



higher education
& training

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NATIONAL CERTIFICATES (VOCATIONAL)

SUBJECT GUIDELINES

CONCRETE STRUCTURES

NQF Level 4

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CONCRETE STRUCTURES - LEVEL 4

CONTENTS

INTRODUCTION

1. DURATION AND TUITION TIME

2. SUBJECT LEVEL FOCUS

3. ASSESSMENT REQUIREMENTS

3.1. Internal assessment

3.2. External assessment

4. WEIGHTED VALUES OF TOPICS

5. CALCULATION OF FINAL MARK

6. PASS REQUIREMENTS

7. SUBJECT AND LEARNING OUTCOMES

7.1. Delivery, handling and storage of reinforcing steel

7.2. Installation of reinforcing steel

7.3. Checks before concreting

7.4. Placing and compacting concrete

7.5. Striking formwork, making good and finishing of concrete

7.6. Cleaning and storage of formwork

8. RESOURCE NEEDS FOR THE TEACHING OF CONCRETE STRUCTURES - LEVEL 4

8.1. Physical resources

8.2. Human resources

8.3. Other resources

INTRODUCTION

A. What is Concrete Structures about?

Concrete Structures is the science of concrete composition and production and its application in various structures such as buildings, dams, bridges and roads.

B. Why is Concrete Structures important in the Construction learning programme?

Concrete work has a critically important role to play in ensuring the strength of structures constructed in the field of Civil Engineering. The reinforcement of concrete is a key aspect of this role, requiring technical expertise relating to handling, storage and installation of reinforcing steel. Processes related to the production of concrete elements, and care of the materials used in this production, are also a focus of this subject at level 4.

C. The link between Concrete Structures and the Critical and Developmental Outcomes

Students will be able to deal with aspects of reinforcement and to perform reinforced concrete activities. They will work effectively with the other team members to complete activities relevant to the subject. Concrete Structures also prepares students to communicate their understanding of the different aspects of reinforcement of concrete structures in required circumstances.

D. Factors that contribute to achieving Learning Outcomes

- Good preparation for teaching and learning activities;
- A conducive teaching and learning environment with effective learner support, motivation, commitment;
- Positive attitude and interest in concreting.
- Students will benefit from exposure to the construction environment to enable their interest in the subject to develop.

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 elective subject Concrete Structures Level 4 has been designed to equip learners with a basic understanding of the principles, methods, materials and equipment required to build formwork in timber and steel.

3 ASSESSMENT REQUIREMENTS

3.1 Internal assessment (50 percent)

3.1.1 Theoretical component

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

Internal assessment of the theoretical component in Concrete Structures Level 4 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 60 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 Concrete Structures Level 4 takes the form of assignments, practical exercises, case studies and practical examinations in a simulated business 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 facilitator 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 student's Portfolio of Evidence. The assessment instruments used for the purpose of conducting these assessments must be part of the evidence contained in the 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 and the practical component 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. The practical component will also be assessed.

External assessment details and procedures are set out in the *Assessment Guidelines: Concrete Structures*.

4 WEIGHTED VALUES OF TOPICS

TOPICS	WEIGHTED VALUE
1. Delivery, handling and storage of reinforcing steel	10%
2. Installation of reinforcing steel	35%
3. Checks before concreting	10%
4. Placing and compacting concrete.	25%
5. Striking formwork, making good and finishing of concrete	10%
6. Cleaning and storage of formwork	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

A student must obtain at least 50 percent in ICASS and 50 percent in the examination to achieve a pass in this subject.

7 SUBJECT AND LEARNING OUTCOMES

On completion of Concrete Structures Level 4, the student should have covered the following topics:

- Topic 1: Delivery, handling and storage of reinforcing steel
- Topic 2: Installation of reinforcing steel
- Topic 3: Checks before concreting
- Topic 4: Placing and compacting concrete
- Topic 5: Striking formwork, making good and finishing of concrete
- Topic 6: Cleaning and storage of formwork

7.1 Topic 1: Delivery, handling and storage of reinforcing steel

7.1.1 Subject Outcome 1: Receive and store reinforcing steel

Learning Outcomes

The student should be able to:

- Explain and demonstrate the lifting of long bundles of reinforcing with slings attached so that approximately a quarter of the length of the bundle projects beyond the lifting points on either end.
- Explain why a layer of light brown rust on reinforcing steel is not a valid reason to reject steel.
- List reasons why rust on reinforcing steel generally starts on the bends before it rusts elsewhere.
- Explain the correct handling of reinforcing steel when for example off-loading a truck.
- Explain and demonstrate how contaminated surfaces of reinforcing may affect the bonding of concrete.
- Explain and demonstrate the importance of rinsing/ washing with fresh water reinforcing bars that have been exposed to sea salt spray immediately prior to placing concrete.

7.2 Topic 2: Installation of reinforcing steel

7.2.1 Subject Outcome 1: Explain and correctly tie reinforcing steel

Learning Outcomes

The student should be able to:

- Correctly identify, describe and explain the purpose of different types of ties used in reinforcing steel.
- List reasons for using only black annealed wire of 1.5 to 1.6mm diameter when tying reinforcing steel.
- Tie reinforced steel with black annealed wire of 1.5 to 1.6mm.

