

Curriculum

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**Plumber**

*(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 **Plumber** is designed to produce employable **plumbers** equipped with knowledge, skills and attitudes related to the occupation. It is expected that, the trainees will acquire skills and knowledge during the period of in house training and will practice the skills related to plumbing works in the under construction private and public buildings as well as over the repairable installations and fixtures of the existing buildings. 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 competent plumbers 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 **plumbers** who could provide plumbing 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 plumbing materials, tools, equipment and fitting materials related to plumbing
2. Handle plumbing related tools and equipment
3. Identify and apply plumbing symbols and codes
4. Perform various bench work such as measuring, marking, filing and sawing
5. Make various sizes of threads on galvanized iron pipes
6. Join and connect GI, CI and PVC fittings
7. Make various types of polyethylene fittings for joining the pipes
8. Install various types of fixtures in private and public buildings
9. Replace/repair and maintain the parts of installations and fixtures
10. Repair and maintain minor masonry and plastering works
11. Prepare quantity estimates and costing

**Course Description**

This course intends to provide skills and knowledge on preparatory works for installations and fixtures fittings related to the occupation.

This course focuses on overview of related occupation, Identification of tools, equipments, and materials, Identification of symbols and codes, Safety rules, Bench work, GI, CI and PVC joining and connecting works, Various installations fitting works, Fixtures installation, replacing, repairing and maintaining the parts of installations and fixtures, Repairing minor masonry and plastering works and Preparing quantity estimate and costing.

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.

**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.

This curriculum also insists in the provision of hands on skill to gain maximum exposure on practical experience.

**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.
- 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.
- There will be three internal evaluations and one final evaluation at institution.
- The ratio between internal and final examination of knowledge test will be 20:80 but for the performance test it will be 80:20.

#### **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 "**Plumber**" to those trainees who successfully complete the prescribed course and conducted evaluation.

**Skill Testing Provision**

The graduates who have the completion certificate of "**Plumber**" may sit in the skill testing examination of level one (L-1) as administered by National Skill Testing Board.

**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 and equipment*****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)	Grinder (5 nos.)

	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



### Competencies in Plumbing

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. Measure the dimension using vernier caliper.
9. Cut GI pipe.
10. Thread GI pipe.
11. Perform bending.
12. Drill a hole.
13. Join elbow/Tee/union/cross/plug with pipe.
14. Join valves (sluice valve/gate valve/air valve/pressure relief valve/check valve/glove valve) with pipe.
15. Cut Pe pipe.
16. Make butt joint of Pe pipe.
17. Make 90/45/bend/elbow of Pe pipe.
18. Make Y/Tee Pe branch.
19. Make Reducer socket/vent cowl of Pe pipe.
20. Install sanitary fittings (bent/Tee/Y/socket) with pipe.
21. Join PVC fittings with pipe.
22. Cut CI pipe.
23. Join CI fittings with pipe.
24. Install multilayer composite tube.
25. Install tap (bib cock/CP tap/fixture).
26. Install shower.
27. Install fixtures (washbasin/bath tub/ bottle trap/sink).
28. Install fixtures (commode/ cistern/ pan).
29. Install electrical geyser.
30. Install water pump.
31. Install roof tank.
32. Connect ferrule and service pipeline.
33. Repair tap/fixture/angle valve.
34. Repair gate valve.
35. Repair conceal valve.
36. Repair floating valve.
37. Repair water pump.
38. Repair water closet (commode and pan).
39. Repair/wash basin/urinal/sink
40. Repair cistern.
41. Repair shower.
42. Repair water pipe line.
43. Repair waste water pipelines.
44. Repair solar water heater.
45. Repair/maintain minor masonry and plastering works
46. Prepare quantity estimate/costing

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

**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"> <li>1. Receive instructions.</li> <li>2. Enlist the objectives of identification of plumbing materials /fitting /valves /fixtures.</li> <li>3. Enumerate/identify type of plumbing materials.</li> <li>4. Enumerate/identify type of fittings.</li> <li>5. Enumerate/identify type of valves.</li> <li>6. Enumerate/identify types of fixtures.</li> <li>7. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>OHP, transparency, white board and marker, handout and safety poster.</p> <p><b><u>Task (What):</u></b></p> <p>Enumerate/identify plumbing materials/ fittings/valves fixtures.</p> <p><b><u>Standard (How well):</u></b></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"> <li>➤ Objectives of plumbing materials, fittings, valves and fixtures identification</li> <li>➤ Function of fittings and valves</li> <li>➤ Classification of various types of fittings</li> <li>➤ Types of plumbing materials and their specification</li> <li>➤ Grades and types of GI pipes</li> <li>➤ Types of valves commonly available</li> <li>➤ Types of fixtures</li> <li>➤ Identification of plumbing materials, fittings, valves and fixtures</li> </ul>

**Tools and equipment:**

**Safety:**

## Task Analysis

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

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

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

**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"> <li>1. Receive instructions.</li> <li>2. Prepare drawing materials.</li> <li>3. Enlist objectives of symbols identification.</li> <li>4. Enumerate various types of symbols.</li> <li>5. Identify the symbols for real picture of object.</li> <li>6. Sketch the required symbols.</li> <li>7. Complete the sketch with detail information.</li> <li>8. Restore all tools and materials.</li> <li>9. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Drawing classroom. Manual, drawing board, pencil, drawing paper, eraser, scale</p> <p><b><u>Task (What):</u></b></p> <p>Enumerate/identify/sketch plumbing and symbols.</p> <p><b><u>Standard (How well):</u></b></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"> <li>➤ Concept of symbols and codes</li> <li>➤ Enumeration of various types of plumbing symbols</li> <li>➤ Identification of various types of plumbing symbols</li> <li>➤ Application of symbols and codes</li> <li>➤ Free hand sketching technique</li> </ul>

