SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED UNIT STANDARD THAT HAS PASSED THE END DATE:

Demonstrate an understanding of basic theory of structures and structural behaviour relative to steel structures

SAQA US ID	UNIT STANDARD TITLE
114200	Demonstrate an understanding of basic theory of structures and structural behaviour relative to steel structures

ORIGINATOR	REGISTERING PROVIDER
SGB Civil Engineering Construction	

QUALITY ASSURING BODY
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FIELD	SUBFIELD
Field 12 - Physical Planning and Construction	Civil Engineering Construction

ABET BAND	UNIT STANDARD TYPE	OLD NQF LEVEL	NEW NQF LEVEL	CREDITS
Undefined	Regular	Level 5	New Level Assignment Pend.	12

REGISTRATION STATUS	REGISTRATION START DATE	REGISTRATION END DATE	SAQA DECISION NUMBER
Passed the End Date - Status was "Reregistered"	2007-02-27	2010-02-27	SAQA 0160/05

LAST DATE FOR ENROLMENT	LAST DATE FOR ACHIEVEMENT
2011-02-27	2014-02-27

In all of the tables in this document, both the old and the new NQF Levels are shown. In the text (purpose statements, qualification rules, etc), any reference to NQF Levels are to the old levels unless specifically stated otherwise.

This unit standard does not replace any other unit standard and is not replaced by any other unit standard.

PURPOSE OF THE UNIT STANDARD

A person credited with this unit standard will be able to:

Identify and describe the functions of the contracts planning department, describe workshop layout and explain workshop planning and procurement procedures as well as the procedures for handling and preparing steel through the preparation bay. Learners will be able to describe layout, dimensional checks and final assembly operations carried out by workshops responsible for the fabrication of structural steelwork assemblies. In addition, learners will be able to explain construction site procedures for the erection of steel structures.

The contribution to The National Skills Development Strategy is the key developmental interface between learners and new competencies to be achieved.

Learners who master the applied competence described in this unit standard will be able to apply their knowledge and understanding of basic contract planning functions, workshop and site procedures for structural steel projects to programme planning and communication processes between drawing office and client thereby ensuring that the time and cost implication associated with the repeated revision of drawings is minimised.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

The following knowledge, skills, attitude and/or equivalent:

- Mathematical numeracy (geometry and trigonometry) at NQF Level 4 or equivalent
- Draughting skills (freehand and 3-dimensional)
- Communication (written and verbal) at NQF Level 4 or equivalent
- Basic computer literacy - NQF Level 3
- The learner will have mastered the applied competence of designing a range of load bearing elements for steel structures.

UNIT STANDARD RANGE

- Range of transport requirements and limitations include but are not limited to: Normal loads, abnormal loads, and loads requiring official escorts
- Range of lifting aids includes but is not limited to: lifting lugs, spreader beams, strong-backs, lifting rigs.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Define, calculate and illustrate bending moments, shear forces, reactions and deflections.

OUTCOME NOTES

Define, calculate and illustrate bending moments, shear forces, reactions and deflections for fixed end beams and propped cantilevers with the use of standard equations.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Beam end constraints for fixed ended beams are defined and described.

ASSESSMENT CRITERION 2

2. Standard solutions for various load conditions on single span fixed ended beams are used to calculate bending moments, shear forces and reactions.

ASSESSMENT CRITERION 3

3. Beam end constraints for propped cantilevers are defined and described.

ASSESSMENT CRITERION 4

4. Standard solutions for various load conditions on propped cantilevers are used to calculate bending moments, shear forces and reactions.

ASSESSMENT CRITERION 5

5. "Tension side/deflection" method for assessing shape of bending moments is described and used to confirm general shape of bending moment diagram.

SPECIFIC OUTCOME 2

Define, calculate and illustrate bending moments, shear forces, reactions and deflections.

OUTCOME NOTES

Define, calculate and illustrate bending moments, shear forces, reactions and deflections for equal span continuous beams with the use of standard equations.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Continuous beams and end constraints are defined and illustrated. Standard equations for specified loading conditions are explained.

ASSESSMENT CRITERION 2

2. Standard equations are used to calculate reactions and shear forces for various loading configurations on continuous beams and the shear force diagrams are drawn.

ASSESSMENT CRITERION 3

3. Standard equations are used to calculate bending moments for various loading configurations on continuous beams and the bending moment diagrams are drawn.

ASSESSMENT CRITERION 4

4. "Tension side/deflection" method is used to confirm general shape of bending moment diagram.

ASSESSMENT CRITERION 5

5. Deflections are calculated using the standard equations for various continuous beams and loading configurations.

SPECIFIC OUTCOME 3

Analyse and design pin jointed frames and trusses using graphical methods.

OUTCOME NOTES

Analyse and design pin jointed frames and trusses using graphical methods to establish internal member forces.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated to scale and notated. Methods of accounting for redundancies are discussed.

