education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

SUBJECT GUIDELINES

CONSTRUCTION PLUMBING

NQF LEVEL 2

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INTRODUCTION

A. What is Construction Plumbing?

In Construction Plumbing, students acquire the skills to install sanitary fittings, water piping to buildings and sewerage systems.

B. Why is Construction Plumbing important in the Building and Civil Construction programme?

Most building structures require plumbing; therefore, students interested in careers in the building and civil construction industry must be aware of plumbing principles and requirements.

C. The link between Construction Plumbing Learning Outcomes and the Critical and Developmental Outcomes

In Construction Plumbing, students develop the skill to work in a team and to identify and provide possible causes of and solutions to problems. Students also learn to understand and contribute to the environment by meaningfully interpreting information which they will come across in their future lives.

Students can demonstrate an understanding of the world as a set of related systems by recognising the impact that the different construction environments can have on an industry. Lastly, students can explore educational and career opportunities in the industry and important building services.

D. Factors that contribute to achieving the Construction Plumbing Learning Outcomes

- Thorough preparation for teaching and learning activities
- An environment conducive to teaching and learning through effective learner support, motivation, commitment and a positive attitude
- An interest in Construction Plumbing
- Exposure to construction environments

CONSTRUCTION PLUMBING – LEVEL 2

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1 DURATION AND TUITION TIME

This is a one-year instructional programme comprising 200 teaching and learning hours. The subject may be offered on a part-time basis provided the student meets all the assessment requirements.

Students with special education needs (LSEN) must be catered for in a way that eliminates barriers to learning.

2 SUBJECT LEVEL FOCUS

The student will be able to:

- Set out the work, procure the necessary resources and prepare the work area to complete plumbing activities.
- Install, maintain and repair hot and cold water plumbing systems.
- Install, inspect and maintain below-ground drainage systems.
- Build, inspect and maintain drainage access structures.
- Install on-site sanitation systems.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

Internal assessment refers to continuous assessment which is college based. The achievement of Learning Outcomes counts towards the achievement of a qualification. All internal assessments must be finalised by an assessor who has been declared competent by an accredited service provider.

3.1.1 Theoretical component

The theoretical component forms 60 percent of the internal assessment mark.

Internal assessment of the theoretical component in Construction Plumbing Level 2 takes the form of observation, class questions, group work, informal group competitions with rewards, individual discussions with students, class, topic and semester tests and internal examinations. Lecturers can observe students when marking exercises from the previous day and asking class questions.

Assignments, case studies and tests can be completed at the end of a topic. Tests and internal examinations must form part of the internal assessment.

3.1.2 Practical component

The practical component forms 40 percent of the internal assessment mark.

Practical components include applications and exercises. All practical components must be indicated in a Portfolio of Evidence (PoE).

Internal assessment of the practical component in Construction Plumbing Level 2 takes the form of assignments, practical exercises, case studies and practical examinations in a simulated construction environment.

Students may complete practical exercises daily. Assignments and case studies can be completed at the end of a topic. Practical examinations can form part of internal practical assessment.

- **Some examples of practical assessments include, but are not limited to:**
  - A. Presentations (lectures, demonstrations, group discussions and activities, practical work, observation, role-play, independent activity, synthesis and evaluation)
  - B. Exhibitions by students
  - C. Visits undertaken by students based on a structured assignment task
  - D. Research
  - E. Task performance in a “Structured Environment”

- **Definition of the term "Structured Environment"**

For the purposes of assessment, "Structured Environment" refers to a simulated workplace or workshop environment. Activities in the simulated workplace or environment must be documented in a logbook with a clear listing of the competencies to be assessed. The following information must be contained in the logbook:

- Nature of department or environment in which practical component was achieved
- Learning Outcomes
- Activities in the environment with which to achieve the Learning Outcomes
- Time spent on activities
- Signature of lecturer or supervisor and student

For the logbook to be regarded as valid evidence, it must be signed by an officially assigned supervisor.

- **Evidence in practical assessments**

All evidence pertaining to evaluation of practical work must be reflected in the students' Portfolio of Evidence (PoE). The tools and instruments constructed and used to conduct these assessments must be clear from the evidence contained in the Portfolio of Evidence (PoE).

3.1.3 Processing of internal assessment mark for the year

A year mark out of 100 is calculated by adding the marks of the theoretical component (60 percent) and the practical component (40 percent) of the internal continuous assessment (ICASS).

3.1.4 Moderation of internal assessment mark

Internal assessment is subjected to internal and external moderation procedures as set out in the *National Examinations Policy for FET College Programmes*.

3.2 External assessment (50 percent)

A National Examination is conducted annually in October or November by means of a paper(s) set and moderated externally. A practical component will also be assessed.

External assessment details and procedures are set out in the *Assessment Guidelines: Construction Plumbing* (Level 2).