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

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

**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><b>1. Measurement:</b> 1.1 Measure the dimension. (Inch/centimeter, millimeter, meter)</p> <p><b>2. Marking:</b> 2.1 Measure the dimension as per drawing. 2.2 Mark the point by using scriber or pencil.</p> <p><b>3. Filing</b> 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 filling surface level and perpendicular using by back square. 3.6 Measure the final dimension. 3.7 Clean work place.</p> <p><b>4. Sawing:</b> 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><b><u>Condition (Given):</u></b> Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b> Measure/mark/file/saw work piece</p> <p><b><u>Standard (How well):</u></b> Work piece measured. Work piece filed. Right angle maintained. Straight sawn</p>	<ul style="list-style-type: none"> <li>➤ Measurement system</li> <li>➤ Conversion of units</li> <li>➤ Marking system</li> <li>➤ Method of filing</li> <li>➤ Method of sawing</li> <li>➤ Identification of tools</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Tools/equipment:** - marking scriber/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 Measure the dimension using vernier caliper.**

Time: 3 hrs  
Theory: 1 hr  
Practical: 2 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Receive instructions.</li> <li>2. Obtain pre machined W/P.</li> <li>3. Obtain vernier caliper.</li> <li>4. Clean the caliper &amp; check that the caliper reads correctly.</li> <li>5. Clean the work pieces &amp; remove burrs.</li> <li>6. Measure outside dimension.</li> <li>7. Set the outside measuring jaw to a dimension larger than that to be measured.</li> <li>8. Place the work piece between the two jaws.</li> <li>9. Move the sliding jaw so that the caliper grips the W/P.</li> <li>10. Make sure that the jaws are in full contact with W/P.</li> <li>11. Read the number of millimeters on the main scale, which show in front of the zero of the vernier scale.</li> <li>12. Read the tenths of mm (0.1) or twentieths (0.05) on the vernier scale.</li> <li>13. Add together both reading</li> <li>14. Measure inside dimension.</li> <li>15. Set the inside measuring jaws of the caliper to a dimension smaller than the dimension be measured.</li> <li>16. Place the jaws against the W/P.</li> <li>17. Move the sliding jaw so that the caliper grafts the work piece.</li> <li>18. Read the measurement as the out side dimension.</li> <li>19. Restore all tools and materials.</li> <li>20. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b> Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b> Measure the dimension using vernier caliper.</p> <p><b><u>Standard (How Well):</u></b> Outside &amp; inside dimensions measured.</p>	<ul style="list-style-type: none"> <li>➤ Introduction &amp; Features of vernier caliper.</li> <li>➤ Reading scale &amp; uses of vernier caliper.</li> <li>➤ Least count &amp; care of vernier caliper</li> </ul>

**Tools/equipment:**

**Safety:**

- Clean the W/P & vernier caliper before use.
- Use vernier caliper only for measuring.
- Clean the vernier caliper after use & store it safely.

## Task Analysis

**Task No: 9 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"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Read drawing.</li> <li>4. Take measurement for cutting.</li> <li>5. Fix GI pipe on the pipe vice.</li> <li>6. Hold the saw with blade.</li> <li>7. Cut GI pipe gently with full strokes.</li> <li>8. Remove pipe from the vice.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p style="text-align: center;">Cut GI pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Work piece measured. Work piece cut. Right angle maintained.</p>	<ul style="list-style-type: none"> <li>➤ Types of cutting tools</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**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: 11 Perform bending.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain the drawing/catalog.</li> <li>2. Read the drawing carefully.</li> <li>3. Obtain the required tools.</li> <li>4. Obtain the required work piece (PVC/metal pipe).</li> <li>5. Mark the center and bending portion on the pipe as per the given drawing.</li> <li>6. Clamp the pipe on near centre in the pipe vices firmly.</li> <li>7. Hold the pipe vices handle in correct position.</li> <li>8. Bend the pipe slowly according to bending degree.</li> <li>9. Restore the tools/materials.</li> <li>10. Clean the work area.</li> <li>11. Keep records.</li> </ol>	<p><b><u>Condition (Given):-</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):-</u></b></p> <p>Perform the bending.</p> <p><b><u>Standard (How well):-</u></b></p> <p>Pipe bended on right degree Measurement Performed Offsets calculated Pipe bent on centre</p>	<ul style="list-style-type: none"> <li>➤ Introduction to bending</li> <li>➤ Types of bending</li> <li>➤ Calculation of offsets</li> <li>➤ Method of bending</li> <li>➤ Safety precautions</li> </ul>

**Tools /Equipment:** Steel scale, Scriber, Pipe vice, and Divider.

**Safety:** Don't apply too much pressure while bending the pipe; do slowly.

## Task Analysis

**Task No: 12 Drill a hole.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain the drawing/catalog.</li> <li>2. Obtain required tools and equipment.</li> <li>3. Obtain finished work piece.</li> <li>4. Mark layout line on the work piece.</li> <li>5. Punch the center.</li> <li>6. Clamp the work piece on the machine vice.</li> <li>7. Mount the required drill bit on drill chuck.</li> <li>8. Set up R.P.M. as per drill bit size.</li> <li>9. Set coolant-housing pipe.</li> <li>10. Start the machine &amp; give hand feed.</li> <li>11. Drill until the required depth is obtained.</li> <li>12. Stop the machine.</li> <li>13. Remove the work piece from vice &amp; clean it.</li> <li>14. Measure the center &amp; the size of hole as per given drawing.</li> <li>15. Remove the drill bit &amp; clean tools &amp; working place.</li> <li>16. Restore all tools and materials.</li> <li>17. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b> Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b> Drill a hole.</p> <p><b><u>Standard (How Well):</u></b> Work piece clamping checked. Drill bit mounting checked. Selection of R.P.M. checked. Accuracy &amp; finishing of dimension checked.</p>	<ul style="list-style-type: none"> <li>➤ Importance of drill machine</li> <li>➤ Types of drill machine.</li> <li>➤ Drill bits &amp; its types.</li> <li>➤ Importance of speed feed R.P.M.</li> <li>➤ Calculation of R.P.M.</li> </ul>

