



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ENGINEERING GRAPHICS AND DESIGN

GUIDELINES FOR PRACTICAL ASSESSMENT TASKS

2016

These guidelines consist of 26 pages.

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1. INTRODUCTION

The 16 Curriculum and Assessment Policy Statement subjects which contain a practical component all include a practical assessment task (PAT). These subjects are:

- AGRICULTURE: Agricultural Management Practices, Agricultural Technology
- ARTS: Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- SCIENCES: Computer Applications Technology, Information Technology
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: Civil Technology, Electrical Technology, Mechanical Technology and Engineering Graphics and Design

A practical assessment task (PAT) mark is a compulsory component of the final promotion mark for all candidates offering subjects that have a practical component and counts 25% (100 marks) of the end-of-year examination mark. The PAT is implemented across the first three terms of the school year. This is broken down into different phases or a series of smaller activities that make up the PAT. The PAT allows for learners to be assessed on a regular basis during the school year and it also allows for the assessment of skills that cannot be assessed in a written format, e.g. test or examination. It is therefore important that schools ensure that all learners complete the practical assessment tasks within the stipulated period to ensure that learners are resulted at the end of the school year. The planning and execution of the PAT differs from subject to subject.

SECTION A (TEACHER GUIDELINES)

2. THE STRUCTURE OF THE PRACTICAL ASSESSMENT TASK (PAT) FOR EGD

As the Engineering Graphics and Design (EGD) **PAT** is a **compulsory national formal assessment task** that contributes 25% (i.e. 100 marks) towards a learner's final NSC mark, it is essentially the **third NSC examination paper** of EGD. All the **presentation requirements must therefore be adhered to and**, with the exception of the required research, **completed at school**, under the supervision of the EGD teacher. **Each learner must complete the PAT individually** and **ALL** the presentations must be **his/her own original work**.

The primary purpose of the EGD PAT is to assess four subjective content and concept topics which are not assessed in the examination papers. These are:

- The design process
- The application of drawing knowledge and drawing skills to the design process
- CAD management and drawings
- The quality and neatness of free-hand, instrument and CAD drawings

The EGD PAT is therefore designed to develop a learner's ability to integrate and apply knowledge and to demonstrate acquired levels of skills and competency. With the inclusion of the PAT into EGD, the learner is given an opportunity to apply

acquired knowledge, skills and values in a creative way through the design process. The learner is given an opportunity to complete the PAT in an environment which is more conducive to the creative processes. This environment should therefore provide the learner with easier access to, and a wider variety of, resource material than would be available in a formal examination.

The various components of the EGD PAT gives the learner an opportunity to demonstrate the level of drawing skill that has been attained in all the appropriate drawing methods through the presentation of the required drawings. Each EGD PAT consists of TWO parts:

- **Part A:** The design process
- **Part B:** Required working and pictorial drawings

Part A of both PATs requires that the learner demonstrates a clear understanding of, and is able to apply, the design process. As part of the design process, the learner must be able to do the following:

- Identify the problem(s) and formulate a design brief with specifications and constraints
- Conduct and use relevant external research in an appropriate way
- Generate a number of own ideas/concepts/solutions analytically and graphically through comprehensive freehand drawings
- Select a final solution(s) that demonstrates a clear understanding of the design brief
- Present the final solution(s) as working drawings and pictorial drawings
- Provide clear evidence of continuous self-evaluation during the development of the PAT

Part B of both PATs requires that the learner demonstrates and provides evidence of a high level of knowledge and understanding of the concepts and content of Engineering Graphics and Design through the presentation of orthographic drawings and pictorial drawings.

Part A and Part B of both PATs also give the learner the opportunity to demonstrate that a high level of competency and skill has been attained in the following required EGD drawing methods:

- Freehand drawings prepared in pencil
- Instrument drawings prepared in pencil
- Using a CAD (Computer-aided Drawing/Design) system

TWO practical assessment tasks (PATs) are included in this document:

- PAT 1 is a design task in the context of civil technology
- PAT 2 is a design task in the context of mechanical technology

Each learner must, with the guidance of the teacher, **select ONE** of the PATs contained in this document.