ASSESSMENT CRITERION 2

2. Reactions at the supports are calculated by graphical or other means. An accurate stress diagram (Vector diagram) is drawn to scale for the frame.

ASSESSMENT CRITERION 3

3. Tension and compression members are identified using Bow`s Notation, or other means. Forces in all members are measured and tabulated for different load conditions.

ASSESSMENT CRITERION 4

4. Out of plane stability and the economic benefits of using similar sections where appropriate are discussed.

ASSESSMENT CRITERION 5

5. Factored compressive resistances are calculated for compression members in accordance with SABS0162 - 1: 1993 clause 13.3.1 and compared with the ultimate load assessed in the member.

ASSESSMENT CRITERION 6

6. The ultimate tension resistances of the tension members are calculated and compared with the ultimate load in accordance with SABS 0162-1: 1993.

SPECIFIC OUTCOME 4

Analyse and design pin jointed frames and trusses using "Method of sections" techniques.

OUTCOME NOTES

Analyse and design pin jointed frames and trusses using "Method of sections" techniques to establish internal member forces.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated accurately and notated.

ASSESSMENT CRITERION 2

2. Reactions at supports are calculated by static equilibrium methods.

ASSESSMENT CRITERION 3

3. The frame is analysed using method of sections to calculate tension and compression forces in the members. Forces in all members for different load conditions are tabulated.

ASSESSMENT CRITERION 4

4. Safe and economical members for the critical compressive or tensile force that may occur are selected and designed.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

- Anyone assessing a learner or moderating the assessment of a learner against this unit standard must be registered as an assessor with the CETA - ETQA.
- Any institution offering learning that will enable the achievement of this unit standard must be accredited as a provider with the CETA - ETQA.
- CETA - ETQA or other ETQA`s, who have a Memorandum of Understanding in place with CETA-ETQA, would be responsible for moderation of learner achievements of learners who meet the requirements of this qualification.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

- End constraints, bending moment diagrams, shear force diagrams and deflections for fixed end beams and propped cantilevers.
- Bending moment diagrams, shear force diagrams and deflections for continuous beams.
- Use of graphical means to analyse lattice structures.
- Use of Bow`s notation to identify forces in members of lattice structures.
- Principles for the economic design of lattice structures including out of plane stability.
- Method of Sections theory to calculate tension and compression forces in lattice structures.

UNIT STANDARD DEVELOPMENTAL OUTCOME

N/A

UNIT STANDARD LINKAGES

N/A

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identify and solve problems.

Specific Outcome 1
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for fixed end beams and propped cantilevers with the use of standard equations.

Assessment Criteria:

1.1 Standard solutions for various load conditions on single span fixed ended beams are used to calculate bending moments, shear forces and reactions.
1.2 Standard solutions for various load conditions on propped cantilevers are used to calculate bending moments, shear forces and reactions.
1.3 "Tension side/deflection" method for assessing shape of bending moments is described and used to confirm general shape of bending moment diagram.

Specific Outcome 2
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for equal span continuous beams with the use of standard equations.

Assessment Criteria:

2.1 Standard equations are used to calculate reactions and shear forces for various loading configurations on continuous beams and the shear force diagrams are drawn.
2.2 Standard equations are used to calculate bending moments for various loading configurations on continuous beams and the bending moment diagrams are drawn.
2.3 Deflections are calculated using the standard equations for various continuous beams and loading configurations.

Specific Outcome 3
Analyse and design pin jointed frames and trusses using graphical methods to establish internal member forces.

Assessment Criteria:

3.1 Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated to scale and notated. Methods of accounting for redundancies are discussed.
3.2 Reactions at the supports are calculated by graphical or other means. An accurate stress diagram (Vector diagram) is drawn to scale for the frame.
3.3 Tension and compression members are identified using Bow`s Notation, or other means. Forces in all members are measured and tabulated for different load conditions.
3.4 Out of plane stability and the economic benefits of using similar sections where appropriate are discussed.
3.5 Factored compressive resistances are calculated for compression members in accordance with SABS0162 - 1: 1993 clause 13.3.1 and compared with the ultimate load assessed in the member.
3.6 The ultimate tension resistances of the tension members are calculated and compared with the ultimate load in accordance with SABS 0162-1: 1993.

Specific Outcome 4
Analyse and design pin jointed frames and trusses using "method of scetions" technique to establish internal member forces.

Assessment criteria:

4.1 Reactions at supports are calculated by static equilibrium methods.
4.2 The frame is analysed using method of sections to calculate tension and compression forces in the members. Forces in all members for different load conditions are tabulated.

UNIT STANDARD CCFO COLLECTING

Manage information.

Specific Outcome 1
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for fixed end beams and propped cantilevers with the use of standard equations.

Assessment Criteria:

1.1 Beam end constraints for fixed ended beams are defined and described.
1.2 Beam end constraints for propped cantilevers are defined and described.

Specific Outcome 2
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for equal span continuous beams with the use of standard equations.