**Tools/equipment:** Drill machine, Drill bit, Vice and Centre punch

**Safety:**

- Tighten the work piece perfectly.
- Check drill bit cutting edge before drilling
- Use safety goggles.
- Never use very loose cloth, tie, chain etc.
- Use clan brush to clean the chips.
- Follow general safety rules.

## Task Analysis

**Task No: 13 Join elbow/Tee/union/cross/plug with pipe.**

Time: 15 hrs  
Theory: 1 hr  
Practical: 14 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain necessary materials.</li> <li>3. Obtain necessary tools.</li> <li>4. Make the thread on GI pipe.</li> <li>5. Rap hemp on the thread clockwise.</li> <li>6. Turn GI fitting freely two or three thread.</li> <li>7. Tighten fitting (elbow/tee/union/cross/cap) full thread by pipe wrench.</li> <li>8. Remove hemp out side of the fitting.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Join elbow/Tee/union/cross/plug with pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Thread length Center to center measured. Tightness of fitting maintained. Leakage tested.</p>	<ul style="list-style-type: none"> <li>➤ Concept of Z dimension</li> <li>➤ Z dimension calculation</li> <li>➤ Center to center dimension</li> <li>➤ Tightness of fitting</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**Safety:**

- Do not damage fitting surface by wrench.
- Do not use pipe wrench for hammer.

## Task Analysis

**Task No: 14 Join valves (sluice valve/gate valve/air valve/pressure relief valve/check valve/glove valve) with pipe.**

Time: 6 hrs  
Theory: 1 hr  
Practical: 5 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials.</li> <li>3. Obtain required tools.</li> <li>4. Make thread on GI pipe.</li> <li>5. Rap hemp on the thread clockwise.</li> <li>6. Turn Gate valve freely two or three thread.</li> <li>7. Tighten Gate valve.</li> <li>8. Tighten the gate valve full thread with Adjustable wrench.</li> <li>9. Clean hemp of out side valve.</li> <li>10. Test leakage of the joint..</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Join valves with GI pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Valves turned Valves tightened Leakage tested.</p>	<ul style="list-style-type: none"> <li>➤ Various type of valves and faucets</li> <li>➤ Function of various type of valves</li> <li>➤ Tightness of valve</li> <li>➤ Flow of water on valve</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Tools/equipment:** Hacksaw frame/ Steel scale/Pipe vice/Stock and die/Pipe adjustable wrench/Oilcan

**Safety:**

- Do not damage valve surface.



## Task Analysis

**Task No: 15. 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"> <li>1. Obtain drawing/catalog.</li> <li>2. Collect required material.</li> <li>3. Obtain required tools</li> <li>4. Take measurement for cutting</li> <li>5. Fix Pe pipe on the pipe vice.</li> <li>6. Hold a wooden saw.</li> <li>7. Cut Pe pipe gently with full strokes.</li> <li>8. Remove pipe from the vice.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Cut Pe pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Work piece cut. Work piece measured. Right angle maintained.</p>	<ul style="list-style-type: none"> <li>➤ Introduction to Pe pipe</li> <li>➤ Properties of Polyethylene materials</li> <li>➤ Types of Pe pipe</li> <li>➤ Cutting devices</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**Safety:** Handle wooden saw properly.

## Task Analysis

**Task No: 16 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"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required tools and equipment.</li> <li>3. Obtain required materials.</li> <li>4. Select correct size of pipe according to the drawing.</li> <li>5. Measure and mark necessary dimensions with yellow pencil.</li> <li>6. Cut the pipe straightly by wooden saw.</li> <li>7. Clean the cut surface.</li> <li>8. Heat Pe pipe cuts on hot plat.</li> <li>9. Join the two heated cuts pieces of Pe pipe immediately with required pressure on them straightly.</li> <li>10. Check the butt-welding by using hammer/cut/water.</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Make butt joint of Pe pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Measurement checked. Straight welded. Leakage tested.</p>	<ul style="list-style-type: none"> <li>➤ Function of heating plate</li> <li>➤ Method of joining</li> <li>➤ Principle Teflon tape/marker</li> <li>➤ Size of heating plate</li> <li>➤ Welding temperature</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

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

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

**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

Time: 19 hrs  
Theory: 1 hr  
Practical: 18 hrs

**Task No: 20 Install sanitary fittings (Bend/Tee/Y/Socket) with pipe.**

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required tools and materials.</li> <li>3. Cut necessary Pe pipes as per calculation.</li> <li>4. Assemble Bend/Tee/Y/Socket, fitting with Pe pipe as per drawing.</li> <li>5. Perform leakage test.</li> <li>6. Dismantle pipeline.</li> <li>7. Restore all tools and materials.</li> <li>8. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Install sanitary fitting (Bend/Tee/Y/Socket) with pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Alignment of pipeline aligned. Leakage tested. Measurement checked. Straight welded. Level checked.</p>	<ul style="list-style-type: none"> <li>➤ Calculation of cutting angle</li> <li>➤ Calculate cutting length of PVC pipe</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**Safety:**