Elements that make up the PAT mark for Engineering Graphics and Design

ELEMENTS OF THE MARK FOR THE PRACTICAL ASSESSMENT TASK	
ELEMENT	MARK
The design process	25
The correctness of the working and pictorial drawings	50
The drawing methods (freehand, instrument and CAD)	25
TOTAL	100

3. ADMINISTRATION OF THE PAT

At the beginning of the academic year the EGD teacher must ensure that **every Grade 12 learner receives a copy of the entire SECTION B** of the PAT document, i.e. **ALL the pages from page 8 to page 23**.

The completed phases of ALL the PATs must be submitted in time for summative assessment to be done before the commencement of phase moderation in the second and third terms and provincial moderation in the third term. The PATs must therefore be **completed in the following phases during the first three terms**:

- **Phase 1:** Design process (completed by the end of the **1st term**)
- **Phase 2:** Presentation drawings (completed by the end of the **2nd term**)
- **Phase 3:** Completion of portfolio (**before** the commencement of **provincial/ final moderation** in the **3rd term** or at the latest **before** the commencement of the **preparatory examinations**)

Although the phases could be done either CYCLICALLY or in BLOCK TIMES, as indicated in the EGD CAPS, it is recommended that ONE ENTIRE DAY per term, e.g. as an extra paper during the June examinations, be allocated for each phase.

The **teaching/period time** that may be allocated for the completion of all three phases of the PAT is **12 hours to a maximum of 16 hours**. Additional non-teaching-/non-period time may, however, also be allocated for the completion of the PAT at the school. However, the **total maximum time** for the completion of all the phases of the PAT should **not exceed 20 hours**.

To ensure that the PAT is completed within the stipulated time it is essential that the teacher draw up a PAT **work schedule/pacesetter/management plan**, with target dates that are in line with the Annual Teaching Plan of the EGD CAPS and the prescribed completion of the phases of the 2016 EGD PAT, for the learners at the beginning of the year. This will help learners to assess their own progress and teachers to set up intervention programmes.

NOTE:

- **ALL the presentation requirements** of the selected PAT **must be adhered to and**, with the exception of the required research, **completed at school under the guidance and supervision of the EGD teacher**, who must observe the learners' progress at all times.
Not adhering to this instruction will be deemed to be an examination irregularity.
- It is the **teacher's responsibility** to ensure that **each learner's PAT** is of an **appropriate higher-order Grade 12 complexity**.

4. ASSESSMENT AND MODERATION OF THE PAT

4.1 Assessment

The assessment of the PAT must be done according to the included relevant Assessment Criteria and Checklist.

Frequent developmental feedback is needed to guide and give support to each learner and to ensure that each learner is on the right track. Both formal and informal assessment should therefore be conducted throughout the development of the PAT. Informal assessment can be conducted by the learner, a peer, a group of learners or by the teacher. **However, the teacher must conduct ALL the formal assessment and record the results on the official mark sheets himself/herself. Each learner's marks must also be indicated on the official 2016 summative assessment sheet in the learner's PAT file/portfolio.**

The completed PAT must be submitted in time for final formal assessment to be done before the commencement of provincial/final moderation or, at the latest, before the preparatory examinations in the **3rd term. Once the PAT has been formally assessed the teacher must retain the PAT for the purpose of external moderation.** All the PATs must also be retained at the school for the period of time, as prescribed by the provincial departments of education.

NOTE:

The concept of '**benchmarking**', i.e. the identification and mark allocation of the best example(s) for each assessment criterion, should be applied when the PATs are being assessed.

4.2 Moderation

The moderation of the PAT must be done according to the included relevant Assessment Criteria and Checklists.

