)	Half round file (5 nos.)	Square file (5 nos.)
Needle file set (2 nos.)	Pe files (2 nos.)	Wooden file (15 nos.)

Measuring tools

Hook tape (10 nos.)	Measuring tape (15 nos.)	Spirit level (15 nos.)
Plumb bob (15 nos.)	Marking tool (5 nos.)	Folding tape (15 nos.)
Bottom square (15 nos.)	Brush 4" (10 nos.)	

Heating tools

Heating plate (5 nos.)	Blow lamp (5 nos.)	Stove (2 nos.)
Lead melting pot (2 nos.)	Electrical hot plate (3 nos.)	

Other Tools

Hand drill (5 nos.)	Combination pliers (5 nos.)	Vice pliers (5 nos.)
Nose pliers (5 nos.)	Yarning tools (15 nos.)	Clacking tools (15 nos.)
Ladle (5 nos.)	Safety goggle (15 nos.)	

Equipment

Vernier calliper (5 nos.)	Threading machine (5 nos.)	Tapping machine (5 nos.)
Pressure test pump (3 nos.)	Compressor machine (2 nos.)	Grinder (5 nos.)
Pillar drill machine (3 nos.)	Align key set (5 nos.)	Circlip pliers set (5 nos.)
Die sets 1/2", 3/4", 1" 1 1/4" (15 nos.)		

Masonry and plastering

Mason hammers (15 nos.)	Shovel (15 nos.)	Finishing trowel (15 nos.)
Trowel (15 nos.)	Plumb bob (15 nos.)	Brick cutter (15 nos.)
Mortar pan (5 nos.)	Bucket (10 nos.)	Mixing board (5 nos.)

Materials (including fitting materials, valves and fixtures)

MS flat 50x5 mm	MS flat 50x5 mm	Angle iron 50x50x5mm
GI pipe 1/4", 3/4", 1", 5/4"	GI elbow	GI Tee
GI socket	GI union	GI tank nut
Pe pipe 32 ø, 50 ø, 63 ø, 110 ø mm	PVC pipe 50 ø, 75 ø, 110 ø mm	PVC bend 45°
PVC bend 90°	PVC T branch	PVC Y branch
PVC floor drain	PVC vent cowl/PVC reducer	CI pipe
CI bend	CI Tee	CI branch
CI socket	Hem	Lead
Tap	Wash basin	Water closet
Shower	Bath tub	Mixture tap
Gate valve	Conceal valve	Water tank
Floating valve	Water pump	Bottle trap
Check valve	Pressure relief valve	Air valve
Sluice valve	Multilayer pipe 15 ø, 20 ø, mm	Multi layer fitting
Cement	Brick	Sand
Glass marker	Electric geyser	Solar water heater set

Tools and equipment required for electrical fixtures repairing

Phase tester (15 nos.)	Pliers (15 nos.)	Screwdriver (flat and phillips) (15 nos.)
Hammer (15 nos.)	Chisel (15 nos.)	Hacksaw (15 nos.)
Measuring tape (15 nos.)	Drill machine and bits (15 nos.)	Multimeter (15 nos.)
Punch (5 nos.)	Wiring board (15 nos.)	Ampere meter (5 nos.)
Voltmeter (5 nos.)	Ohmmeter (5 nos.)	Megger (5 nos.)
Wattmeter (15 nos.)	Energy meter (15 nos.)	Insulation tester (15 nos.)
Fish wire (15 nos.)	Cable drums (2 nos.)	Torch light (15 nos.)

Course Structure of DI Repairer

S. No.	Modules	Name of Modules	Durations (Hrs.)
1	I	Plumbing installations / fixtures repairing	195
2	II	Electrical installations/ fixtures repairing	195
Total (Hrs.)			390

Module I:

Plumbing installations /fixtures repairing

Duration: 195 hours (1.5 month)

Competencies in plumbing installations /fixtures repairing

1. State concept of plumbing and pipe fitting
2. Enumerate/identify plumbing materials/ fittings/valves/fixtures
3. Enumerate/identify/handle basic tools and equipment.
4. Enumerate/identify plumbing symbols.
5. Orient with safety rules.
6. Interpret working drawing/blueprint/catalog
7. Measure/mark/file/saw work piece.
8. Cut GI pipe.
9. Thread GI pipe.
10. Cut Pe pipe.
11. Make butt joint of Pe pipe.
12. Make 90/45/bend/elbow of Pe pipe.
13. Make Y/Tee Pe branch.
14. Make Reducer socket/vent cowl of Pe pipe.
15. Repair tap/fixture/angle valve.
16. Repair gate valve.
17. Repair conceal valve.
18. Repair floating valve.
19. Repair water pump.
20. Repair water closet (commode and pan).
21. Repair/wash basin/urinal/sink.
22. Repair cistern.
23. Repair shower.
24. Repair water pipeline.
25. Repair waste water pipelines.
26. Repair solar water heater.

Tasks Analysis

Task Analysis

Task No: 1 State concept of plumbing and pipe fitting

Time: 2 hrs
Theory: 2 hrs
Practical: 0 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Explain historical background and development. 3. Explain water transferable diseases and sanitation. 4. Define plumbing 5. Define sanitation 6. Differentiate between plumber and pipe fitter. 7. Keep records. 	<p><u>Condition (Given):</u></p> <p>OHP, transparency, white board marker handouts and manual</p> <p><u>Task (What):</u></p> <p>State concept of Plumbing and pipe fitting</p> <p><u>Standard (How well):</u></p> <p>The concept of plumbing and pipe fitting stated</p>	<ul style="list-style-type: none"> ➤ Historical background and development plumbing and pipe fitting ➤ Definition of plumbing ➤ Definition of sanitation ➤ Different between plumber and pipe fitter ➤ Water transferable diseases and sanitation. ➤ Government organizations related to plumbing and pipe fitting services

Tools and equipment:

Safety:

Task Analysis

Task No: 2 Enumerate/identify plumbing materials/ fittings /valves /fixtures.

Time: 7 hrs
Theory: 2 hrs
Practical: 5 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Enlist the objectives of identification of plumbing materials /fitting /valves /fixtures. 3. Enumerate/identify type of plumbing materials. 4. Enumerate/identify type of fittings. 5. Enumerate/identify type of valves. 6. Enumerate/identify types of fixtures. 7. Keep records. 	<p><u>Condition (Given):</u></p> <p>OHP, transparency, white board and marker, handout and safety poster.</p> <p><u>Task (What):</u></p> <p>Enumerate/identify plumbing materials/ fittings/valves fixtures.</p> <p><u>Standard (How well):</u></p> <p>Various types of plumbing materials, fittings, valves and fixtures enumerated. Various types of plumbing materials, fittings, valves and fixtures identified.</p>	<ul style="list-style-type: none"> ➤ Objectives of plumbing materials, fittings, valves and fixtures identification ➤ Function of fittings and valves ➤ Classification of various types of fittings ➤ Types of plumbing materials and their specification ➤ Grades and types of GI pipes ➤ Types of valves commonly available ➤ Types of fixtures ➤ Identification of plumbing materials, fittings, valves and fixtures

Tools and equipment:

Safety:

Task Analysis

Task No: 3 Enumerate/identify/ handle basic tools and equipment.

Time: 6 hrs
Theory: 2 hrs
Practical: 4 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Enlist the objectives of identification of basic tools and equipment. 3. Enlist function of various tools and equipment. 4. Enumerate/identify measuring and marking tools and equipment 5. Enumerate/identify checking tools. 6. Enumerate/identify sawing and cutting tools and equipment 7. Enumerate/identify measuring and marking tools and equipment 8. Enumerate/identify hammering tools. 9. Enumerate/identify filing and chiseling tools. 10. Enumerate/identify holding and clamping tools. 11. Enumerate/identify threading tools and equipment. 12. Enumerate/identify drilling tools and equipment. 13. Maintain tools and equipment. 14. Keep records. 	<p><u>Condition (Given):</u></p> <p>Class room, OHP/Transparency/White board and marker/Handout/ Safety poster.</p> <p><u>Task (What):</u></p> <p>Enumerate/identify /handle basic tools and equipment.</p> <p><u>Standard (How well):</u></p> <p>Various types of tools and equipments enumerated. Various types of tools and equipment identified. Various types of tools and equipment handled /operated</p>	<ul style="list-style-type: none"> ➤ Objectives of plumbing related tools and equipment identification ➤ Enumeration and identification of various types of tools and equipment ➤ Tools handling technique ➤ Safety of different tools and equipment ➤ Safety precautions

Tools and equipment:

Safety:

Task Analysis

Task No: 4 Enumerate/ identify/ sketch plumbing symbols.