Assessment Criteria:

2.1 Continuous beams and end constraints are defined and illustrated. Standard equations for specified loading conditions are explained.
2.2 "Tension side/deflection" method is used to confirm general shape of bending moment diagram.

Specific Outcome 3
Analyse and design pin jointed frames and trusses using graphical methods to establish internal member forces.

Assessment Criteria:

3.1 Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated to scale and notated. Methods of accounting for redundancies are discussed.
3.2 Tension and compression members are identified using Bow`s Notation, or other means. Forces in all members are measured and tabulated for different load conditions.
3.3 Out of plane stability and the economic benefits of using similar sections where appropriate are discussed.
3.4 Factored compressive resistances are calculated for compression members in accordance with SABS0162 - 1: 1993 clause 13.3.1 and compared with the ultimate load assessed in the member.

Specific Outcome 4
Analyse and design pin jointed frames and trusses using "method of sections" techniques to establish internal member forces.

Assessment Criteria:

4.1 The frame is analysed using method of sections to calculate tension and compression forces in the members. Forces in all members for different load conditions are tabulated.
4.2 Safe and economical members for the critical compressive or tensile force that may occur are selected and designed.

UNIT STANDARD CCFO SCIENCE

Demonstrate scientific and technological competence.

Specific Outcome 1
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for fixed end beams and propped cantilevers with the use of standard equations.

Assessment Criteria:

1.1 Standard solutions for various load conditions on single span fixed ended beams are used to calculate bending moments, shear forces and reactions
1.2 Standard solutions for various load conditions on propped cantilevers are used to calculate bending moments, shear forces and reactions
1.3 "Tension side/deflection" method for assessing shape of bending moments is described and used to confirm general shape of bending moment diagram

Specific Outcome 2
Define, calculate and illustrate bending moments, shear forces, reactions and deflections for equal span continuous beams with the use of standard equations.

Assessment Criteria:

2.1 Standard equations are used to calculate reactions and shear forces for various loading configurations on continuous beams and the shear force diagrams are drawn.
2.2 Standard equations are used to calculate bending moments for various loading configurations on continuous beams and the bending moment diagrams are drawn.
2.3 "Tension side/deflection" method is used to confirm general shape of bending moment diagram.
2.4 Deflections are calculated using the standard equations for various continuous beams and loading configurations.

Specific Outcome 3
Analyse and design pin jointed frames and trusses using graphical methods to establish internal member forces.

Assessment Criteria:

3.1 Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated to scale and notated. Methods of accounting for redundancies are discussed.
3.2 Reactions at the supports are calculated by graphical or other means. An accurate stress diagram (Vector diagram) is drawn to scale for the frame.
3.3 Tension and compression members are identified using Bow`s Notation, or other means. Forces in all members are measured and tabulated for different load conditions.
3.4 Out of plane stability and the economic benefits of using similar sections where appropriate are discussed.
3.5 Factored compressive resistances are calculated for compression members in accordance with SABS0162 - 1: 1993 clause 13.3.1 and compared with the ultimate load assessed in the member.
3.6 The ultimate tension resistances of the tension members are calculated and compared with the ultimate load in accordance with SABS 0162-1: 1993.

Specific Outcome 3
Analyse and design pin jointed frames and trusses using "method of sections" techniques to establish internal member forces.

Assessment Criteria:

3.1 Various frame and truss configurations for different non-concurrent systems of loads are described, illustrated accurately and notated.
3.2 Reactions at supports are calculated by static equilibrium methods.
3.3 The frame is analysed using method of sections to calculate tension and compression forces in the members. Forces in all members for different load conditions are tabulated.
3.4 Safe and economical members for the critical compressive or tensile force that may occur are selected and designed.

UNIT STANDARD CCFO CONTRIBUTING

Understand contextual world-systems.

Specific Outcomes 1
Analyse and design pin jointed frames and trusses using "method of sections" techniques to establish internal member forces.

Assessment Criteria:

1.1 Safe and economical members for the critical compressive or tensile force that may occur are selected and designed.

QUALIFICATIONS UTILISING THIS UNIT STANDARD:

	ID	QUALIFICATION TITLE	OLD LEVEL	NEW LEVEL	STATUS	END DATE

Core	48636	National Diploma: Structural Steelwork Detailing	Level 5	New Level Assignment Pend.	Passed the End Date - Status was "Reregistered"	2010-02-27

PROVIDERS CURRENTLY ACCREDITED TO OFFER THIS UNIT STANDARD:

This information shows the current accreditations (i.e. those not past their accreditation end dates), and is the most complete record available to SAQA as of today. Some Quality Assuring Bodies have a lag in their recording systems for provider accreditation, in turn leading to a lag in notifying SAQA of all the providers that they have accredited to offer qualifications and unit standards, as well as any extensions to accreditation end dates. The relevant Quality Assuring Body should be notified if a record appears to be missing from here.

NONE