Monitoring and/or moderation of the PAT can take place at any time during the development of the PAT. ALL completed presentation requirements of the PAT must therefore always be available at the school. However, in order to make provision for intervention programmes, **the following phase moderation must be done during the second and third terms:**

- **Phase 1:** Design process (beginning of the 2nd term before the commencement of phase 2 or the June examinations)
- **Phase 2:** Presentation drawings (beginning of the 3rd term before the commencement of phase 3)

During the moderation process the moderator will randomly select the PAT files/portfolios that have to be moderated. To assist the process of final provincial moderation the teacher must supply the moderator with a completed mark sheet(s) and a merit list(s).

During the moderation process learners may be called upon to explain the functions and principles of operating a CAD system and to demonstrate drawing skills through performing capability tasks.

4.3 Declaration of authenticity

Prior to the final submission of the PAT for formative assessment ALL the learners and the teacher must complete the declaration of authenticity, as set out on the final page of this document.

NOTE:

Only the official 2016 SUMMATIVE ASSESSMENT SHEET (page 25) and the completed DECLARATION OF AUTHENTICITY (page 26) of this document must be included in the front of the learner's completed PAT file/portfolio.

5. CONCLUSION

On completion of the practical assessment task learners should be able to demonstrate their understanding of the industry, enhance their knowledge, skills, values and reasoning abilities as well as establish connections to life outside the classroom and address real-world challenges. The PAT furthermore develops learners' life skills and provides opportunities for learners to engage in their own learning.

SECTION B (LEARNER TASKS)

General information and instructions:

- The EGD PAT is a **compulsory national formal assessment task** that contributes 100 marks towards your final National Senior Certificate (NSC) mark.
- This **document contains TWO PATs**, i.e. a civil design project (PAT 1) and a mechanical design project (PAT 2). **You, the learner**, with the guidance of your EGD teacher, **must select ONE** of the PATs contained in this document.
- ALL the **presentation requirements** of the selected PAT **must be adhered to** and, with the exception of the required research, **completed at school**, under the guidance and supervision of your EGD teacher.
- The PAT must be **completed individually** and **ALL the presentations**, including the front page and index, must be **your own original work**.
- The PAT must be **completed in phases and within the given time frame** of your teacher's PAT work schedule/pace setter/management plan.
- ALL **freehand drawings** and **instrument drawings** must be **prepared in pencil**.
- The PAT must be of an appropriate **higher-order Grade 12 complexity**.
- The PAT will be **assessed according to** the relevant **Assessment Criteria and Checklists** included in this document.
- Untidy and messy work, as well as the late submission of presentation requirements, will be penalised.

6. PRACTICAL ASSESSMENT TASK 1 (PAT 1)

A civil design project

Scenario

The management committee of a local sports facility, which belongs to the local municipality, identified the need for a basic first-aid room and a clubhouse, which could be used for meetings, social functions and outdoor concerts, which could raise additional funds for community projects.

