basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ENGINEERING GRAPHICS AND DESIGN

EXAMINATION GUIDELINES

GRADE 12

2014

These guidelines consist of 10 pages.

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1. INTRODUCTION

The Curriculum and Assessment Policy Statement (CAPS) for Engineering Graphics and Design outlines the nature and purpose of the subject Engineering Graphics and Design. This guides the philosophy underlying the teaching and assessment of the subject in Grade 12.

The purpose of these Examination Guidelines is to:

- Provide clarity on the depth and scope of the content to be assessed in the Grade 12 National Senior Certificate Examination in Engineering Graphics and Design.
- Assist teachers to adequately prepare learners for the examinations.

This document deals with the final Grade 12 external examinations. It does not deal in any depth with the School-Based Assessment (SBA), Practical Assessment Tasks (PATs) or final external practical examinations, as these are clarified in a separate PAT document which is updated annually.

These Examination Guidelines should be read in conjunction with:

- The *National Curriculum Statement (NCS) Curriculum and Assessment Policy Statement (CAPS)*: *Engineering Graphics and Design*
- The National Protocol of Assessment: *An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding the National Protocol for Assessment (Grades R–12)*
- The national policy pertaining to the programme and promotion requirements of the National Curriculum Statement, Grades R–12

2. ASSESSMENT IN GRADE 12

2.1 Format and composition of the Grade 12 EGD NSC question papers

PAPER 1: CIVIL (3 hours) In **first-angle** orthographic projection			**PAPER 2: MECHANICAL** (3 hours) In **third-angle** orthographic projection		
Q 1	Civil analytical	± 15%	Q 1	Mechanical analytical	± 15%
Q 2	Interpenetration and development **and/or** development of a transition piece **and/or** Solid geometry	± 20%	Q 2	Loci of a Helix **and/or** Loci of a Cam **and/or** Loci of a Point(s) of a Mechanism	± 20%
Q 3	2-point perspective drawing	± 20%	Q 3	Isometric drawing	± 20%
Q 4	Civil working drawing including electrical features	± 45%	Q 4	Mechanical assembly	± 45%
Total mark allocation		200	Total mark allocation		200
Total NSC contribution		**100**	**Total NSC contribution**		**100**

2.2 General instructions in Grade 12 EGD NSC question papers

1. The question paper consists of FOUR questions.
2. Answer ALL the questions.
3. ALL drawings are in first-angle orthographic projection for PAPER 1 and third-angle orthographic projection for PAPER 2, unless stated otherwise.
4. ALL drawings must be completed using instruments, unless stated otherwise.
5. ALL answers must be drawn accurately and neatly.
6. ALL the questions must be answered on the QUESTION PAPER as instructed.
7. ALL the pages must be re-stapled in numerical sequence, irrespective of whether the question was attempted.
8. Time management is essential in order to complete all the questions.
9. Print your examination number in the block provided on every page.
10. Any details or dimensions not given must be assumed in good proportion.

2.3 Weighting of the cognitive levels for the combined totals of Grade 12

The application of Bloom's Taxonomy	
Cognitive level	**Weighting**
Lower order (Understanding and remembering)	**± 30%**
Middle order (Analysing and applying)	**± 40%**
Higher order (Creating and evaluating)	**± 30%**

3. ELABORATION OF THE CONTENT FOR GRADE 12 (CAPS)

As prescribed on pages 12 and 13 of the EGD CAPS document, the content of the following topics remain applicable to all Grade 12 topics:

Applicable to **ALL questions** for **both papers**	
TOPIC	**PRESCRIBED CONTENT**
General drawing principles relevant to all types of drawings	• Relevant **line types** as contained in the *SANS (SABS) 10111 and 10143 Guidelines.* EGD GUIDELINES for PENCIL LINE-WORK: **NOTE:** *A **wooden pencil** or a **0.3/0.5 clutch pencil** with either a **2H, 3H or 4H** lead should be used*. ➢ **A-type line** (darkest line): Border and title/name block/panel; outlines and visible parts; answers of e.g. loci; projection symbol; tables ➢ **B-type line** (medium line): All writing and numbering; dimensions; projection planes; auxiliary views; hatching; screw threads; folding lines, break lines ➢ **C-type line** (lightest line): Constructions; planning; projections; guidelines (for writing) ➢ **Medium chain-line** (B-type): Centre points of circles; centre lines (centre axis); section planes; assembly diagrams; building lines/boundaries (servitudes) ➢ **Dark chain-line** (A-type): Plumbing; water pipes; drainage; services, irrigation systems ➢ **Short broken-line** (B-type): Hidden detail; items to be removed on civil drawings ➢ **Long broken-line** (B-type): Contour lines on site plans • General **lettering** (writing) and **annotation** requirements as contained in the *SANS (SABS) 10111 & 10143 Guidelines* • General **dimensioning** requirements as contained in the *SANS (SABS) 10111 & 10143 Guidelines.*
Free-hand drawing	The basic hand movements needed to draw proportional single, multi-view and pictorial drawings on plain paper and/or grid sheets.
Scales	• **Practise and apply different scales**, e.g. 5 : 1, 2 : 1, 1 : 2, 1 : 25, 1 : 50, 1 : 75, 1 : 100, etc. • The application of **any scale** to all types of drawing.

Continuation of the fundamental EGD topics for both papers	
Geometrical construction	• **Practise and apply** the following **constructions**: bisecting lines and angles, perpendicular lines, angles, dividing a line, a circle through three points, circle divisions, tangents, convex and concave tangential arcs, etc. • Construct regular **polygons** with **3, 4, 5, 6 and 8** sides. • **Ellipse**
Descriptive geometry	• **Orthographic views** of **points** and **line segments** that are perpendicular, inclined or oblique to the projection planes. • The **true length** of line segments • The **true shapes** of surfaces

- **PAPER 1 topics and prescribed content**

QUESTION 1: ± 15% (± 30 marks) **AND** **QUESTION 4:** ± 45% (± 90 marks)	
TOPIC	**PRESCRIBED CONTENT**
Civil drawing	Limited to **single-storey dwellings**, **first-angle orthographic** working drawings with **floor plans**, **detailed elevations** and **sectional elevations** showing the **detail** of the **foundation to the roof**. Include the following: • Annotation, labels, dimensioning, scales • Relevant abbreviations and graphical symbols • On ALL relevant views/elevations: detail of pitched and flat roofs (trusses, battens/purlins, covering, fascia, barge-board, ceiling, etc.), gutters and rain-water downpipes, plumbing and drainage detail, **electrical fixtures** and wiring diagrams as well as all the other features and fixtures covered in Grades 10 and 11. • Hatching detail and the application of colours • Format and content of working drawing title panels • Detailed site plans showing electrical, plumbing and drainage services detail as well as relevant natural features • Perimeters and areas of dwellings and sites **NOTE:** • ALL aspects of drawing addressed in the *SANS 10143 Guideline* must comply with the **guidelines** and **graphical symbols** contained in the *SANS 10143*. • ALL substructure hatching may be drawn in freehand.
NOTE: • Although the primary focus of QUESTION 1 will be on the prescribed content of civil drawings, aspects from other topics could also be included. • QUESTION 4 could be either ONE question only OR it could be subdivided into MORE THAN ONE question.	

QUESTION 2: ± 20% (± 40 marks)	
TOPIC	**PRESCRIBED CONTENT**
Interpenetrations and development ***and/or***	**First-angle orthographic** views showing the **curve of interpenetration** formed between two solids or pipes joined at 30°, 45°, 60° or 90°. • The solids or pipes have to be **right-regular prisms,** with 3, 4, 5, 6 and 8 sides, **and/or cylinders only.** • The axes of the two solids or pipes could either **meet in a common plane or be offset.** **The surface developments of:** o The parts of the **interpenetrating** solids or pipes o **Sectioned pyramids** and **cones**
Development of a transition piece ***and/or***	**The surface developments of:** o **Complex transition pieces** o **Hoppers** The focus should be on industrial examples.
Solid geometry	**First-angle orthographic views** of **solids** or a **combination of solids**, which includes **solids with holes**. The solids and shape of the holes may be either right-regular **prisms** or **pyramids** with 3, 4, 5, 6 and 8 sides only, **cylinders** or **cones.** The axis of the solids may be perpendicular, parallel or inclined to one principal projection plane only. Include the following: • **Sectional views** • **The true shape of the cut surface**
NOTE: • ALL necessary construction and folding lines must be shown. • The curves may be drawn in neat freehand. However, inaccurate and/or untidy curves will be penalised. • Hidden detail must only be shown if required.	