Time: 8 hrs
Theory: 2 hrs
Practical: 6 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Prepare drawing materials. 3. Enlist objectives of symbols identification. 4. Enumerate various types of symbols. 5. Identify the symbols for real picture of object. 6. Sketch the required symbols. 7. Complete the sketch with detail information. 8. Restore all tools and materials. 9. Keep records. 	<p><u>Condition (Given):</u></p> <p>Drawing classroom. Manual, drawing board, pencil, drawing paper, eraser, scale</p> <p><u>Task (What):</u></p> <p>Enumerate/identify/sketch plumbing and symbols.</p> <p><u>Standard (How well):</u></p> <p>Various symbols related to plumbing enumerated.</p> <p>Various symbols related to plumbing identified.</p> <p>Various symbols related to plumbing sketched.</p>	<ul style="list-style-type: none"> ➤ Concept of symbols and codes ➤ Enumeration of various types of plumbing symbols ➤ Identification of various types of plumbing symbols ➤ Application of symbols and codes ➤ Free hand sketching technique

Tools and equipment:

Safety:

Task Analysis

Task: 5 Orient with safety rules.

Time: 2 hr
Theory: 2 hrs
Practical: hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Define safety. 2. Enlist importance of safety precaution. 3. Enlist workshop hazards. 4. Enlist personal safety rules and regulations. 5. Enlist workshop safety rules and regulations. 6. Keep records. 	<p><u>Condition (Given):</u></p> <p>Class room OHP, transparency, white board and marker, handouts and safety poster.</p> <p><u>Task (What):</u></p> <p>Orient with safety rules.</p> <p><u>Standard (How well):</u></p> <p>Various safety rules and regulation oriented.</p>	<ul style="list-style-type: none"> ➤ Definition of safety ➤ Importance of safety precaution ➤ Workshop hazards ➤ Safety rules and regulations

Tools and equipment:

Safety:

Task Analysis

Task: 6 Interpret working drawing/ blueprint/ catalog.

Time: 4 hr
Theory: 2 hrs
Practical: 2 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Obtain working drawing/catalog. 3. Read working drawing/catalog. 4. Interpret components of working drawing/catalog 5. Interpret the symbols used. 6. Interpret the dimension. 7. Interpret the size and types of pipes, fittings, installations and fixtures. 8. Keep records. 	<p><u>Condition (Given):</u></p> <p>Working drawing, blueprint, catalog, calculator and pencil</p> <p><u>Task (What):</u></p> <p>Interpret working drawing/catalog</p> <p><u>Standard (How well):</u></p> <p>Working drawing interpret. Catalog interpret Symbol identified.</p>	<ul style="list-style-type: none"> ➤ Introduction to working drawing and blueprint ➤ Importance of working drawing and catalog ➤ Components of working drawing ➤ Symbols used in working drawing and catalog ➤ Information included in working drawing and catalog ➤ Scale conversion

Tools and equipment: Working drawing, Catalog, Calculator and Measuring scale

Safety:

Task Analysis

Task No: 7 Measure/mark/file/saw work piece.

Time: 12 hrs
Theory: 2 hrs
Practical: 10 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<p>1. Measurement: 1.1 Measure the dimension. (Inch/centimeter, millimeter, meter)</p> <p>2. Marking: 2.1 Measure the dimension as per drawing. 2.2 Mark the point by using scribe or pencil.</p> <p>3. Filing 3.1 Read drawing 3.2 Measure the work piece by using scale. 3.3 clamp work piece on the vice. 3.4 File the work piece using appropriate file. 3.5 Check filing surface level and perpendicular using by back square. 3.6 Measure the final dimension. 3.7 Clean work place.</p> <p>4. Sawing: 4.1 Mark on the work piece as per drawing. 4.2 Clamp the work piece on the bench vice. 4.3 Collect and fix hacksaw blade on hacksaw. 4.4 Saw on the work piece. 4.5 Apply coolant. 4.6 Keep records.</p>	<p><u>Condition (Given):</u> Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u> Measure/mark/file/saw work piece</p> <p><u>Standard (How well):</u> Work piece measured. Work piece filed. Right angle maintained. Straight sawn</p>	<ul style="list-style-type: none"> ➤ Measurement system ➤ Conversion of units ➤ Marking system ➤ Method of filing ➤ Method of sawing ➤ Identification of tools ➤ Procedure ➤ Safety precaution

Tools/equipment: - marking scribe/Measuring tape/File/Hack saw frame/, Steel scale/Bench vice

Safety:

- Fix the saw blade properly
- Clamp the work piece properly.
- Apply coolant while sawing.
- Reduced pressure on saw just before the separation.

Task Analysis

Task No: 8 Cut GI pipes.

Time: 2 hrs
Theory: 0.5 hr
Practical: 1.5 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain required materials and tools. 3. Read drawing. 4. Take measurement for cutting. 5. Fix GI pipe on the pipe vice. 6. Hold the saw with blade. 7. Cut GI pipe gently with full strokes. 8. Remove pipe from the vice. 9. Restore all tools and materials. 10. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p style="text-align: center;">Cut GI pipe.</p> <p><u>Standard (How well):</u></p> <p>Work piece measured. Work piece cut. Right angle maintained.</p>	<ul style="list-style-type: none"> ➤ Types of cutting tools ➤ Procedure ➤ Safety precaution <p style="text-align: center;">-</p>

Required Tools/equipment: - Hack saw frame/ Steel scale/Pipe vice

Safety:

- Fix the saw blade properly
- Reduced pressure on saw just before the separation.

Task Analysis

Task No: 9 Thread GI pipes.

Time: 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain tools, equipment materials. 3. Obtain pre machined W/P. 4. Clamp the GI pipe into the vice. 5. Insert the pipe die from the end of pipe. 6. Apply little pressure onto the stock. 7. Rotate the die in clockwise direction. 8. Rotate the die anti-clockwise after few turn completion clockwise. 9. Apply lubricant on the pipe. 10. Cut thread until one or two thread out of die teeth is made. 11. Remove the die set from the pipe. 12. Clean thread. 13. Check the thread by fitting pipe on it. 14. Remove the pipe from the vice. 15. Restore all tools and materials. 16. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Thread GI pipe.</p> <p><u>Standard (How well):</u></p> <p>Length of thread maintained. Quality of thread maintained.</p>	<ul style="list-style-type: none"> ➤ Function of thread ➤ Thread length ➤ Lubricant use ➤ Flat threads ➤ Die set and accessories ➤ Procedure ➤ Safety precaution

Required Tools/equipment: - Hack saw frame/ Steel scale/Pipe vice/Stock and die/Oilcan

Safety:

- Fix the saw blade properly
- Do not spoil oil on the floor.
- Do not clean thread by necked hand.

Task Analysis

Task No: 10 Cut Pe pipe.

Time: 2 hrs
Theory: 1 hr
Practical: 1 hr

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Collect required material. 3. Obtain required tools 4. Take measurement for cutting 5. Fix Pe pipe on the pipe vice. 6. Hold a wooden saw. 7. Cut Pe pipe gently with full strokes. 8. Remove pipe from the vice. 9. Restore all tools and materials. 10. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Cut Pe pipe.</p> <p><u>Standard (How well):</u></p> <p>Work piece cut. Work piece measured. Right angle maintained.</p>	<ul style="list-style-type: none"> ➤ Introduction to Pe pipe ➤ Properties of Polyethylene materials ➤ Types of Pe pipe ➤ Cutting devices ➤ Procedure ➤ Safety precaution

Required Tools/equipment: - Measuring tape/Wooden saw/Pipe vice

Safety: Handle wooden saw properly.

Task Analysis

Task No: 11 Make butt joint of Pe pipe.

Time: 4 hrs
Theory: 1 hr
Practical: 3 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain required tools and equipment. 3. Obtain required materials. 4. Select correct size of pipe according to the drawing. 5. Measure and mark necessary dimensions with yellow pencil. 6. Cut the pipe straightly by wooden saw. 7. Clean the cut surface. 8. Heat Pe pipe cuts on hot plat. 9. Join the two heated cuts pieces of Pe pipe immediately with required pressure on them straightly. 10. Check the butt-welding by using hammer/cut/water. 11. Restore all tools and materials. 12. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Make butt joint of Pe pipe.</p> <p><u>Standard (How well):</u></p> <p>Measurement checked. Straight welded. Leakage tested.</p>	<ul style="list-style-type: none"> ➤ Function of heating plate ➤ Method of joining ➤ Principle Teflon tape/marker ➤ Size of heating plate ➤ Welding temperature ➤ Procedure ➤ Safety precaution

Required Tools/equipment: - Wooden saw / Steel scale/Pipe vice/Pe file/Hot plate/Knife.

Safety:

- Do not play with hot welding plate.
- Handle wooden saw properly.

Task Analysis

Task No: 12 Make 90/45-bend/ elbow of Pe pipe.