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

## Task Analysis

**Task No: 21 Join PVC fittings with pipe.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tool,</li> <li>3. Cut necessary PVC pipes as per calculation.</li> <li>4. Clean joint surface of PVC pipe by using grinding paper/ sand paper.</li> <li>5. Use adhesive to lubricant joint surface of PVC pipe by brush.</li> <li>6. Assemble different fittings with PVC pipe as per drawing.</li> <li>7. Perform leakage test.</li> <li>8. Dismantle pipeline.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Join PVC fitting with pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Pipeline aligned. Leakage tested. Measurement checked Level checked.</p>	<ul style="list-style-type: none"> <li>➤ Identification of jointing materials</li> <li>➤ Calculation of cutting length of PVC pipe</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Wooden saw / Measuring tape/Wooden file/Knife/Miter box

**Safety:**

- Be careful while using wooden saw.
- Handle solvent cement carefully because it is harmful/highly burnable.

## Task Analysis

**Task No: 22. Cut CI pipes.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Prepare materials and tools.</li> <li>3. Mark the CI pipe by using chalk.</li> <li>4. Place pipe on the sand floor.</li> <li>5. Cut CI pipe using cold chisel and hammer.</li> <li>6. Restore all tools and materials.</li> <li>7. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Cut CI pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Work piece cut. Work piece measured. Right angle maintained</p>	<ul style="list-style-type: none"> <li>➤ Introduction to CI pipe</li> <li>➤ Properties of cast iron materials</li> <li>➤ Types of CI pipe</li> <li>➤ Size of CI pipe</li> <li>➤ Cutting tools and equipment</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** - Measuring tape/Hammer/Cold chisel

**Safety:**

- DO NOT use mushroom head chisel
- Wear glove while cutting CI pipes.



## Task Analysis

**Task No: 23. Join CI fittings with pipe.**

Time: 13 hrs  
Theory: 1 hr  
Practical: 12 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tool.</li> <li>3. Mark the pipe for necessary lengths of pipe.</li> <li>4. Cut the lengths of CI pipes as per calculation.</li> <li>5. Melt the lead.</li> <li>6. Fix spigot to Hub of CI pipe.</li> <li>7. Yarn hemp between spigot and hub of pipe</li> <li>8. Put mud around the hub.</li> <li>9. Melt necessary quantity of lead in a melting pot.</li> <li>10. Pull out the hemp from the hub.</li> <li>11. Pour the melting lead into the hub.</li> <li>12. Clack lead with clacking tools.</li> <li>13. Assemble different fitting with CI pipe as per drawing.</li> <li>14. Perform leakage test.</li> <li>15. Dismantle pipeline.</li> <li>16. Restore all tools and materials.</li> <li>17. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Join CI fitting with pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Pipeline aligned. Leakage tested. Measurement checked Level checked. Tightness of yarning of hemp maintained. Tightness of calking lead maintained.</p>	<ul style="list-style-type: none"> <li>➤ Temperature of melt lead</li> <li>➤ Types of joints</li> <li>➤ Hemp</li> <li>➤ Quantity and area of pouring lead</li> <li>➤ Identification of jointing materials</li> <li>➤ Calculate cutting length of CI pipe</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Measuring tape/hammer/Cold chisel/Yarning tool/Calking tool/Rope/Stove/Pan/

**Safety:**

- Do not pour water in melting lead.
- Remove slag before pour lead.

## Task Analysis

**Task No: 24 Install multilayer composite tube.**

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

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Receive instructions.</li> <li>2. Read catalog/drawing.</li> <li>3. Obtain required materials and tool.</li> <li>4. Mark the pipe for necessary lengths of pipe.</li> <li>5. Cut the lengths of MC tubes as per calculation.</li> <li>6. Perform pipe calibration and deburring.</li> <li>7. Mount the fitting.</li> <li>8. Tighten the pipe with the fitting.</li> <li>9. Perform leakage test.</li> <li>10. Dismantle pipeline.</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop tools set and materials</p> <p><b><u>Task (What):</u></b></p> <p>Install multilayer composite tube.</p> <p><b><u>Standard (How well):</u></b></p> <p>Pipeline aligned. Leakage tested. Measurement checked. Level checked.</p>	<ul style="list-style-type: none"> <li>➤ Use of multilayer composite pipe and fittings.</li> <li>➤ Concept of thermal conductivity</li> <li>➤ Concept of MCP.</li> <li>➤ Application in hot water system</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Pipe cutting tools/ Pipe bending tool/T reamer.