7.3 Topic 3: Checks before concreting

7.3.1 Subject Outcome 1: Perform pre-concreting checks prior to placement of concrete

Learning Outcomes

The student should be able to:

- Inspect formwork and reinforcing before placing concrete and complete a provided checklist.

7.4 Topic 4: Placing and compacting concrete

7.4.1 Subject Outcome 1: Explain and correctly use a concrete mixer

Learning Outcomes

The student should be able to:

- Correctly interpret slump limits for hand-placed and vibrated concrete for different applications according to regulated prescribed national standards
- Explain and perform the correct procedure for charging a concrete mixer and state minimum mixing times.
- Explain and demonstrate the importance of adhering to the stated capacity when loading a concrete mixer.
- Explain how to delay the stiffening of concrete in the mixer if necessary and describe rules regarding adding additional water to increase the slump.

7.4.2 Subject Outcome 2: Place and compact concrete correctly

Learning Outcomes

The student should be able to:

- Explain how to avoid the formation of a cold-joint when casting annular/closed ring structures.
- Explain correct and incorrect methods of dropping concrete and preventative measures to take.
- Explain challenges when dropping concrete into tall wall and column forms.
- Describe and illustrate methods to overcome challenges of placing concrete into tall walls and columns.
- Explain what causes honeycombing in the bottom of columns and walls and how to prevent/overcome this.
- Explain and demonstrate the risk and trimming of “overcast” columns.
- Explain the formation and removal of laitance on top of cast concrete and top up the concrete.
- Motivate use of plums and describe rules for correctly using plums.
- Explain how to eliminate plastic settlement cracks in concrete.
- Explain the importance of and demonstrate adhering to the design professionals’ stated maximum rate of rise in wall and column forms.
- Explain and demonstrate the use of poker vibrators on site.
- List the tell-tale signs indicating problems or danger with the formwork and falsework during a pour.
- Explain and demonstrate actions to be taken when a form “kicks” or if the falsework moves during a pour.

7.5 Topic 5: Striking formwork, making good and finishing of concrete

7.5.1 Subject Outcome 1: Explain and perform striking of formwork, making good and finishing

Learning Outcomes

The student should be able to:

- Explain factors to consider before removing formwork.
- Explain the role of early cube test results in confirming that the concrete is sufficiently strong for the formwork to be removed.
- Explain and interpret “Concrete works structural” as prescribed by regulated national standards to determine the minimum time before removing formwork.
- List reasons why prescribed minimum time frames are not a guarantee that the structure will not collapse when forms are removed.
- Describe the concept “double headed jack” and explain its function.
- Explain how a double headed jack allows soffit formwork to be struck very early and re-used elsewhere while still safely supporting the slab.
- Explain the importance of striking soffit formwork in the correct sequence approved by a design professional.
- Demonstrate the correct technique of prising away shutters with wooden wedges without damaging the newly cast concrete.
- Explain the advantages of preventing damage rather than trying to repair damage to concrete while making good
- Describe the problems of concrete repair.
- Remove grout runs, fins and lipping without damaging or bruising adjacent concrete.
- Explain problems that may be encountered when using foreign non-cementitious binders (such as epoxies) to repair concrete.
- Fill blowholes with a sand-cement grout applied with a sponge and replace formwork to ensure adequate cure.
- Procure tools, materials and equipment to repair concrete defects and prepare concrete surfaces to receive repairs.
- State proportions of ingredients needed to make a dry-pack repair mortar and demonstrate two tests to confirm when the correct amount of water has been added to the mix.
- Prime the surfaces of a substrate to receive dry-pack mortar.
- Repair minor honeycomb and tie-bolt holes and cure the repair by using the dry-pack technique.

7.6 Topic 6: Cleaning and storage of formwork

7.6.1 Subject Outcome 1: Explain and demonstrate cleaning and storage of formwork

Learning Outcomes

The student should be able to:

- Describe reasons for damages to formwork while not in use.
- Remove projecting nails, clean forms, repair minor damages and stack panels face to face.
- Oil steel forms for protection from rust and to protect timber forms from rot and uneven drying that might result in warping.
- Explain why panels are best stored horizontally on a flat base and covered with a waterproof sheet.
- Devise a simple system for organising and storing small components such as wedges, bolts, ties and keys.

8 RESOURCE NEEDS FOR THE TEACHING OF CONCRETE STRUCTURES - LEVEL 4

8.1 Physical resources

Suitable venue for carrying out practical work, equipped with teaching aids, work tables, chairs, chalkboards.

8.2 Human resources

A lecturer with minimum educator qualifications, an acceptable NQF level qualification, registered assessor qualification, and on-going top-up training and upskilling requirements

8.3 Other resources

- Overhead projector
- Chalkboard
- Pre-designed models
- Tools and equipment requirements
- Teaching and learning materials and resources.