Time: 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain required tools and equipments. 3. Obtain required materials. 4. Select correct size of pipe according to the drawing. 5. Calculate cutting angles. 6. Mark the necessary dimensions with yellow pencil. 7. Cut the pipe through the marks at necessary angle /straight by using wooden saw. 8. Clean the cut surface. 9. Join the nos. of cut pieces of Pe pipe as per drawing. 10. Check the angle of bend 90/45 by protector. 11. Check water test. 12. Restore all tools and materials. 13. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Make 90/45-bend/ elbow of Pe pipe.</p> <p><u>Standard (How well):</u></p> <p>Measurement checked. Straight welded. Angle cut. Right angle checked. Leakage tested.</p>	<ul style="list-style-type: none"> ➤ Calculation of cutting angles ➤ Method of angle cutting ➤ Angle cutting devices ➤ Procedure of cutting ➤ Safety precaution

Required Tools/equipment: Wooden saw/ Steel scale/ Pe file/ Hot plate/ Knife/ Meter box.

Safety:

- Do not play with hot welding plate.
- Handle wooden saw properly.

Task Analysis

Task No: 13 Make Tee/Y Pe branch.

Time: 12 hrs
Theory: 1 hr
Practical: 11 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain required tools and equipment. 3. Obtain required materials. 4. Select correct sizes of pipe according to the drawing. 5. Calculate cutting angles. 6. Mark necessary dimension by using yellow pencil. 7. Cut the pipe to necessary numbers at required angle/straight using wooden saw. 8. Clean the cut surface. 9. Join the two pieces of Pe pipe making given angle. 10. Check the angle of branch 90/45 by protector. 11. Check water test. 12. Restore all tools and materials. 13. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Make Tee/Y Pe branch.</p> <p><u>Standard (How well):</u></p> <p>Measurements checked. Straight welded. Angle cut. Right angle checked. Leakage tested.</p>	<ul style="list-style-type: none"> ➤ Calculation of cutting angle ➤ Method of angle cutting ➤ Procedure ➤ Safety precaution ➤ Angle cutting devices

Required Tools/equipment: Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box.

Safety:

- Handle wooden saw properly.
- Do not pour oil on welding surface.

Task Analysis

Task No: 14 Make reducer socket/vent cowl of Pe pipe.

Time: 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Obtain drawing/catalog. 2. Obtain required tools and materials. 3. Select the correct sizes of pipe as per given in drawing. 4. Mark on the pipe for pieces according to the drawing. 5. Heat the end of cut pipe by blowlamp correct to required measurement. 6. Expand the heated pipe using taper wooden block. 7. Join expanded pipe with other pipe. 8. Check the reducer socket according to drawing. 9. Test with water. 10. Restore all tools and materials. 11. Keep records. 	<p><u>Condition (Given):</u></p> <p>Workshop, necessary tools, equipment and materials</p> <p><u>Task (What):</u></p> <p>Make reducer socket/vent cowl of Pe pipe.</p> <p><u>Standard (How well):</u></p> <p>Measurement checked. Straight welded. Right angle checked. Leakage tested.</p>	<ul style="list-style-type: none"> ➤ Calculation of cutting angle ➤ Method of angle cutting ➤ Procedure ➤ Safety precaution ➤ Angle cutting devices

Required Tools/equipment: - Wooden saw / Steel scale/Pe file/Hot plate/Knife/Meter box.

Safety:

- Be careful while using blower.
- Do not pour oil on welding surface.

Task Analysis

Task No: 15 Repair tap/fixture/angle valve.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read catalog/real object. 3. Prepare repairing tools and materials. 4. Close main water pipeline valve. 5. Open nub cap. 6. Turn left screw inside nub. 7. Remove nub. 8. Open stuffing box. 9. Replace/repair jumper washer. 10. Repair packing. 11. Repair gasket. 12. Replace spindle. 13. Retighten stuffing box. 14. Fix nub. 15. Fix screw inside nub 16. Place nub cap. 17. Test/check water leakage. 18. Restore all tools and materials. 19. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair tap/fixture/angle valve</p> <p><u>Standard (How well):</u></p> <p>Leakage checked. Level checked. Tap, fixture and angle valve repaired. Handle of top operated easily.</p>	<ul style="list-style-type: none"> ➤ Purpose of repair ➤ Types of repair ➤ Periodical maintenance ➤ Different types of taps ➤ Name of parts of a tap ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Adjustable wrench /Hacksaw frame

Safety: Do not open stuffing box wherever water dropping from tap.

Task Analysis

Task No: 16 Repair gate valve.

Time : 5 hrs

Theory: 1 hr

Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read catalog/real object. 3. Prepare repairing tools and materials. 4. Close main water pipeline valve. 5. Open stuffing box. 6. Repair packing. 7. Repair gasket. 8. Repair/replace/r dish. 9. Replace spindle. 10. Retighten stuffing box. 11. Test/check water leakage. 12. Restore all tools and materials. 13. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair gate valve.</p> <p><u>Standard (How well):</u></p> <p>Leakage checked. Level checked. Gate valve repaired. Handle of gate valve operated easily.</p>	<ul style="list-style-type: none"> ➤ Different types of gate valve commonly available ➤ Name of parts of a gate valve ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Adjustable wrench/ Hacksaw frame

Safety: Empty water tank before repairing gate valve.

Task Analysis

Task No: 17 Repair conceal valve.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read catalog/real object. 3. Prepare repairing tools and materials. 4. Close main water pipeline valve. 5. Open nub cap. 6. Turn of screw inside nub. 7. Open hexagon nut. 8. Remove spindle. 9. Repair/replace jumper washer. 10. Repair gasket. 11. Replace spindle. 12. Retighten hexagon nut. 13. Mix nub. 14. Tighten screw inside nub. 15. Fix nub cap. 16. Test/check water leakage. 17. Restore all tools and materials. 18. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair conceal valve.</p> <p><u>Standard (How well):</u></p> <p>Leakage checked. Level checked. Conceal valve repaired. Conceal valve operated easily.</p>	<ul style="list-style-type: none"> ➤ Different types of conceal valve commonly available ➤ Name of parts of a conceal valve ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Adjustable wrench /Hacksaw frame

Safety: Do not open hexagon nut wherever water dropping from pipe.

Task Analysis

Task No: 18 Repair floating valve.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read catalog/real object. 3. Prepare repairing tools and materials. 4. Open luck pin (split pin). 5. Change rubber washer. 6. Change ball (floating). 7. Change rod. 8. Refit luck pin. 9. Test/check water leakage. 10. Restore all tools and materials. 11. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair floating valve.</p> <p><u>Standard (How well):</u></p> <p>Leakage checked. Level checked. Water stopped when the float valve floats on the surface of water tank. Float valve repaired</p>	<ul style="list-style-type: none"> ➤ Different types of floating valve commonly available ➤ Name of parts of a floating valve ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Pliers /Screw driver

Safety: Do not stay inside water tank during repairing time.

Task Analysis

Task No: 19 Repair water pump (plumbing parts only).

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read catalog/real object. 3. Prepare repairing tools and materials. 4. Open union from delivery and suction pipe line. 5. Find out faults o pumping system. 6. Mark on the out side of impeller box. 7. Open nuts and bolts. 8. Open impeller box. 9. Remove impeller. 10. Replace impeller. 11. Fit new washer for impeller box. 12. Tighten nuts and bolts. 13. Open gland nut box. 14. Fit gland rope. 15. Tighten gland nut box. 16. Check/test water suction. Retighten union. 17. Restore all tools and materials. 18. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair water pump (mechanical parts only)</p> <p><u>Standard (How well):</u></p> <p>Water suction by water pump. Air leakage from impeller box checked controlled. Water leakage tested. Mechanical parts of pump repaired.</p>	<ul style="list-style-type: none"> ➤ Types of domestic pump ➤ Uses of domestic pump ➤ Name of parts of a pump ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Adjustable wrench/ Hacksaw frame/Hammer/Chisel
Safety:

- Do not connect electricity while union is opened.
- Do not hammer on the pump directly.

Task Analysis

Task No: 20 Repair water closets (Commode and pan).

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing 3. Prepare repairing tools and materials. 4. Close water supply. 5. Disconnect flush pipe/water pipe line. 6. Remove commode/cistern/pan. 7. Clean floor where the fixtures is to be rested. 8. Make a level of fixtures. 9. Fix the cistern. 10. Connect water/flush pipe. 11. Check/test water leakage. 12. Restore all tools and materials. 13. Clean working area. 14. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair water closet (commode /pan).</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Level checked. Commode and pan positioned as per drawing.</p>	<ul style="list-style-type: none"> ➤ Types of commode, cistern and pan commonly available ➤ Name of parts of a water closet ➤ Method of selecting fixtures ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/Adjustable wrench/Pipe wrench/ Hammer and Drill machine

Safety: Remove fixtures safely.