**Safety:**

## Task Analysis

**Task No: 25 Install tap (Bib cock/CP tap/fixture).**

Time: 6 hrs  
Theory: 1 hr  
Practical: 5 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Make thread on GI pipe.</li> <li>4. Rap hemp clockwise on the thread.</li> <li>5. Turn GI socket freely two or three thread.</li> <li>6. Tighten GI socket full-thread by pipe wrench.</li> <li>7. Fix pipeline on the wall.</li> <li>8. Rap ceiling tape on the tap thread.</li> <li>9. Tighten tap into the socket.</li> <li>10. Restore all tools and materials.</li> <li>11. Keep records.</li> </ol>	<p><b>Condition (Given):</b> Site, workshop, necessary tools, equipment and materials</p> <p><b>Task (What):</b> Install Tap (bib cock/CP tap/fixture).</p> <p><b>Standard (How well):</b> Leakage proof tested. Straightness of tap maintained.</p>	<ul style="list-style-type: none"> <li>➤ Types of taps</li> <li>➤ Tightness of tap</li> <li>➤ Concept of roughing- in</li> <li>➤ Flow water on tap</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape/Pipe vice/stock and die/pipe Adjustable wrench/Oilcan

**Safety:** DO NOT damage tap surface by wrench.

## Task Analysis

**Task No: 26 Install shower.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials</li> <li>3. Obtain required Tools.</li> <li>4. Layout the system on the wall.</li> <li>5. Install pipeline for hot and cold water.</li> <li>6. Install conceal valve</li> <li>7. Insulate hot water pipeline.</li> <li>8. Install shower.</li> <li>9. Perform leakage test.</li> <li>10. Clean working area.</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b></p> <p>Install shower.</p> <p><b><u>Standard (How well):</u></b></p> <p>Height of shower maintained as per drawing. Height of conceal valve maintained. Leakage tested Level checked.</p>	<ul style="list-style-type: none"> <li>➤ Height of conceal valve</li> <li>➤ Types of shower</li> <li>➤ Standard height of shower</li> <li>➤ Size of drain pipe</li> <li>➤ Unit calculation</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape/Pipe vice/Stock and die/Pipe Adjustable wrench/Oilcan

**Safety:** Do not damage conceal valve surface by wrench.

## Task Analysis

Time: 20 hrs  
Theory: 2 hrs  
Practical: 18 hrs

**Task No: 27 Install fixtures (washbasin/bath tub/ bottle trap/sink).**

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Mark positions of bracket on the wall as per drawing.</li> <li>4. Make the hole for fixing bracket by hand drill machine.</li> <li>5. Fix the bracket with grip and screw.</li> <li>6. Install fixtures (washbasin/bath tub/ bottle trap/sink) on the bracket.</li> <li>7. Apply white cement between fixtures and wall.</li> <li>8. Fix waste coupling.</li> <li>9. Install bottle trap.</li> <li>10. Restore all tools and materials.</li> <li>11. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment, materials and fixtures</p> <p><b><u>Task (What):</u></b></p> <p>Install fixtures</p> <p><b><u>Standard (How well):</u></b></p> <p>Stander height of fixtures maintained. Leakage tested. Level checked Correct positioned Meter level marked.</p>	<ul style="list-style-type: none"> <li>➤ Height of fixtures as per drawing</li> <li>➤ Selection of fixtures</li> <li>➤ Height of drain point</li> <li>➤ Height of water source</li> <li>➤ Bracket selection</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oil can/Hand drill machine/Hammer  
**Safety:** Handle drill machine properly.

## Task Analysis

**Task No: 28 Install fixtures (commode/cistern/pan).**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain the drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Connect drain pipeline with siphon.</li> <li>4. Rest fixtures (Pan/Commode)</li> <li>5. Make a level of fixtures.</li> <li>6. Press oakum between fixtures and siphon or pipe.</li> <li>7. Put cement on the oakum.</li> <li>8. Fix the cistern.</li> <li>9. Connect flush pipe with cistern and pan/ commode.</li> <li>10. Connect water pipeline with angle valve</li> <li>11. Test water leakage.</li> <li>12. Clean working area.</li> <li>13. Restore all tools and materials.</li> <li>14. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment, materials and fixtures</p> <p><b><u>Task (What):</u></b></p> <p>Install fixtures (commode/cistern/pan).</p> <p><b><u>Standard (How well):</u></b></p> <p>Standard height of fixtures maintained. Leakage tested. Level checked Correct positioned Meter level marked.</p>	<ul style="list-style-type: none"> <li>➤ Height of fixtures as per drawing</li> <li>➤ Selection of fixtures</li> <li>➤ Height of drain point</li> <li>➤ Height of water source</li> <li>➤ Height of waste water source</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/ Adjustable wrench/ Hand drill machine/Hammer

**Safety:** Take precaution of electricity.

## Task Analysis

**Task No: 29 Install electrical geyser (project work).**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Mark the positions of bracket as per drawing on the wall.</li> <li>4. Make holes for fixing bracket using hand drill machine.</li> <li>5. Fix the bracket with grip and screw.</li> <li>6. Install Electrical Geyser on the bracket.</li> <li>7. Connect hot and cold water pipe line with necessary valve and fittings.</li> <li>8. Check water leakage.</li> <li>9. Connect electric line.</li> <li>10. Restore all tools and materials.</li> <li>11. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment, materials and geyser</p> <p><b><u>Task (What):</u></b></p> <p>Install electrical geyser.</p> <p><b><u>Standard (How well):</u></b></p> <p>Electrical Geyser installed as per drawing. Leakage tested Level checked Correct positioned</p>	<ul style="list-style-type: none"> <li>➤ Standard height for electrical geyser installation</li> <li>➤ Height of water source</li> <li>➤ Selection of bracket</li> <li>➤ Electricity</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

**Safety:**

- Handle drill machine appropriately
- Take precaution of electricity.