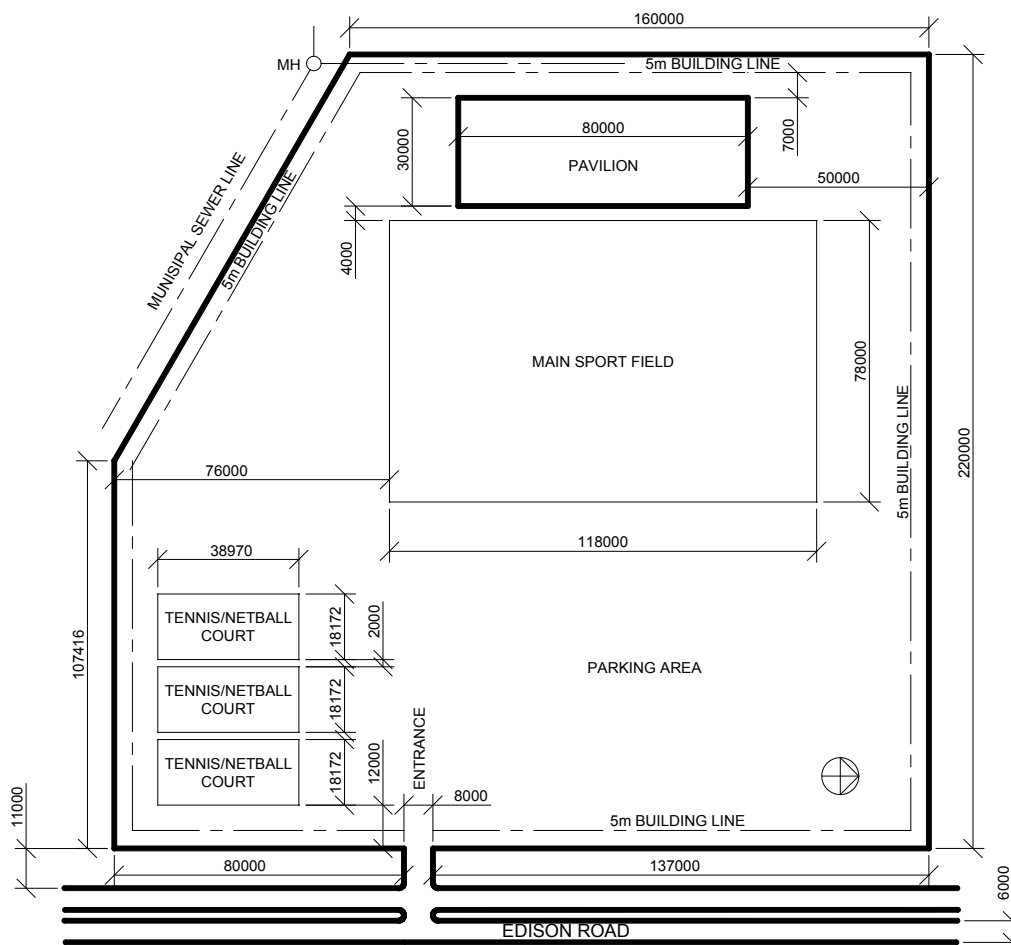
In order to cut costs, the committee decided to build an additional single-storey clubhouse building with a large cement deck, which could serve as additional space for social functions, as a viewing area for sport events and as a stage for outdoor concerts.

It was also decided that the cement deck had to be elevated and covered by an appropriate steel structure roof that will be high enough to stage concerts.

You have been commissioned by the management committee to provide a proposed design solution for the **new clubhouse and cement deck** so that the provincial government may be approached to fund the project.

Given: The site plan of the sports facility

NOTE: Any details or dimensions not given may be assumed in good proportion.



The current facilities consist of three netball/tennis courts, a large grass sports field, a large pavilion with sufficient change rooms, all the required male and female toilet facilities, storerooms for all the equipment and a tuck shop, as well as a large parking area.

The new clubhouse, which may not exceed 180 m², must be a single-storey building covered by a conventional pitched roof. The 180 m² excludes the cement deck. The clubhouse must consist of the following: An open area of approximately 70 m² where at least 50 people may be seated for functions or meetings; a small kitchen with a fridge, stove, double sink, hand wash basin, lockable cupboard and counters where pre-prepared food may be heated and served; a counter where drinks and beverages may be served; sufficient separate male and female toilet facilities; two small storerooms where stacked chairs, folding tables and equipment may be stored and two adequately equipped dressing/change rooms when the cement deck is used as a stage for concerts. The clubhouse building must also incorporate a small basic first-aid room for not more than two patients, with its own external entrance with a ramp for stretchers and wheel chairs, as well as an additional entrance into the clubhouse. The building should have all the relevant and required electrical fittings for the various rooms as well as adequate security.