QUESTION 3: ± 20% (± 40 marks)	
TOPIC	**PRESCRIBED CONTENT**
Perspective drawings	**2-point** perspective drawings of **complex** castings, dwellings and civil structures with **overhangs**, **depth detail**, **circles** and **arcs**. • The HL, PP and SP can be varied to provide any desired view. **NOTE:** • ALL necessary construction must be shown. • The curves of circles and arcs may be drawn in neat freehand. However, inaccurate and/or untidy curves will be penalised. • Hidden detail must only be shown if required.

- **PAPER 2 topics and prescribed content**

QUESTION 1: ± 15% (± 30 marks) **AND** **QUESTION 4:** ± 45% (± 90 marks)	
TOPIC	**PRESCRIBED CONTENT**
Mechanical drawings	**Third-angle orthographic** working drawings with **non-sectional, sectional, half-sectional and part-sectional** views of **complex mechanical assemblies**. Include the following: • Title, scale, hidden detail, dimensioning, cutting planes, hatching detail, notes and symbol of projection • Hexagonal bolts, nuts and lock nuts, washers/spacers, keys and keyways and appropriate labels • Different types of section • Conventional presentation of common features • Format and content of working drawing title blocks • **Detailed drawings** of individual components • Basic welding, machining and surface treatment symbols • Tolerances **NOTE:** • ALL aspects of drawing addressed in the *SANS 10111 Guideline* must comply with the **guidelines** contained in the *SANS 10111*. • ALL necessary construction, including for bolts and nuts, must be shown. • Hidden detail must only be shown if required.
NOTE: • Although the primary focus of QUESTION 1 will on the prescribed content of mechanical drawings, aspects from other topics could also be included. • QUESTION 4 could be either ONE question only or it could be subdivided into MORE THAN ONE question.	

QUESTION 2: ± 20% (± 40 marks)	
TOPIC	**PRESCRIBED CONTENT**
Loci of a helix ***and/or***	The principles of the **helix** in **complex** applications of: o **Augers** o **Spiral chutes** o **Coil springs** o **Different types of thread** • **Single start** only • **Right-handed** or **left-handed** • The **direction** has to be emphasised.
Loci of a cam ***and/or***	The principles of the **cam** in **complex** applications in which the following has to be shown: **o** The camshaft and follower detail **o** The complete displacement graph **o** The complete cam profile • The **motion** may be **uniform** and/or **simple harmonic** and/or **uniform acceleration and retardation**. • The direction has to be emphasised. • The follower may be placed at any angle, provided that it reciprocates on a centre line which passes through the centre of the camshaft. • The follower may be wedge-shaped or a roller.
Loci of a point(s) of a mechanism	The principles of the **loci of a point(s)** on **schematic drawings** of the moving **components** of **mechanisms**. • Maximum THREE points
NOTE: • ALL necessary construction must be shown. • The curve(s)/profile of the loci may be drawn in neat freehand. However, inaccurate and/or untidy curves/profiles will be penalised. • Hidden detail must only be shown if required.	

QUESTION 3: ± 20% (± 40 marks)	
TOPIC	**PRESCRIBED CONTENT**
Isometric drawing	**Complex** isometric drawings with isometric and non-isometric lines as well as **auxiliary views**, **circles** and **sections**. **NOTE:** • ALL necessary auxiliary views and construction, including for circles, must be shown • Hidden detail must only be shown if required.

4. CONCLUSION

It is envisaged that this Examination Guidelines document will serve as an instrument to strengthen and empower teachers to set valid and reliable assessment items in all their classroom activities.

This Examination Guidelines document is meant to articulate the assessment aspirations espoused in the CAPS document. It is therefore not a substitute for the CAPS document which teachers should teach to.

Qualitative curriculum coverage as enunciated in the CAPS cannot be over-emphasised.