## Task Analysis

**Task No: 30 Install water pump (plumbing part only).**

Time: 9 hrs  
Theory: 1 hr  
Practical: 8 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Mark positions for fixing bracket on the wall as per drawing.</li> <li>4. Measure horizontal level of holes (for foundation)</li> <li>5. Fix the pump according to measurement.</li> <li>6. Install foot valve or check valve on the end of suction pipeline.</li> <li>7. Install the suction pipeline with pump.</li> <li>8. Install Delivery pipeline with necessary fitting.</li> <li>9. Check the connection and leakage of joint.</li> <li>10. Test and run the pump with water suction.</li> <li>11. Clean the working area.</li> <li>12. Restore all tools and materials.</li> <li>13. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment, materials and water pump</p> <p><b><u>Task (What):</u></b></p> <p>Install water pump.</p> <p><b><u>Standard (How well):</u></b></p> <p>Dimension maintained. Pump fixed on the floor. Leakage tested Level maintained.</p>	<ul style="list-style-type: none"> <li>➤ Types of domestic pumps and their uses</li> <li>➤ Function of water pumps</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

**Safety:**

- Handle drill machine appropriately
- Take precaution of electricity.
- Do not run pump without water.



## Task Analysis

**Task No: 31 Install roof tank (project work).**

Time: 11 hrs  
Theory: 1 hr  
Practical: 10 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Calculate inlet outlet and overflow pipe lengths.</li> <li>4. Cut outlet pipe according to given drawing.</li> <li>5. Make the hole by drill machine for inlet/outlet/overflow on the tank.</li> <li>6. Tighten Tank nut with hexagon nut for inlet/outlet and overflow.</li> <li>7. Put tank on the tank stand.</li> <li>8. Install necessary fitting (gate valve, union, elbow and tee etc.)</li> <li>9. Check the connection water leakage.</li> <li>10. Clean the working area.</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment, materials and water tank</p> <p><b><u>Task (What):</u></b></p> <p>Install roof tank.</p> <p><b><u>Standard (How well):</u></b></p> <p>Level checked Leakage checked. Water tank installed as per drawing.</p>	<ul style="list-style-type: none"> <li>➤ Calculate tank size</li> <li>➤ Area selection</li> <li>➤ Installation height of tank</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer

**Safety:**

- Handle drill machine properly.
- Do not stay long time inside the tank along.

## Task Analysis

**Task No: 32 Connect ferrule and service pipe.**

Time: 3 hrs  
Theory: 1 hr  
Practical: 2 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Obtain drawing/catalog.</li> <li>2. Obtain required materials and tools.</li> <li>3. Fix the saddled clamp on the main pipeline.</li> <li>4. Make a hole by using drill machine.</li> <li>5. Tap the hole as per required size.</li> <li>6. Fix the ferrule cock on the main pipeline.</li> <li>7. Connect the pipe and pipe fitting for service pipe.</li> <li>8. Check water leakage.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Site, workshop, necessary tools, equipment and materials</p> <p><b><u>Task (What):</u></b> Connect ferrule and service pipe.</p> <p><b><u>Standard (How well):</u></b></p> <p>Leakage checked. Straightness of tap maintained.</p>	<ul style="list-style-type: none"> <li>➤ Types of ferrule cock</li> <li>➤ Tightness of ferrule</li> <li>➤ Flow water on ferrule</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Hack saw frame/ Measuring tape//Pipe wrench/Stock and die/ Adjustable wrench/Oilcan/Hand drill machine/Hammer/Tap.

**Safety:**

## Task Analysis

**Task No: 33 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"> <li>1. Receive instructions.</li> <li>2. Read catalog/real object.</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Close main water pipeline valve.</li> <li>5. Open nub cap.</li> <li>6. Turn left screw inside nub.</li> <li>7. Remove nub.</li> <li>8. Open stuffing box.</li> <li>9. Replace/repair jumper washer.</li> <li>10. Repair packing.</li> <li>11. Repair gasket.</li> <li>12. Replace spindle.</li> <li>13. Retighten stuffing box.</li> <li>14. Fix nub.</li> <li>15. Fix screw inside nub</li> <li>16. Place nub cap.</li> <li>17. Test/check water leakage.</li> <li>18. Restore all tools and materials.</li> <li>19. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair tap/fixture/angle valve</p> <p><b><u>Standard (How well):</u></b></p> <p>Leakage checked. Level checked. Tap, fixture and angle valve repaired. Handle of top operated easily.</p>	<ul style="list-style-type: none"> <li>➤ Purpose of repair</li> <li>➤ Types of repair</li> <li>➤ Periodical maintenance</li> <li>➤ Different types of taps</li> <li>➤ Name of parts of a tap</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

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

## Task Analysis

**Task No: 34 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"> <li>1. Receive instructions.</li> <li>2. Read catalog/real object.</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Close main water pipeline valve.</li> <li>5. Open stuffing box.</li> <li>6. Repair packing.</li> <li>7. Repair gasket.</li> <li>8. Repair/replace/r dish.</li> <li>9. Replace spindle.</li> <li>10. Retighten stuffing box.</li> <li>11. Test/check water leakage.</li> <li>12. Restore all tools and materials.</li> <li>13. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair gate valve.</p> <p><b><u>Standard (How well):</u></b></p> <p>Leakage checked. Level checked. Gate valve repaired. Handle of gate valve operated easily.</p>	<ul style="list-style-type: none"> <li>➤ Different types of gate valve commonly available</li> <li>➤ Name of parts of a gate valve</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**Safety:** Empty water tank before repairing gate valve.