4 WEIGHTED VALUES FOR TOPICS

TOPICS	WEIGHTED VALUE
1. Understand and Describe Basic Plumbing Principles	10
2. Install and Repair Water Supply Systems	20
3. Install Waste-water Fixture and Sanitary Fittings	35
4. Install Below-the-Ground Drainage Systems	25
5. Construct Brick Masonry Manholes and Chambers	10
TOTAL	**100**

5 CALCULATION OF FINAL MARK

Internal assessment mark: Student's mark/100 x 50 = a mark out of 50 (a)

Examination mark: Student's mark/100 x 50 = a mark out of 50 (b)

Final mark: **(a) + (b) = a mark out of 100**

All marks are systematically processed and accurately recorded to be available as hard copy evidence for, amongst others, reporting, moderation and verification purposes.

6 PASS REQUIREMENTS

The student must obtain at least fifty (50) percent in ICASS and fifty (50) percent in the examination.

7 SUBJECT AND LEARNING OUTCOMES

On the completion of Construction Plumbing Level 2, the student should have covered the following topics:

Topic 1: Understand and Describe Basic Plumbing Principles
Topic 2: Install and Repair Water Supply Systems
Topic 3: Install Waste-water Fixture and Sanitary Fittings
Topic 4: Install Below-the-Ground Drainage Systems
Topic 5: Construct Brick Masonry Manholes and Chambers

7.1 Topic 1: Understand and Describe Basic Plumbing Principles

Subject Outcome 1: Understand and describe basic plumbing techniques.

Learning Outcomes:

The student should be able to:
- Describe basic water flow principles.
- Describe water pressure principles.
- Describe water quality principles.
- Explain basic corrosion of plumbing materials.
- Describe basic pollution prevention principles.

Subject Outcome 2: Identify and describe uses of plumbing tools and materials.

Learning Outcomes:

The student should be able to:
- Identify plumbing tools and equipment and describe their uses.
- Identify and describe plumbing pipe work and related fittings and indicate their uses.
- Identify and describe plumbing sanitary ware fixtures and fittings and indicate their uses.
- Identify and describe ancillary plumbing materials and consumables and explain their uses.

7.2 Topic 2: Install and Repair Water Supply Systems

Subject Outcome 1: Plan, prepare and select tools and set out work area for plumbing.

Learning Outcomes:

The student should be able to:
- Read and interpret building drawings.
- Identify the correct work area according to the drawings.
- Identify and communicate work that affects other contractors according to worksite procedures.
- Select correct materials, tools and equipment to perform plumbing activities.
- Identify and prevent damaging of existing services and built-in items.

Subject Outcome 2: Cut, thread and join GMS pipes in accordance with drawings.

Learning Outcomes:

The student should be able to:
- Position fittings and reduce bushes and gate valves according to the drawings.
- Use all measurements in accordance with the drawings.
- Install pipe work and gate valves correctly while ensuring that pipes are free of threading oil and tool marks.
- Verify that horizontal and vertical pipes run parallel to one another.
- Test a test piece of pipe to determine its ability to accommodate water pressure and to ensure there are no leaks.

Subject Outcome 3: Cut, bend and assemble copper pipe work.

Learning Outcomes:

The student should be able to:
- Select and use class 460/2 copper pipe for bending according to the drawing.
- Select and use class 460/0 copper pipe for the remaining pipe work.

- Complete measurement for bending according to the drawing.
- Position a gate valve, ball-o-stop and stopcock according to the drawing.
- Remove excess flux and ensure that the soldering is free of defects.
- Test the test piece of pipe for leaks.

Subject Outcome 4: Repair and alter the existing copper pipe work.

Learning Outcomes:

The student should be able to:

- Insert a T-copper fitting in damaged pipe work without removing the existing pipe from the wall.
- Insert a T-copper fitting into the copper pipe, reassemble it using a slip coupler and install additional pipe work and elbows.
- Check that soldered capillary joints are sound and free of defects and flux.

Subject Outcome 5: Repair and maintain taps, valves and locks.

Learning Outcomes:

The student should be able to:

- Replace the washer in a 20 mm section through a chromium-plated bib tap and check opening and closing.
- Replace the washer in a diaphragm-type ball valve and check opening and closing.
- Fit a replacement kit to a closing pressure control valve.
- Fit a complete washer kit to a senior flush master flushing valve.
- Replace the washer in a Beta-type flushing valve.

7.3 Topic 3: Install Waste-water Fixtures and Sanitary Fittings

Subject Outcome 1: Plan, prepare and select tools and set out work area for plumbing.

Learning Outcomes:

The student should be able to:

- Read and interpret building drawings.
- Identify the correct work area according to the drawings.
- Identify and communicate work that affects other contractors according to worksite procedures.
- Select correct materials, tools and equipment to perform plumbing activities.
- Identify and prevent damaging existing services and built-in items.