There should be reserved parking for an ambulance next to the clubhouse, as well as an emergency access road which must be clearly indicated on the site plan.

The elevated cement deck, which must be constructed as part of the clubhouse, may not exceed 140 m². The cement deck should be covered with an appropriate steel-structure roof and have temporary side panels on all sides so that it can be used as additional space for functions. The cement deck must be placed in such a way that it may be used as a viewing deck during matches and as a stage for open-air concerts.

PHASE 1: Presentation requirements

1. **Identify the primary and secondary problem(s)** and formulate your own **design brief** on the given scenario. Include the following as part of the design brief:
 - An **extended** and **comprehensive** list of **specifications**
 - A list of at least **FIVE constraints** that are relevant to the task
 - A list of the **main points** of **ALL** the **presentation requirements** together with a **management plan** for the development of the PAT
2. **Conduct your own research** on:
 - Regulations and layouts of clubhouses/public entertainment areas
 - The requirements for, and layout of, a small first-aid room for two patients
 - Steel-structure roofs that will be large enough to cover the cement deck
 - At least **THREE** different types of temporary side panels/walls for the cement deck

NOTE:

- The research must be **relevant** and **usable**.
- Evidence of **ALL** the **relevant resource material used** must be **presented as proof** that the required research had been done.
- There must be clear evidence that the **research was used**.
- Include a list of **ALL references (bibliography)**.

3. **Generate THREE detailed self-explanatory freehand drawings** of the **layout** of **THREE possible design solutions** for the new clubhouse and cement deck. The freehand drawings must show **dimensions**, **labels** and **notes**, as well as the **correct presentation** of **ALL building features** and **permanent fixtures**, excluding electrical fittings. The **calculation and indication of the areas** of each possible solution should also be shown clearly.

NOTE:

- **ALL** the features should be drawn **proportionally the same size**. **Grid/Graph paper** should therefore be used.
- These drawings must provide clear evidence that a high level of competency has been attained in **freehand drawings** as one of the required **EGD drawing methods**.
- All the drawings must comply with the *SANS 10143 Guidelines*.

4. **Select the best solution**, which demonstrates an in-depth understanding of the design brief within the context of the specifications and constraints, by **evaluating and comparing** the possible design solutions of the **THREE freehand drawings**. Include a **comprehensive summary** of the reasons for the solution selected.

PHASE 2: Presentation requirements

5. **Present the selected solution** as a set of **working drawings** and a **pictorial drawing** (5.1, 5.2 and 5.3) that adhere to the following:
- All the **working drawings** must be presented on appropriately sized drawing sheets, correctly set up with borders. Only the **first working drawing** (5.1) has to be set up with a **complete civil title panel**.
 - The drawings must provide clear evidence that a high level of competency had been attained in the following **TWO** required **EGD drawing methods**:
 - Instrument drawings
 - CAD (Computer-aided Drawing/Design)
- NOTE:**
- **ONE working drawing** (i.e. 5.1 or 5.2) must be prepared as an **instrument drawing** and the **other** using a **CAD system**.
 - The **perspective drawing** (5.3) may be prepared **either** as an instrument drawing **or** by using a CAD system.
 - **Schools that do not have CAD facilities must prepare all the required drawings** (5.1, 5.2 and 5.3) **as instrument drawings**.
- All title panels and drawings must comply with the *SANS 10143 Guidelines*.
- 5.1 Draw a detailed **layout drawing** of the **selected proposed clubhouse and cement deck, clearly showing all the features**. The drawing must show a **minimum** of **FOUR** orthographic views drawn to a suitable scale(s).