Task Analysis

Task No: 21 Repair/wash basin/urinal/sink.

Time : 10 hrs

Theory: 1 hr

Practical: 9 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing 3. Prepare repairing tools and materials. 4. Disconnect bottle tap from basin. 5. Close water supply. 6. Disconnect tap with connecting pipe. 7. Remove washbasin from wall. 8. Remove basin bracket. 9. Make hole for fixing bracket. 10. Fix the bracket with screw grip. 11. Install wash basin. 12. Connect bottle trap with basin. 13. Connect water line with tap. 14. Check/test water leakage. 15. Fill white cement paste in the gap between basin and wall. 16. Restore all tools and materials. 17. Clean wash basin. 18. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair wash basin/urinal/sink.</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Level checked. Wash basin, urinal and sink positioned as per drawing.</p>	<ul style="list-style-type: none"> ➤ Types of wash basin, urinal and sink commonly available ➤ Name of parts of wash basin, urinal and sink ➤ Method of selecting fixtures and bracket ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver, Adjustable wrench, Pipe wrench, Hammer and Drill machine

Safety:

- Remove fixtures safely.
- Handle drill machine safely.
- Handle PVC pipe carefully.

Task Analysis

Task No: 22 Repair cistern.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing/catalog 3. Prepare repairing tools and materials. 4. Close angle valve. 5. Repair/replace washer of flush valve. 6. Repair floating valve. 7. Open angle valve. 8. Check/test water leakage. 9. Flush water to commode. 10. Restore all tools and materials. 11. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair cistern.</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Level checked. Cistern repaired as per standard.</p>	<ul style="list-style-type: none"> ➤ Types of cistern commonly available ➤ Name of parts of inside cistern ➤ Method of selecting cistern ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/Adjustable wrench/Hammer and
Safety: Remove fixtures safely.

Task Analysis

Task No: 23 Repair shower.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing/catalog. 3. Find out leakage/damage area 4. Prepare repairing tools and materials. 5. Close conceal valve. 6. Remove shower. 7. Replace new shower. 8. Check/test water leakage. 9. Restore all tools and materials. 10. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair shower.</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Shower repair.</p>	<ul style="list-style-type: none"> ➤ Types of shower commonly available ➤ Name of parts of shower ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Adjustable wrench/ Hammer,
Safety: Handle shower safely.

Task Analysis

Task No: 24 Repair water pipeline.

Time : 7 hrs
Theory: 1 hr
Practical: 6 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing/catalog. 3. Find out leakage area. 4. Prepare repairing tools and materials. 5. Close main valve. 6. Dig/chisel wall or floor. 7. Mark/cut pipe. 8. Remove leakage/damage pipe. 9. Select required size of pre machined pipe for replacement. 10. Cut thread on pipe. 11. Tighten union parts on pipe. 12. Fix the union each other. 13. Check/test water leakage. 14. Apply plaster over chiseled area. 15. Restore all tools and materials. 16. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair water pipeline</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Pipe positioned on level Water pipeline repaired.</p>	<ul style="list-style-type: none"> ➤ Leakage area finding technique ➤ Method of selecting fittings and materials ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Screw driver/ Pipe wrench and Hammer/ Die set/ Chisel/ Pipe vice /Hacksaw

Safety: Handle die set safely.

Task Analysis

Task No: 25 Repair waste water pipeline.

Time : 5 hrs
Theory: 1 hr
Practical: 4 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Read drawing/catalog. 3. Find out blockage area. 4. Prepare repairing tools and materials. 5. Chisel/dig floor. 6. Cut pipe. 7. Remove leakage/blockage pipe. 8. Join new pipe with expansion socket. 9. Check/test water leakage. 10. Apply plaster over chiseled area. 11. Restore all tools and materials. 12. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><u>Task (What):</u></p> <p>Repair waste water pipeline.</p> <p><u>Standard (How well):</u></p> <p>Water leakage tested. Pipe positioned on level. Waste water pipeline repaired as per standard.</p>	<ul style="list-style-type: none"> ➤ Leakage area finding technique ➤ Method of selecting fittings and materials ➤ Procedure ➤ Safety precaution

Required Tools/equipment: Wooden saw/ Measuring tape

Safety: Handle hacksaw safely.

Task Analysis

Task No: 26 Repair solar water heater.

Time : 14 hrs
Theory: 2 hrs
Practical: 12 hrs

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Find out the problem. <p>Problem on collector.</p> <ol style="list-style-type: none"> 3. Open screw of farm. 4. Remove collector's grid. 5. Remove old insulations (glass wood or etc.) 6. Put new installation. 7. Fix collector grid. 8. Repaint on the aluminum sheet (blackboard) 9. Fix U rubber for glass. 10. Fix glass on the collector. 11. Fix farm on the glass. 12. Check water. <p>Problem on boiler</p> <ol style="list-style-type: none"> 13. Open screw of outside cover. 14. Remove insulation. 15. Check water leakage. 16. Repair leakage area. 17. Rap insulation. 18. Fix outside cover. 19. Restore tools and equipment. 20. Keep records. 	<p><u>Condition (Given):</u></p> <p>Real worksite, workshop tool set and materials.</p> <p><u>Task (What):</u></p> <p>Repair solar water heater.</p> <p><u>Standard (How well):</u></p> <p>Problem on collector and boiler identified. Component of parts of collector and boiler repaired. Leakage checked running hot water on tap.</p>	<ul style="list-style-type: none"> ➤ Definition of heater and collector ➤ Need of paint and insulation ➤ Procedure ➤ Safety precautions

Required Tools/equipment: Screw driver/ Brush/Wrench

Safety: Don't empty water in the collector.

Module II:

Electrical installations/fixtures repairing

Duration: 195 hours (1.5 month)

Competencies in electrical installations/fixtures repairing

1. State the concept of electricity
2. Orient with electrical safety rules
3. Measure resistance by ohmmeter
4. Measure voltage by Voltmeters
5. Measure current by ammeter
6. Measure powers by watt meter and energy meter
7. Interpret electrical drawing/manuals/catalog
8. Repair wire/cable eyelet
9. Repair/replace lighting fixtures
10. Repair/replace doorbell
11. Repair/replace over current-protection device
12. Repair/replace electrical boxes
13. Repair mechanical parts of electrical equipment and machines
14. Repair appliances circuits
15. Repair single-pole switch circuit
16. Repair two-way switch (Three way switch) circuit
17. Repair 5 ampere, 220 volts receptacle outlet/plug/socket
18. Repair 15, ampere, 220 volts receptacle outlet
19. Cut, bend and install electrical conduit
20. Replace lamp socket/power supply cord
21. Replace fluorescent light ballast
22. Repair and/or install door-closer
23. Replace/repair switch /control units
24. Replace/repair distribution unit
25. Replace energy meter
26. Replace/repair smoke detector
27. Repair/replace defective component/connections of pump motor
28. Repair/replace defective component/connections of geyser

Tasks Analysis

Task Analysis

Task No: 1 State the concept of electricity.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions. 2 Define electricity. 3 Describe history of electricity 4 Enlist importance of electricity. 5 Enlist types of electricity. 6 Enlist uses of electricity. 7 Enlist sources of electricity. 8 Define current/voltage/resistance 9 Keep records.	Condition (Given): Classroom , books and manual Task (What): Develop the concept of electricity Standards (How well): The concept of electricity defined. Principles of electricity described. Importance of electricity enlisted. Type of electricity enlisted. Sources of electricity enlisted.	➤ Functional definition of electricity ➤ Originations of electricity ➤ Types of electricity ➤ Uses of electricity ➤ Sources of electricity ➤ Concept of current, voltage and resistance ➤ Units of current ➤ Units of voltage ➤ Units of resistance

Tools/equipment:

Safety:

Task Analysis

Task No: 2 Orient with electrical safety rules.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Define safety in common sense. 3. Describe the importance of safety. 4. Orient with general workshop shop rules. 5. Orient with color codes rules. 6. Orient with construction safety rules. 7. Orient with operation safety rules 8. Orient with tools/instruments/equipment handling safety rules. 	<p>Condition (Given):</p> <p>Workshop, necessary tools, equipment, Materials, poster, manual related to safety</p> <p>Task (What):</p> <p>Orient with electrical safety rules</p> <p>Standards (How well):</p> <p>Various safety rules concerning electrical occupation oriented.</p>	<ul style="list-style-type: none"> ➤ Concept of safety <ul style="list-style-type: none"> ▪ Definition ▪ Importance of ➤ Types of safety rules <ul style="list-style-type: none"> ▪ General workshop shop rules ▪ Color codes rules ▪ Construction safety rules ▪ Operation safety rules ▪ Tools/instruments/equipment handling safety rules ➤ Concept of shock ➤ Ways to reduce accidents <ul style="list-style-type: none"> ▪ Use of appropriate tools to make job easier and more pleasant ▪ Following of the color codes rules ▪ Use of correct sizes and types of wires in wirings. ▪ Correct methods of exposing wires and removing the sheathing of wires. ▪ Correct methods of splicing or joining together the wires ➤ Importance of grounding or earthing system in wiring