Subject Outcome 2: Install waste-water fixtures and explain methods of installation.

Learning Outcomes:

The student should be able to:

- Install a sink with hot and cold water supplies, a P-trap and water pipe according to the drawing.
- Install a pedestal wash basin with a bottle trap, PVC waste pipe connected to a discharge stack and hot and cold water supply, using a single tap-hole basin mixer with outlet pop-up waste and two regulating valves according to the drawing.
- Install a bath with a combined bath trap and overflow, PVC waste pipe discharging over a galley and hot and cold water supply, using bib taps discharging over the top edge of the bath according to the drawing.
- Install a bidet with a bottle trap, PVC discharging pipe connected to the soil pipe and copper pipe for hot and cold water according to the drawing.
- Install the hot and cold water supplies, tap and waste pipe for a shower according to the drawing.

Subject Outcome 3: Install and test sanitary fittings and explain the methods of installation.

Learning Outcomes:

The student should be able to:

- Install a low level water closet suite with water supply and overflow according to the drawing.
- Install a wall-hung urinal with a bottle trap and PVC discharge pipe connected to a PVC soil vent pipe and fit a flush valve and cold water supply according to the drawing.

7.4 Topic 4: Install Below-the-Ground Drainage Systems

Subject Outcome 1: Recognise the various systems, definitions and terminology used and applicable to the installation of drainage systems.

Learning Outcome:

The student should be able to:

- Explain various systems, definitions and terminology used for the installation of drainage systems.

Subject Outcome 2: Prepare for plumbing activities.

Learning Outcomes:

The student should be able to:

- Select materials and tools for plumbing activities.
- Plan and set out work area according to site procedures.
- Fit soil, waste and vent pipes according to the specifications.
- Test pipes according to the specifications.

Subject Outcome 3: Install a below-the-ground drainage system in accordance with the drawing.

Learning Outcomes:

The student should be able to:

- Explain and install a drainage system according to the drawing and set out and excavate trenches in line and level.
- Place soil vent pipes in position as indicated on the drawing.
- Bend, join and lay drain pipes 900 mm from and parallel to the wall of the building.
- Check if invert levels on different points are correct for the slope of the drain.
- Install the whole drain with a fall of 1:40 in a series of straight lines according to the plan.
- Backfill and compact excavations.
- Inspect drain pipes and clear blockages after installation.

Subject Outcome 4: Install a drain to comply with the air-test.

Learning Outcomes:

The student should be able to:

- Pump air into the drain to a pressure of not less than 0,35 kPa.
- Measure pressure after three minutes to be not less than 0,25 kPa.

7.5 Topic 5: Construct Brick Masonry Manholes and Chambers

Subject Outcome 1: Build a brick manhole and construct and steel-trowel finish the benching of the manhole according to the drawing.

Learning Outcomes:

The student should be able to:

- Build, square and level the manhole.

  Range: One brick thick, three courses high with internal measurements of 915 mm x 610 mm
- Install the channel on bedded mortar and use weak concrete as an in-fill to receive the vertical and sloping benches.
- Plaster two ends and the sloping benching.

  Range: 12 – 18 mm thick
- Plaster vertical benching 75 mm high, flush with the inside of the channel and steel trowel to a smooth finish.
- Plaster the sloping benching at an angle from the top of the vertical benching to the top edge of the third course of bricks and steel trowel to a smooth finish.

8 RESOURCE NEEDS FOR TEACHING CONSTRUCTION PLUMBING – LEVEL 2

8.1 Physical resources

- Classroom and suitable venue for practical assessments
- Teaching aids and pre-designed models and structures
- Work tables, work area, chairs and chalkboards
- Overhead projector

8.2 Human resources

The lecturer should have an acceptable NQF level qualification in Building and Civil Construction and should preferably be a registered assessor. The lecturer should be committed to continually improving and expanding his or her knowledge and skills.

8.3 Other resources

- Toolbox and tools for each student
- Equipment and tools:

1. Plumbing materials
2. Nibblers – lock former
3. Scaffolding
4. Theodolite
5. Drain rods
6. Pipe threading machine (electrical)
7. Soldering irons
8. Goggles
9. Safety boots
10. Helmets
11. Breathing aids
12. Signage
13. Fittings
14. Pre-cast concrete rings
15. Hand tools
16. Generator
17. Drain testing machine
18. Trestles
19. Ladders
20. Dumpy level and boning rods
21. Jetting machine (drain cleaning)
22. Gas bottles
23. Gloves
24. Overalls
25. Masks and ear plugs
26. Torches
27. Gumboots
28. Pipes
29. Consumables
30. Prefabricated manholes
31. Power tools