The views must include the following:

5.1.1 The **floor plan**

5.1.2 A **sectional elevation** of the **clubhouse building**

5.1.3 **TWO elevations**, showing the **front view** and a **side view**

The following should be included on all relevant views:

- ALL sanitary, kitchen and other permanent fixtures
- ALL electrical fittings and the wiring detail
- Waste-water disposal systems (sewerage)
- The layout of the first-aid room as well as the detail of the ramp
- The shape of the steel structure roof for the cement deck
- Labels, notes and fixture codes
- Scale(s)
- Dimensions
- Cutting plane(s)
- All hatching detail
- North point

5.2 Draw a detailed **site plan** to a suitable scale.

The following must be included:

- ALL relevant site detail and features, e.g. building lines, natural features, etc.
- The emergency access road for the ambulance
- ALL existing and new buildings and structures
- ALL services, sewerage and drainage connections
- Electrical supply
- Labels and notes
- Scale
- Dimensions and corner heights
- North point

5.3 Draw a detailed **two-point perspective drawing** that will show a view of the **clubhouse and the complete cement deck**. The horizon line (HL) should be placed 1,8 metres above the ground in order to produce a human eye view.

Evidence of the following must be included with the drawing:

- All views/drawings used to produce the drawing
- The construction/method used to produce the drawing

NOTE: A copy of the perspective drawing, which may contain artistic features, should be used as the picture for the cover page of the PAT file/portfolio.

PHASE 3: Presentation requirements

Create a PAT file/portfolio containing:

- A complete **cover page**
- An **index**
- The **2016 SUMMATIVE ASSESSMENT SHEET** (see page 25)
- The completed **DECLARATION OF AUTHENTICITY** (see page 26)

Present the following phase 1 and phase 2 presentation requirements in the PAT file/portfolio after the DECLARATION OF AUTHENTICITY:

1. ALL the design brief requirements
2. Evidence of ALL the relevant resource material used for the **required research**
3. The **THREE freehand drawings** of THREE possible design solutions
4. ALL the evidence of the **selection** of the **best solutions**
5. ALL the required **working drawings** (5.1 and 5.2) and the **pictorial drawing** (5.3)
6. Using the **included checklist**, clear evidence of **continuous self-evaluation** of the **entire process** and of the **meeting** of all the **deadlines** during the development of the PAT

NOTE:

Include the following on each page of each presentation requirement:

- Clear **numbering** according to the numbers of the presentation requirements
- **Your** (the learner's) **name**
- The **date of completion** and **submission**

Assessment criteria and checklist for the 2016 EGD Civil PAT

- The **SUMMATIVE ASSESSMENT SHEET** on page 25 of the EGD PAT document must be used to indicate the final totals out of 10 for each assessment criterion.
- The **contribution** of each aspect of the PAT is as follows:
 - The **design process**, i.e. presentation requirements numbers 1, 2, 3, 4, 6 and 7, will contribute **25 marks** to the final PAT mark out of 100
 - The **working drawings and a pictorial drawing**, i.e. presentation requirement number 5, will contribute **50 marks** to the final PAT mark out of 100
 - **Drawing methods, drawing skills** and **presentation**, which should be assessed according to ANNEXURE A, will contribute **25 marks** to the final PAT mark out of 100