Tools/equipment:

Task Analysis

Task No: 3 Measure resistances by Ohmmeters.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions. 2 Review definition of current/voltage/resistance. 3 Describe the relationship among current, voltage and resistance. 4 Apply current dividing rule. 5 Apply voltage dividing rule. 6 Restore tools, equipment and materials. 7 Keep records.	<p>Condition (Given):</p> <p>Workshop, necessary tools, equipment and required materials.</p> <p>Task (What):</p> <p>Measure resistance with Ohmmeters. Identify tools and equipment. Handle Ohmmeter.</p> <p>Standards (How well):</p> <p>Ohm's law stated. Relationship among current, voltage and resistance described. Various tools and equipment identified Ohmmeter handled Voltage measured with Ohmmeters.</p>	<ul style="list-style-type: none"> ➤ Statement of Ohm's Law ➤ Importance of Ohm's law ➤ Application of Ohm's law ➤ Relationship among V, I & R ➤ Principle of Ohm meter ➤ Connection diagram of Ohm meter ➤ Application ➤ Connecting procedures in circuit ➤ Current dividing rule ➤ Voltage dividing rule ➤ Safety precaution

Tools/equipment: Slot and Phillips screwdrivers, Cold and wood chisels, Pliers (Needle, linesman's, multipurpose), Aviation snips, Voltage tester, continuity tester, cable stripper, Electrician's tape, Hammer, Electric drill, Spade bit, Flashlight, Fish tape, Bit extension, Hacksaw, Mini hacksaw and compass saw.

Safety:

- Handle Ohmmeter properly.
- Do not measure resistance in live circuit.

Task Analysis

Task No: 4 Measure voltages by Voltmeters.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions. 2 Review definition of current/voltage/resistance. 3 Describe the relationship among current, voltage and resistance. 4 Apply current dividing rule. 5 Apply voltage dividing rule. 6 Restore tools, equipment and materials. 7 Keep records.	<p>Condition (Given): Workshop, necessary tools, equipment and required materials.</p> <p>Task (What): Measure voltage with Voltmeters.</p> <p>Standards (How well): Voltmeter handled. Voltage measured with Voltmeter</p>	<ul style="list-style-type: none"> ➤ Principle of Volt meter ➤ Connection diagram of Voltmeter ➤ Application ➤ Connecting procedures in circuit ➤ Safety precaution ➤ Calculation procedure ➤ Types of circuit (closed, opened & short) ➤ Safety precaution

Tools/equipment: Calculator, voltmeter

Safety:

- Handle Voltmeter properly
- Do not voltage in live circuit.

Task Analysis

Task No: 5 Measure current by Ammeters.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions. 2 Review definition of current/voltage/resistance. 3 Describe the relationship among current, voltage and resistance. 4 Apply current dividing rule. 5 Apply voltage dividing rule. 6 Restore tools, equipment and materials. 7 Keep records.	<p>Condition (Given): Workshop, necessary tools, equipment and required materials.</p> <p>Task (What): Measure current with Ammeter. Handle Ammeter.</p> <p>Standards (How well): Current measured with Ammeter. Ammeter handled</p>	<ul style="list-style-type: none"> ➤ Principle of Ohm meter ➤ Connection diagram of Ohm meter ➤ Application ➤ Connecting procedures in circuit ➤ Safety precaution

Tools/equipment: Connecting leads, Ohmmeter/multimeter

Safety:

- Handle Ammeters properly.
- Do not measure current in live circuit.

Task Analysis

Task No: 6 Measure electrical power by Energy meter

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1 Receive instructions. 2 Review definition of current/voltage/resistance. 3 Recall electrical power structure. 4 Collect necessary tools equipment & materials. 5 Construct circuit for measuring current / voltage. 6 Construct circuit for measuring power. 7 Compare measured power. 8 Restore tools, equipment and materials. 9 Keep records. 	<p>Condition (Given): Workshop, necessary tools, equipment and required materials.</p> <p>Task (What): Measure electrical power with Wattmeter and Energy meter. Handle Wattmeter and Energy meter.</p> <p>Standards (How well): Electrical power measured. Wattmeter and Energy meter handled.</p>	<ul style="list-style-type: none"> ➤ Definition of work, power and energy, ➤ Units of work, power & energy ➤ Measuring procedure ➤ Conversion of power ➤ Safety precautions.

Tools/equipment: Connecting leads, power meter.

Safety:

- Handle and energy meter properly.
- Do not measure electrical in live circuit.

Task Analysis

Task No: 7 Interpret electrical drawing/manuals/catalog.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions 2 Obtain electrical drawing 3 Collect measuring instruments & materials. 4 Identify location of accessories and fittings. 5 Ensure cable route. 6 Keep records.	<p>Condition (Given): Electrical drawings, manual, catalog measuring instrument and materials.</p> <p>Task (What): Interpret electrical drawings/manual/catalog.</p> <p>Standards (How well): Electrical drawings, manual and catalog interpreted. Location of accessories and fittings identified.</p>	<ul style="list-style-type: none"> ➤ Symbols of accessories and fittings ➤ Identification of current capacity of accessories, fittings and protective devices ➤ Electrical codes of practice ➤ NEA rules and regulations ➤ Electrical codes ➤ Interpretation technique of drawing ➤ Safety precautions

Tools/equipment: Electrical codes of practice, NEA rules and regulations, electrical specifications, drawing instrument set, drawing board, cello tape.

Safety: Handle drawing instruments properly.

Task Analysis

Task No: 8 Repair wire/cable eyelets.

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Obtain the required drawing. 3. Obtain the required tools. 4. Identify wire specifications 5. Obtain the required wire/cable piece. 6. Measure and mark the wire/cable piece according to the screw sizes 7. Cut insulation of wire/cable by electrician knife/cutting pliers/wire stripper without cutting into the wire inside. 8. Remove insulation of wire/cable by pliers/wire stripper. 9. Over lap the stripping parts of wire/cable each other. 10. Twist the wire/cable each other slowly and carefully by pliers. 11. Restore the tools/material. 12. Clean the work place. 13. Restore tools, equipment and materials. 14. Keep records. 	<p><u>Condition (Given):-</u></p> <p>Workshop, necessary tools, equipment and required materials.</p> <p><u>Task (What):-</u></p> <p>Repair wire/cable eyelets.</p> <p><u>Standard (How well):-</u></p> <p>Wires/cable stripped to specified length and joined. Wires joints covered with electrician's tape.</p>	<ul style="list-style-type: none"> ➤ Introduction to wire/cable ➤ Wire specification, sizes, ampacity and their use ➤ Types of wires and cables ➤ Armored cable ➤ Technique of stripping protective coverings ➤ Concept of wire splicing ➤ Safety precautions for aluminum and copper wire splicing

Tools /Equipment: Wire specification chart and wire color code chart, Electrician's knife, Hack-saw frame and blade Stripper or Multipurpose tool

Safety:

- Tighten joints properly and cover joints with tape properly.
- Do not scratch conductor while stripping insulation

Task Analysis

Task No: **9 Repair/Replace lighting fixtures**

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Obtain required drawing/manual 3. Obtain the required tools, equipment and materials. 4. Examine the defective of connections in: Ceiling boxes Switch boxes Receptacle boxes Distribution boxes Lamp holders 5. Identify the malfunctions of the circuits in: <ul style="list-style-type: none"> ▪ Ceiling boxes ▪ Switch boxes ▪ Receptacle boxes ▪ Distribution boxes ▪ Lamp holders 6. Strip off to required length of insulation of the damaged wire end. 7. Twist and wrap it clockwise around the terminal screws. 8. Tighten the screws and reassemble the ceiling and switch boxes into its original position. 9. Reassemble the lamp and test it for satisfactory operation. 10. Restore the tools, material. 11. Clean the work place. 12. Restore tools, equipment and materials. 13. Keep records. 	<p><u>Condition (Given):-</u> Site/workshop, necessary tools, equipment, Incandescent/ Fluorescent lamps and fixtures circuits.</p> <p><u>Task (What):-</u> Repair/Replace lighting fixtures</p> <p><u>Standard (How well):-</u> Repair/Replace lighting fixtures repaired and replaced Incandescent and fluorescent light circuits tested and troubleshot.</p> <p>Switch as the only moving part in the lamp frequently checked for identifying of problems.</p>	<ul style="list-style-type: none"> ➤ Introduction of: <ul style="list-style-type: none"> • Incandescent lamps • Fluorescent lamps • Components of lamp ➤ Types of incandescent lamps and fluorescent lamps. ➤ Hooking up components of ceiling fixtures. ➤ Potential causes of lamp failures. ➤ Procedures of troubleshooting of lamp. ➤ Energy-consciousness. ➤ Functions of fluorescent gas in the tube for charging of electricity ➤ Procedures of changing tubes ➤ Replacing procedure of fluorescent components like: <ul style="list-style-type: none"> Starters Ballast Sockets ➤ Safety precautions

Tools /Equipment: Wire specification chart and wire color code chart, Electrician's knife, Hack-saw frame and blade Stripper or Multipurpose tool

Safety: Do not work in live circuit.