## Task Analysis

**Task No: 35 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"> <li>1. Receive instructions.</li> <li>2. Read catalog/real object.</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Close main water pipeline valve.</li> <li>5. Open nub cap.</li> <li>6. Turn of screw inside nub.</li> <li>7. Open hexagon nut.</li> <li>8. Remove spindle.</li> <li>9. Repair/replace jumper washer.</li> <li>10. Repair gasket.</li> <li>11. Replace spindle.</li> <li>12. Retighten hexagon nut.</li> <li>13. Mix nub.</li> <li>14. Tighten screw inside nub.</li> <li>15. Fix nub cap.</li> <li>16. Test/check water leakage.</li> <li>17. Restore all tools and materials.</li> <li>18. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair conceal valve.</p> <p><b><u>Standard (How well):</u></b></p> <p>Leakage checked. Level checked. Conceal valve repaired. Conceal valve operated easily.</p>	<ul style="list-style-type: none"> <li>➤ Different types of conceal valve commonly available</li> <li>➤ Name of parts of a conceal valve</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

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

## Task Analysis

**Task No: 36 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"> <li>1. Receive instructions.</li> <li>2. Read catalog/real object.</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Open luck pin (split pin).</li> <li>5. Change rubber washer.</li> <li>6. Change ball (floating).</li> <li>7. Change rod.</li> <li>8. Refit luck pin.</li> <li>9. Test/check water leakage.</li> <li>10. Restore all tools and materials.</li> <li>11. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair floating valve.</p> <p><b><u>Standard (How well):</u></b></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"> <li>➤ Different types of floating valve commonly available</li> <li>➤ Name of parts of a floating valve</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Pliers /Screw driver

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

## Task Analysis

**Task No: 37 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"> <li>1. Receive instructions.</li> <li>2. Read catalog/real object.</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Open union from delivery and suction pipe line.</li> <li>5. Find out faults o pumping system.</li> <li>6. Mark on the out side of impeller box.</li> <li>7. Open nuts and bolts.</li> <li>8. Open impeller box.</li> <li>9. Remove impeller.</li> <li>10. Replace impeller.</li> <li>11. Fit new washer for impeller box.</li> <li>12. Tighten nuts and bolts.</li> <li>13. Open gland nut box.</li> <li>14. Fit gland rope.</li> <li>15. Tighten gland nut box.</li> <li>16. Check/test water suction. Retighten union.</li> <li>17. Restore all tools and materials.</li> <li>18. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair water pump ( mechanical parts only)</p> <p><b><u>Standard (How well):</u></b></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"> <li>➤ Types of domestic pump</li> <li>➤ Uses of domestic pump</li> <li>➤ Name of parts of a pump</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

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

**Safety:** Remove fixtures safely.



## Task Analysis

**Task No: 39 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"> <li>1. Receive instructions.</li> <li>2. Read drawing</li> <li>3. Prepare repairing tools and materials.</li> <li>4. Disconnect bottle tap from basin.</li> <li>5. Close water supply.</li> <li>6. Disconnect tap with connecting pipe.</li> <li>7. Remove washbasin from wall.</li> <li>8. Remove basin bracket.</li> <li>9. Make hole fox fixing bracket.</li> <li>10. Fix the bracket with screw grip.</li> <li>11. Install wash basin.</li> <li>12. Connect bottle trap with basin.</li> <li>13. Connect water line with tap.</li> <li>14. Check/test water leakage.</li> <li>15. Fill white cement paste in the gap between basin and wall.</li> <li>16. Restore all tools and materials.</li> <li>17. Clean wash basin.</li> <li>18. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair wash basin/urinal/sink.</p> <p><b><u>Standard (How well):</u></b></p> <p>Water leakage tested. Level checked. Wash basin, urinal and sink positioned as per drawing.</p>	<ul style="list-style-type: none"> <li>➤ Types of wash basin, urinal and sink commonly available</li> <li>➤ Name of parts of wash basin, urinal and sink</li> <li>➤ Method of selecting fixtures and bracket</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

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

## Task Analysis

**Task No: 41 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"> <li>1. Receive instructions.</li> <li>2. Read drawing/catalog.</li> <li>3. Find out leakage/damage area</li> <li>4. Prepare repairing tools and materials.</li> <li>5. Close conceal valve.</li> <li>6. Remove shower.</li> <li>7. Replace new shower.</li> <li>8. Check/test water leakage.</li> <li>9. Restore all tools and materials.</li> <li>10. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair shower.</p> <p><b><u>Standard (How well):</u></b></p> <p>Water leakage tested. Shower repair.</p>	<ul style="list-style-type: none"> <li>➤ Types of shower commonly available</li> <li>➤ Name of parts of shower</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

## Task Analysis

**Task No: 42 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"> <li>1. Receive instructions.</li> <li>2. Read drawing/catalog.</li> <li>3. Find out leakage area.</li> <li>4. Prepare repairing tools and materials.</li> <li>5. Close main valve.</li> <li>6. Dig/chisel wall or floor.</li> <li>7. Mark/cut pipe.</li> <li>8. Remove leakage/damage pipe.</li> <li>9. Select required size of pre machined pipe for replacement.</li> <li>10. Cut thread on pipe.</li> <li>11. Tighten union parts on pipe.</li> <li>12. Fix the union each other.</li> <li>13. Check/test water leakage.</li> <li>14. Apply plaster over chiseled area.</li> <li>15. Restore all tools and materials.</li> <li>16. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair water pipeline</p> <p><b><u>Standard (How well):</u></b></p> <p>Water leakage tested. Pipe positioned on level Water pipeline repaired.</p>	<ul style="list-style-type: none"> <li>➤ Leakage area finding technique</li> <li>➤ Method of selecting fittings and materials</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