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2016 EGD CIVIL PAT									
1 mark level descriptive		0	No evidence/not done or not correct/complete/compliant/achieved/very poor				Checked	Suggested mark allocation	Own marks/ notes/ comments
		1	All evidence shown/correct/complete/compliant/achieved/clear						
2 mark level descriptive		0	No evidence/not done/very poor						
		1	Evidence shown but not correct/complete/compliant/achieved/clear/average						
		2	All evidence shown/correct/complete/compliant/achieved/clear/very good						
1.	Design Brief								
	1.1	Identifying the primary problem and secondary problems in own words						2	
	1.2	Formulating of a design brief in own words						2	
	1.3	List of the specifications (extended and comprehensive and not just the given)						2	
	1.4	List of at least FIVE constraints that are relevant to the task						2	
	1.5	List of the entire process together with a management plan						2	
							TOTAL	10	
2.	Research (This should be restricted to a maximum of THREE A4 or TWO A3 pages per research topic)								
	Relevant and usable research on:	2.1	Regulations and layout of clubhouses/public entertainment areas					2	
		2.2	Requirements for, and layout of, a first-aid room					2	
		2.3	Relevant steel-structure roofs					2	
		2.4	THREE types of temporary side panels/walls for the cement deck					2	
								1	
								1	
							TOTAL	10	
3.	Freehand drawings of THREE possible design solutions								
	Assess each freehand solution as follows:	ALL required layout features and fixtures included				2	Final mark for each solution		
		Correct presentation of building features and fixtures				2	Solution 1	10	
		The relative size of all features and fixtures to each other				2			
		Labels and notes (2) + Dimensions (2) (2 + 2 = 4)				4	Solution 2	10	
		Calculation and presentation of the areas				2			
		Sizes of the areas correct within the given constraints				1	Solution 3	10	
		Design: Effective utilisation of space and functionality				2			
		Subtotal = 15 ÷ 1,5 = TOTAL				15			
(1 = 1; 2 = 1; 3 = 2; 4 = 3; 5 = 3; 6 = 4; 7 = 5; 8 = 5; 9 = 6; 10 = 7; 11 = 7; 12 = 8; 13 = 9; 14 = 9; 15 = 10)									
4.	Selecting the best freehand solution (This must be a separate presentation)								
	Appropriate and easily understandable presentation of the selection process							2	
	Using the requirements and specifications as criteria for the evaluation							2	
	Relevant and comprehensive reasons (evaluating and comparing)							2	
	A rating scale to score each solution, i.e. a mark allocation of each criterion							2	
	A comprehensive summary of the reasons for the selected solution							2	
							TOTAL	10	
5.	Working drawings and a pictorial drawing of selected solution								
	Drawing sheet preparation								
	Appropriately sized drawing sheets							1	
	Borders on all the drawing sheets of working drawings							2	
	Appropriate and complete civil title panel on the first working drawing (5.1)							7	
							TOTAL	10	
5.1	Detailed layout drawings of the selected proposed solution								
	5.1.1	Floor plan							
		Correlation with selected freehand solution and the selection process summary						2	
		ALL walls and the roofline						2	
		ALL doors and windows						2	
		ALL sanitary, kitchen and other permanent fixtures						2	
		ALL electrical fittings and the wiring detail						2	
		Waste-water disposal systems (sewerage)						2	
		Labels, notes and fixture codes						2	
		Suitable scale selected and indicated correctly						1	
		Dimensions						2	
		Cutting plane (1) + ALL hatching detail (1) + North point (1) (1 + 1 + 1 = 3)						3	
							Subtotal = 20 ÷ 2 = TOTAL	10	