Task Analysis

Task No: 10 Repair/Replace over current-protection device

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Identify the fuse box/breaker panel for possible electrical wiring defectives 4 Identify the circuit connections run through the building. 5 Identify the size of the wire installed in the building. 6 Identify the fuse or breaker installed for the single circuit of entire building or for different branch circuits. 7 Perform continuity test of all boxes. 8 Remove breaker loosening the load-power-lug-screw and the power wire. 9 Rectify/Repair all defective connections/burnt out fuses/breakers. 10 Restore tools, equipment and materials. 11 Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Over-current-protection devices repaired or replaced.</p> <p>Standards (How well): Over-current-protection devices repaired or replaced as per the rated values of the power.</p>	<ul style="list-style-type: none"> ➤ Principle of electric circuits. ➤ Introduction of protective devices. ➤ Purpose and use of protective devices in individual circuits of different parts of the buildings such as living room, kitchen, baths room, garage etc. ➤ Types of protective devices : Plug or edition base fuse, Ferrule-edge fuse, knife-edge fuse, cartridge fuse, Time-delay fuse, Miniature circuit breaker fuse (MCB), MCCB fuse, and Ground fault circuit interrupts(GFCI) ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware's and wiring materials.

Safety: Do not work in live circuit.

Task Analysis

Task No: 11 Repair/Replace doorbell

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
1 Receive instructions. 2 Collect tools/instruments & materials. 3 Check and locate the doorbell Points or circuit. 4 Open do Clean clapper/hammer 5 Clean clapper/hammer and doorbell covers. 6 Clean push button switch by striping to bare metal part or replace it. 7 Check and test doorbell circuits 8 Check and locate problems or fainted sound of the doorbell 7 Check/repair/replace broken or frayed wires and nuts 8 Check and tight terminal screws of the push button switch. 9 Perform final test and operate doorbell. 10 Restore tools, equipment and materials. 11 Keep records.	Condition (Given): Site/workshop, necessary tools, equipment, and materials Task (What): Repair/Replace doorbell Standards (How well): Doorbell repaired and replaced as per standard.	➤ Working principle ➤ Identification of doorbell parts such as : • Electro-magnet of solenoid coil • Iron frame for solenoid coil • Soft iron cores for solenoid coil • Bakelite base • Gong to release the sound • Clapper or hammer to strike the gong • Contact strip to make contact with adjusting screw • Adjusting screw to contact with armature • Binding post or terminals to connect the supply wires • Construction procedures ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware's and wiring materials.

Safety:

- Do not work in live circuit.
- Use pushbutton switch for bell

Task Analysis

Task No: 12 Repair/Replace electrical boxes

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Inspect the entire existing installation systems 4 Check the service entrance wiring box step by step process 5 Check hot wires, neutral and the ground wire connections 6 Check each hot wire run to the breaker switch. 7 Check the inserted wires in each junction box. 8 Check the outgoing wires from each box to light points. 9 Repair/Replace junction box 10 Repair/Replace broken/burnt out wires 11 Connect securely the defective wires to proper connection 12 Test the repaired connections with the appropriate instrument. 13 Perform final test of the repaired installation for satisfactory operation. 14 Collect and store all tools to designated place. 15 Clean work place. 16 Restore tools, equipment and materials. 17 Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What):</p> <p>Repair/Replace electrical boxes.</p> <p>Standards (How well):</p> <p>New switches and outlets mounting or utility boxes repaired, replaced and reinstalled removing the old ones.</p>	<ul style="list-style-type: none"> ➤ Introduction of Switches, Boxes, Socket outlets, Panel board boxes, Combinations boxes to serve different needs ➤ Types of boxes : Plastic, Metal Gang boxes for two or more switches or socket outlets ➤ Use of clamping wire and knockouts in boxes

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware's and wiring materials.

Safety:

Task Analysis

Task No: 13 Repair mechanical parts of electrical equipment and machines

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions/manual. Collect the required tools, instrument/materials. 2. Identify the appliances to be repaired. 3. Check physically and test the appliances. 4. Check/remove and replace oil oil seal and washer. 5. Check bearing and make them free from greasing. 6. Check and replace worn replace bearing. 7. Check and replace brushes. 8. Check and clean commentators. 9. Check and replace cleats, porcelain bead. 10. Clean rusted points in the body of iron/kettle/heaters. 11. Restore tools, equipment and materials. 12. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair mechanical connections</p> <p>Standards (How well): Mechanical connections repaired in accordance with the specifications.</p>	<p>Inspections of breakers:</p> <ul style="list-style-type: none"> ➤ Main contacts ➤ Bus bar ➤ Earthing ➤ Bearing and joints ➤ Insulated parts <p>Techniques of:</p> <ul style="list-style-type: none"> ➤ Maintenance of metal clad switches such as handle, lever, tension of the spring, Pins of cover and handle, contact strips, terminal strips and screws, insulating fibre rod, fuse grips and base <p>Trouble shooting of fluorescent tube:</p> <ul style="list-style-type: none"> ➤ Starter contacts (welded or shorted), ➤ Alignment of motor ➤ Drying of motor ➤ Checking of motor before commissioning. ➤ Electrical checking ➤ Maintenance of motors ➤ Rotor maintenance ➤ Care of bearings

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardwires and wiring materials.

Safety: Handle tools and measuring instruments properly.

Task Analysis

Task No: 14 Repair/Replace single-pole switch circuit.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1 Receive instructions. 2 Collect necessary tools, equipment & materials. 3 Check the existing single Pole operated circuits for proper Condition(s). 4 Check the existing old wiring for following stages : <ul style="list-style-type: none"> • Tapping condition into an existing wiring • Replace or redraw a new circuit • Replace or reinstall a new switch boxes • Draw new wire for replacement of wiring under the floors or through the walls. 5 Connect single pole switch and tightening down the phase wires under the screws 6 Make the loop three quarters of the way around the screw 7 Make assure that no wire is sticking out under the screws.. 8 Inspect and check wiring. 9 Test wiring. 10 Restore tools, equipment and materials. 11 Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair/Replace single-pole switch circuit</p> <p>Standards (How well): Single-pole switch circuit repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Types of switches ➤ Function of switches ➤ Selection of protective devices ➤ Procedure ➤ Safety precaution.

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardwares and wiring materials.

Safety: Handle hand tools properly.

TASK ANALYSIS

Task No: 15 Repair/Replace two-way switch (Three way switch) circuit.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials 3. Check the existing two way three Pole operated circuits for proper Condition(s). 4. Check the existing old wiring for following stages : <ul style="list-style-type: none"> • Tapping condition into an existing wiring • Replace or redraw a new circuit • Replace or reinstall a new switch boxes • Draw new wires for replacement of wiring under the floors or through the walls. 5 Connect two way switch and tightening down the phase wires under the screws 10 Make the loop three quarters of the way around the screw 11 Make assure that no wire is sticking out under the screws. 12 Inspect and check wiring. 13 Test wiring. 14 Restore tools, equipment and materials. 15 Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What):</p> <p>Repair/Replace two-way switch (Three way switch) circuit.</p> <p>Standards (How well):</p> <p>The two way (three ways) switches connected in pairs to control a light from either end of a room or hallway, or at the top and bottom of stairs repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Function of switches. ➤ Uses of four basic types of switch in house ➤ The most common places for using two ways switches in house. ➤ Reasons for using two ways switches in pairs. ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control and indicating accessories, lighting fittings, fixing hardwires and wiring materials.

Safety: Handle hand tools properly.