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

**Safety:** Handle die set safely.

## Task Analysis

**Task No: 43 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"> <li>1. Receive instructions.</li> <li>2. Read drawing/catalog.</li> <li>3. Find out blockage area.</li> <li>4. Prepare repairing tools and materials.</li> <li>5. Chisel/dig floor.</li> <li>6. Cut pipe.</li> <li>7. Remove leakage/blockage pipe.</li> <li>8. Join new pipe with expansion socket.</li> <li>9. Check/test water leakage.</li> <li>10. Apply plaster over chiseled area.</li> <li>11. Restore all tools and materials.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Real work site/ workshop Tools set and Materials.</p> <p><b><u>Task (What):</u></b></p> <p>Repair waste water pipeline.</p> <p><b><u>Standard (How well):</u></b></p> <p>Water leakage tested. Pipe positioned on level. Waste water pipeline repaired as per standard.</p>	<ul style="list-style-type: none"> <li>➤ Leakage area finding technique</li> <li>➤ Method of selecting fittings and materials</li> <li>➤ Procedure</li> <li>➤ Safety precaution</li> </ul>

**Required Tools/equipment:** Wooden saw/ Measuring tape

**Safety:** Handle hacksaw safely.

## Task Analysis

**Task No: 44 Repair solar water heater.**

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

Performance Steps	Terminal Performance objectives	Related Technical Knowledge
1. Receive instructions. 2. Find out the problem. <b>Problem on collector.</b> 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. <b>Problem on boiler</b> 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><b><u>Condition (Given):</u></b></p> Real worksite, workshop tool set and materials.	<ul style="list-style-type: none"> <li>➤ Definition of heater and collector</li> <li>➤ Need of paint and insulation</li> <li>➤ Procedure</li> <li>➤ Safety precautions</li> </ul>
	<p><b><u>Task (What):</u></b></p> Repair solar water heater.	
	<p><b><u>Standard (How well):</u></b></p> Problem on collector and boiler identified. Component of parts of collector and boiler repaired. Leakage checked running hot water on tap.	

**Required Tools/equipment:** Screw driver/ Brush/Wrench

**Safety:** Don't empty water in the collector.

## Task Analysis

**Task No: 45 Maintain/repair minor masonry and plastering works.**

Time: 6 hrs  
Theory: 1 hr  
Practical: 5 hrs

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Receive instructions for repairs.</li> <li>2. Collect repair and maintenance tools.</li> <li>3. Open out the repairing part for maintenance.</li> <li>4. Wire-brush the repairing portion to make dustless, dirt less and loose particle less.</li> <li>5. Washout the portion to remove dirt, dust or loss particles.</li> <li>6. Prepare mortar @ of 1:3 cement sand.</li> <li>7. Soak the surface with clean water.</li> <li>8. Spread mortar on the bed of the coming building unit with the help of trowel.</li> <li>9. Place the building unit pressing on spread mortar and make flush with the existing building unit surface.</li> <li>10. Place mortar and building unit fill up the repairing portion.</li> <li>11. Cure the built up portion for few days.</li> <li>12. Prepare plastering stuff with cement and sand.</li> <li>13. Plaster the built up surface with the prepared stuff with the help of plastering trowel.</li> <li>14. Cure the surface with water after 10 hours of the application and continue it for few days.</li> <li>15. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b></p> <p>Repairing portion that requires building up and plastering, necessary tools, equipment, materials and fixtures</p> <p><b><u>Task (What):</u></b></p> <p>Maintain/repair minor masonry and plastering works.</p> <p><b><u>Standard (How well):</u></b></p> <p>Minor masonry and plastering work repaired and maintained.</p>	<ul style="list-style-type: none"> <li>➤ Concept of brick bonding pattern</li> <li>➤ Mortar preparation techniques</li> <li>➤ Plastering methods</li> <li>➤ Curing of plastering</li> </ul>

**Required Tools/equipment:** Trowel, Shovel/Mortar Pan /Bucket/ Hawk/ Brick hammer/ Bolster/ Spirit level

**Safety:** Keep the plastered portion safe from damages until it cures well.

## Task Analysis

**Task No: 46 Prepare quantities and estimate/costing.**

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

Performance Steps	Terminal Performance Objectives	Related Technical Knowledge
<ol style="list-style-type: none"> <li>1. Receive instructions and specification of the works.</li> <li>2. Receive drawing along with specifications of the works.</li> <li>3. Read dimensions of various works in the drawing.</li> <li>4. Use a format of detailed estimate of quantities.</li> <li>5. Enter items of works, their numbers, dimensions like length, breadth and height or depth.</li> <li>6. Work out the quantities and total quantities of each item of work asked.</li> <li>7. Use abstract cost sheet format for costing the items of work.</li> <li>8. Enter item no., description of item of works, quantities, unit of the quantity, rate per unit of the item of work and total amount of the item of works.</li> <li>9. Total up the amount of all asked items of work.</li> <li>10. Add from 5 to 7.5% of the total cost for work charged establishment and contingencies to get grand total cost of the project.</li> <li>11. Write the grand total amount in words, which is estimated budget for the project and sign it.</li> <li>12. Keep records.</li> </ol>	<p><b><u>Condition (Given):</u></b> Drawings, specification rate and calculator</p> <p><b><u>Task (What):</u></b> Prepare quantities estimate/costing.</p> <p><b><u>Standard (How well):</u></b> Quantities of various items of works prepared and their costs and total budget prepared.</p>	<ul style="list-style-type: none"> <li>➤ Concept of measuring units</li> <li>➤ Interpretation of drawing</li> <li>➤ Building technology and understanding of specification.</li> <li>➤ Government Norms for construction.</li> </ul>

**Required Tools/equipment:** Calculator/ Detailed estimate sheet/ Pencil/ Drawings/ Rates of item of works/Government Norms for construction.

**Safety:**



## References

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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.