Task Analysis

Task No: 16 Repair/Replace 240 volts, 5 amperes receptacle outlet/plug/socket.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1 Receive instructions. 2 Collect necessary tools, equipment & materials 3 Check incoming power supply passes through the power point(s). 4 Check the reasons of fuse blown every time. 5 Identify and remove the cause of the short circuit in the receptacle(s). 6 Make the terminal screws tight and reinstall the socket outlet. 7 Replace the socket outlet with the three wholes if fuse blown out again and again. 8 Reinstall grounding-type socket outlet only, if box is metal. 9 Inspect and check wiring. 10 Test wiring. 11 Restore tools, equipment and materials. 12 Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair/Replace receptacle outlet/plug/socket.</p> <p>Standards (How well): Receptacle outlet, plug and socket repaired and replaced in accordance with the load.</p>	<ul style="list-style-type: none"> ➤ Receptacle outlet and its functions. ➤ Identification of color code of the wires and the indication of the black, red, white and the green color for phase, neutral and the ground wires. ➤ Types of receptacle outlet and the slots: <ul style="list-style-type: none"> • Ungrounded two-prong plug • Grounded three-prong plug • Grounded plug (240volts – 30 amps) • Grounded plug (240 volts- 60 amp) ➤ Concept on where the outlets used [primarily for cooking ranges, air conditioners and water heaters (geysers)] ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring cables and materials, and Power sockets

Safety: Handle hand tools properly.

Task Analysis

Task No: 17 Repair /Replace 240 volts, 15 ampere above outlets/ plug/socket.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Check incoming power supply passes through the power point(s). 4. Check the reasons of fuse blown every time. 5. Identify and remove the cause of the short circuit in the receptacle(s). 6. Make the terminal screws tight and reinstall the socket outlet. 7. Replace the socket outlet with the three wholes if fuse blown out again and again. 8. Reinstall grounding-type socket outlet only, if box is metal. 9. Inspect and check wiring. 10. Test wiring. 11. Restore tools, equipment and materials. 12. Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What):</p> <p>Repair/Replace 240 volts, 15 amps and above socket outlet/plug/socket</p> <p>Standards (How well):</p> <p>220 volts, 15 ampere above outlets repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring cables and materials, and Power sockets.

Safety:

- Handle hand tools properly.
- Separated fuses for power circuit from light circuit.

Task Analysis

Task No: 18 Cut/ bend/install conduits for wiring and casing capping

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Identify routes wiring run through the wall/floors/ground 4. Test the wires run for the electrical system. 5. Cut the disconnected wall/floor/ground route partly. 6. Connect wires into the original conditions securely. 7. Cut and tap or insulate the disconnected conduit ends using appropriate coupling or connectors/nipples. 8. Make cement plaster with appropriate mixtures 9. Plaster wall/floors/ground smooth. 10. Restore tools, equipment and materials. 11. Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What):</p> <p>Cut/ bend/install conduits for wiring.</p> <p>Standards (How well):</p> <p>Conduits for electrical wiring cut, bent and installed in the recesses in accordance with the local codes of installation regulations.</p>	<ul style="list-style-type: none"> ➤ Concept about wiring conduits ➤ Types and size of conduits used in electrical wirings such as: <ul style="list-style-type: none"> • Plastic conduit (PVC) • Thinwall conduit (EMT) • Rigid conduit (either steel or aluminum) ➤ Application of glues in plastic conduit for fished through the wall or floor or ground ➤ Recesses making (along the route and deep conduit through wall or floor or ground) ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring cables and materials, and fixing boxes.

Safety:

- Handle hand tools properly.
- Fix hacksaw block properly in hacksaw frame.

Task Analysis

Task No: 19 Repair/Replace lamp socket/power supply cord.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually individual lighting circuits of wiring system and supply cord. 4. Disassemble the socket, supply cord. 5. Check and test socket, circuit and the supply cord. 6. Check sliding switch of the lamp. 7. Repair sliding switch bending little upward, if contact is in “off” position. 8. Replace sliding switch, if not work properly. 9. Clean the rusted spot of the fuse socket/holder with sand paper. 10. Assemble the socket/supply cord. 11. Test and operate the lamp socket/supply cord. 12. Restore tools, equipment and materials. 13. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair/Replace lamp socket/power supply cord.</p> <p>Standards (How well): Lamp socket/power supply cord repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Concept on: <ul style="list-style-type: none"> • Open circuit fault • Short circuit fault • Earth fault • Leakage fault • Other fault such as mica and asbestos sheets damaged, any part of appliance is rusted. ➤ Procedure ➤ Safety precaution

Tools/equipment: Set of wiring tool kit, control accessories, lighting fittings, fixing hardware and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.
- Do not scratch conductor while stripping insulation
- Do not use poor insulated wire/cable

Task Analysis

Task No: 20 Replace fluorescent light and ballast.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually ballast behind the cover plate and sockets of a fluorescent tube lamp before removing the tube and wires. 4. Unplug the lamp and remove the fluorescent tubes and the cover plate, if it is. 5. Cut or disconnect the two wires running into the ballast. 6. Remove the mounting screws to free the ballast. 7. Strip the ends of wires coming from the source. 8. Connect the wire to terminal points of the ballast according to the wiring diagram printed on the ballast. 9. Remove the wires from socket, if damaged or corroded. 13 Replace the socket matching the replacement accurately. 14 Check and test the connection confirming to smooth operation. 15 Restore tools, equipment and materials. 16 Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Replace fluorescent light ballast.</p> <p>Standards (How well): Fluorescent light ballast replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Principle operation of fluorescent tube light ➤ Explain why fluorescent light is lighted brighter and longer and use lesser electricity. ➤ Working theory of fluorescent components such as : <ul style="list-style-type: none"> • Ballast • Starter • Sockets/holders/Tube/ starter ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardwires and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.

Task Analysis

Task No: 21 Repair/ install door-closer.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually switch points and circuits of wiring system. 4. Check connection points for malfunction. 5. Identify problems. 6. Repair faults. 7. Test circuits. 8. Perform pre-commission test of the circuit. 9. Operate the circuit. 10. Restore tools, equipment and materials. 11. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair and/or install door-closer</p> <p>Standards (How well): Repair and/or install door-closer in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Concept of door closer ➤ Constructions of door closer ➤ Types : <ul style="list-style-type: none"> • Manual • Spring type • Automatic ➤ Functions : <ul style="list-style-type: none"> • Manual • Push button switch, motion or detector proximity detector and other devices ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardware and wiring cables and materials, controlling accessories, fixing boxes test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.

Task Analysis

Task No: 22 Replace/repair switch /control units

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually ceiling rose of light and fan points. 4. Flip and check lamp switch 5. Check fuse or breakers. 6. Cut the power and check out the switch. 7. Remove the wall plate of the switch. 8. Make sure no power coming to switch while testing. 9. Replace the switch. 10. Retest the switch to confirm for smooth operation after replacement. 11. Connect wires to switches under a binding screw terminal or in a push-in terminal. 12. Operate the circuit. 13. Restore tools, equipment and materials. 14. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Replace/repair switch /control units</p> <p>Standards (How well): Switch and control units repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Concept and importance of shut off power ➤ Color codes and use of wires phase, neutral and ground. ➤ Branch connection for switch ➤ Fitting Clamps ➤ Moveable fittings ➤ Uses of wires according to the color codes. ➤ Ampere and voltage rating and the use of wire sizes according to the rating ➤ Identification of : <ul style="list-style-type: none"> • Binding screw terminal of the switch • Push-in terminal of the switch • One screw, two wires connection. ➤ Identification of a malfunction ➤ Replacing techniques of switches ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardwires and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.

Task Analysis

Task No: 23 Replace/repair distribution panel/control units.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually fuses and breakers of the distribution box. 4. Identify and check the incoming line and the circuit breakers or fuses of individual circuits going to house. 5. Disconnect and check the consumer's main switch pulling a handle down to "off" position. 6. Identify and check the individual circuits distributed to different circuits. 7. Identify and tally the power loads bear by the each branch circuit. 8. Remove the breaker(s) loosening the load power lug screw and the wires. 9. Replace the new breaker(s) gripping with your thumb and index finger. 10. Replace the new GFCI breaker gripping with your thumb and index finger. 11. Check and test installations & connections. 12. Restore tools, equipment and materials. 13. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Replace/repair distribution panel/control units.</p> <p>Standards (How well): Distribution panel and control units repaired or replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Concept and importance of shut off power ➤ Color codes and use of wires of phase, neutral and ground wires. ➤ Identification and location of various faults ➤ Open circuit fault ➤ Short circuit fault ➤ Earth or leakage faults ➤ Continuity testing ➤ Trouble shooting of lighting wirings ➤ Trouble shooting of power points wirings ➤ Undertaking of inspection, servicing, examining and overhauling activities. ➤ Undertaking repair, maintenance and recommissioning activities ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardwires and wiring cables and materials, fixing boxes test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.
- Use fuse according to the load

Task Analysis

Task No: 24 Repair/replace/Energy meter.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Inspect visually protective over load devices of the system and the service entrance wires pass to the energy meter. 4. Check drip loops and eaves of the roof for any damaged/frayed wires. 5. Check the weatherhead and service box used to hookup wires for the energy meter. 6. Repair and maintain flashing seal used to prevent rainwater dripping down the pipe/through wires.. 7. Repair and maintain screw terminals of the main disconnect switch. 8. Inspect, check and repair wires going out to house circuits 9. Inspect, check and repair neutral wires coming from the house circuits to the neutral bus-bar. 10. Measure, test and tally the comprehensive loads of the meter. 11. Perform the pre-commissioning test. 12. Operate the circuit. 13. Restore tools, equipment and materials. 14. Keep records. 	<p>Condition (Given):</p> <p>Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What):</p> <p>Repair / replace protective and overload devices.</p> <p>Standards (How well):</p> <p>Protective and overload devices repaired and replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Single and three phase wiring systems (concept only) ➤ Principle operation of : <ul style="list-style-type: none"> • Fuse, MCB, MCCB • Ferrule type Fuse • Knife-edge (cartridge) fuse, HRC • Drop out fuse (DO Fuse) • Time-delay fuse • Time clock switch • Circuit breaker • Earth leakage circuit breaker or Ground fault circuit interrupters (ELCB or GFCI) • Screw type fuse • Dimmer • Pilot light attached with the switch • Clock attached with the switch • Single phase and three phase energy meters. ➤ Construction & components of the 1ϕ and 3 ϕ energy meters. ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardwares and wiring cables and materials, fixing boxes, fuses and protective devices, test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.

Task Analysis

Task No: 25 Replace/repair smoke alarm/detector.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Inspect visually. 4. Blow out a match/candle under the detector and check it. 5. Inspect visually for the missing/low power of batteries (alarm may chirp at interval of time if battery power is low). 6. Check the power supply of the detector. 7. Clean debris/dust inside of the alarm/detector. 8. Inspect and tighten the connections. 9. Check the location of alarm and detectors. 10. Discard the old alarm/detector and replace by new one if alarm gives continues sounds. 11. Replace all old alarm/detectors after reach 10 years. 12. Restore tools, equipment and materials. 13. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Replace/repair smoke detector(s)</p> <p>Standards (How well): Smoke detector/fire alarm(s) repaired and replaced based upon the standards (Smoke detector/alarm should be 20 feet's from oven toaster, 10 feet's from heater, furnaces, vent and bathroom. established by the local authority.</p>	<ul style="list-style-type: none"> ➤ Working principles (radiation from a small amount of radioactive materials) & photoelectric sensor in light level caused by smoke. ➤ Types: (Optical smoke detector, ionization smoke detector & Cigarette smoke detector) ➤ Reliability and Power source of smoke detectors & backup sources. ➤ Uses of batteries; 9 volts alkaline, lithium battery & its life ➤ Reasons behind why the rechargeable battery not allowed using in smoke detectors ➤ Installation of smoke detector in (kitchen, Bedrooms, stairway, hallway, Garage) ➤ Procedure ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, fixing hardwires and wiring cables and materials, fixing boxes, fuses and protective devices, test lamp/phase tester.

Safety:

- Handle hand tools properly.
- Follow safety while working in live line.

Task Analysis

Task No: 26 Repair/replace defective component & connections of pump motor.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions. 2. Collect necessary tools, equipment & materials. 3. Interpret drawing. 4. Identify and check the main faults of the pump such as failure of main supply, capacitor, rotor shaft, and tension of belt, physical condition of connections, supply voltage and grease. 5. Check the main switch with test lamp. 6. Check and replace fuses or breakers. 7. Check and repair control circuit, if wrong. 8. Check the windings and recommend repairing it in the workshop. 9. Check for phase failure with the test lamp. 10. Check motor for misalignment 11. Check motor for giving noise. 12. Check motor for bearings overheating. 13. Check motor for overheating motor 14. Check and set all above possible faults correctly. 15. Energize installation systems. 16. Check for operation. 17. Restore tools, equipment and materials. 18. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair /replace the defective components & connections of pump motor.</p> <p>Standards (How well): Defective components and connections of the pump motor repaired or replaced in accordance with the specifications.</p>	<ul style="list-style-type: none"> ➤ Working principle of pump motor ➤ Common type of pump motor <ul style="list-style-type: none"> • Centrifugal pump • Capacitor-start & polyphone type motor ➤ Rating of the pump motor using in houses for raising or moving water ➤ Techniques of testing and checking of noisy motor ➤ Techniques of testing and checking of overheating motor ➤ Techniques of testing and checking of overheating of bearings. ➤ Techniques of testing: <ul style="list-style-type: none"> • Open circuit • Short circuit • Loose circuit • Loose contact • Eccentric rings ➤ Safety precautions

Tools/equipment:

Safety:

Task Analysis

Task No: 27 Repair/replace defective component/connections of geyser.

Performance steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> 1. Receive instructions 2. Collect necessary tools, equipment & materials. 3. Interpret drawing. 4. Shut down the switch to turn off supply line. 5. Check fuse blown or the tripping off supply line. 6. Replace the heating element, if burnt out or calcium building up 7. Check and replace defective thermostat. 8. Reset the thermostat dial, if water not hot enough. 9. Reset the thermostat dial to a lower setting, if water too hot. 10. Make and drain regular flushing, if the geyser gives rumbling and cracking sounds. 11. Check the leaking point of the geyser (water heater). 12. Drain the water out. 13. Remove the outer jacket and insulation tighten. 14. Drill, insert and tighten the toggle bolt to stop the leak. 15. Test the temperature and pressure relief valve by squeezing its lever. 16. Restore tools, equipment and materials. 17. Keep records. 	<p>Condition (Given): Site/workshop, necessary tools, equipment, and materials</p> <p>Task (What): Repair/replace defective component/connections of geyser</p> <p>Standards (How well): Defective component/connections of geyser repaired and replaced as per the instruction given in the control panel.</p>	<ul style="list-style-type: none"> ➤ Importance of : <ul style="list-style-type: none"> • hot water systems in modern houses • Bathroom, kitchen & laundry room ➤ Technique of replacing a water heater or geyser ➤ Technique of emptying the tank before repairing. ➤ Disconnecting the water inlet and outlet pipes from the heater. ➤ Detaching the power or gas line from the heater. ➤ Checking of methodology of plumb line and level for reinstalling the heater ➤ Instruction given in the control panel plate for activating the heater ➤ Safety precautions

Tools/equipment: Set of wiring tool kits, pulling/fish wire, different color of insulation tape for identification marking.

Safety:

- Use hand tools properly
- Move carefully around construction site.

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4. Deolakar S.G., *Plumbing Design and Practice*, Tata Mc Graw-Hill Publishing Company Limited, 1994.
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Glossary used in the technical and vocational curricula

Competency: A performance capability needed by workers in a specific area.

Curriculum guide: A curriculum guide is a detail resource for teachers to conduct training programs effectively. The guide intends to add the teacher in developing lesson plan, handouts, training manuals, and evaluation criteria etc, which are basic elements in the teaching learning process.

Curriculum: A plan for providing sets of learning opportunity to achieve broad goal and related specific objectives for an identifiable population serves by a single school center.

DACUM: Developing A Curriculum. DACUM is a technique that uses a group consultative process to identify the competencies relevant to a particular occupation. These competencies are then built on to form a vocational curriculum.

Duty: is an arbitrary clustering of related tasks in to broad functional area or general area of responsibility.

Enabling Objective: The Objectives are defined as to set for guiding the teacher and students to attain the end result of the particular unit of work or lesson.

Instructional Guide: is a well-planned and structured document for the instructor to deliver effective instruction so that trainees can attain learning is objectives as per training standards.

Module: A module is defined as a specific learning material. Modules are essentially self-contained. Self-instructional packages, with learning paced by each learner according to his/her individual ability and needs. A module covers either a single element of subject matter content or a group of content elements forming a discrete unit of subject matter or area of skills.

Occupational Analysis: is a process used to identify the duties and tasks that are important to workers in any given occupation. A number of alternative and acceptable approaches to occupational analysis are available.

Program guide: A program guide is a comprehensive resource for teachers, planners, and top-level management for planning and implementation of any training programs.

Program Objectives: The objectives are set in a broad way to target to achieve mastery learning of the complete occupation.

Related Technical Knowledge: Knowledge essential to perform a task/ step in complete, accurate and safe manner.

Skill: The ability to perform on occupational task with the degree of proficiency required for a given occupation

Step: The smallest discrete or observable aspect of a task.

Task Analysis: Task analysis is the process of identifying and writing down the specific skills, knowledge and attitudes that distinguish someone who performs a task competently from someone who cannot perform the task at all.

Task: A unit of work complete in itself that forms a logical part of an occupation. It can be broken down into discrete steps.

Terminal Performance Objective: The objectives set to attain at the end of the training completion. It includes condition, unit of work and standard of teaching and learning.