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2016 EGD CIVIL PAT				
5.1.2	Sectional elevation of the clubhouse building			
	Foundation		2	
	Walls with door(s) and window(s) included		2	
	Roof		2	
	Labels and notes		2	
	Suitable scale selected and indicated correctly		1	
	Dimensions		2	
	Section correct according to the indicated cutting plane(s)		2	
	ALL hatching detail		2	
Subtotal = 15 ÷ 1,5 = TOTAL			10	
(1 = 1; 2 = 1; 3 = 2; 4 = 3; 5 = 3; 6 = 4; 7 = 5; 8 = 5; 9 = 6; 10 = 7; 11 = 7; 12 = 8; 13 = 9; 14 = 9; 15 = 10)				
5.1.3	TWO elevations, showing the front view and a side view			
	Relevant views, which include sewerage, selected/shown		1	
	Door and window detail		2	
	Walls and ALL other external features		2	
	Roof of the clubhouse and the shape of the steel-structure roof		2	
	Waste-water disposal system (sewerage)		2	
	Drawn to same scale as the floor plan		1	
TOTAL			10	
5.2	Detailed site plan			
	ALL relevant site detail/features, e.g. building lines, natural features, driveways, etc.		2	
	ALL existing and new buildings/structures/civil features		2	
	ALL services, sewerage and drainage connections as well as electrical supply		2	
	Suitable scale selected and indicated correctly		1	
	Dimensions, reference dimension, corner heights, labels and notes		2	
	North point		1	
TOTAL			10	
5.3	Detailed two-point perspective drawing			
	Evidence of views/drawings and construction/method used for the drawing		1	
	Correct orientation of views and the correct HL high (1,8 m)		2	
	Perspective drawing/answer (Use 7-mark rubric on page 45 of the EGD CAPS)		7	
TOTAL			10	
6.	Continuous self-evaluation and the meeting of deadlines			
	Checklist(s) of continuous self-evaluation of the entire process (mark out of 10 ÷ 2)		5	
	The meeting of ALL the deadlines during the development (mark out of 10 ÷ 2)		5	
TOTAL			10	
7.	Presentation of the complete PAT file/portfolio			
	Cover page		1	
	Index		1	
	Summative assessment sheet and declaration		1	
	Correct sequencing of ALL presentation requirements		1	
	Name and numbering on ALL the presentation requirements		1	
	General impression of file/portfolio, e.g. binding, appearance etc. (mark out of 10 ÷ 2)		5	
TOTAL			10	
Assessment of drawing methods, drawing skills and presentation				
a	Freehand drawings			
	Freehand drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
b	Instrument drawings			
	Use of drawing instruments, drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
c	CAD drawings			
	Competence displayed in using a CAD system/program (See ANNEXURE A on page 23)		10	
	Layout and correctness of the drawings presentation (See ANNEXURE A on page 23)		10	

7. PRACTICAL ASSESSMENT TASK 2 (PAT 2)

A mechanical design project

Scenario

You are employed as a draughtsperson by a drafting firm that specialises in providing design services on **PORTABLE HAND-OPERATED JACKS/LIFTING DEVICES for MOTOR VEHICLES**.

You are tasked with investigating and analysing the design features of existing **portable hand-operated jacks/lifting devices, with a lifting capacity of less than 1 500 kg**, and to come up with new or improved ideas. The improvement(s) to the jack/lifting device, device could be one or more of the following:

- To improve efficiency
- To strengthen its current design
- To simplify its application

The PAT requires the following stages:

- The first stage involves selecting/finding a suitable portable hand-operated jack/lifting device for motor vehicles, which must include mechanical parts/components and movement as part of its operation/function.

NOTE: You are not required to purchase a new jack/lifting device. The selected jack/lifting device should therefore be one that is **already available to you**.

- The **second stage** involves the **dismantling** of the selected jack/lifting device so that **all the mechanisms and parts/components** can be **revealed, investigated and measured**.
- The **third stage** involves the identification of **ONE** of the **main parts/components** or a **combination of parts/components** of the selected jack/lifting device which could be **improved, modified or redesigned** in some way. This will necessitate the application of the **design process**, as stipulated by the presentation requirements for this PAT.

Requirements and specifications of the selected jack/lifting device:

- The **jack/lifting device, or a set of detailed photographs thereof if it is too large to submit, must be submitted as part of the PAT presentation**.
- Your **teacher must approve** the jack/lifting device in order to ensure that it **meets all the requirements** and that a PAT of an **appropriate higher-order Grade 12 complexity** can be produced.
- The jack/lifting device must be **portable and hand-operated** with a **lifting capacity of less than 1 500 kg**. **Electrical and/or pneumatically (air) operated jacks/lifting devices may therefore not be used**.
- The jack/lifting device must be an **assembly** consisting of a **minimum of FOUR different mechanical parts/components**, e.g. a scissor jack, trolley jack, axle jack, floor jack, screw jack, bottle jack etc., with a lifting capacity of less than 1 500 kg that includes **mechanical movement** as part of its operation/function.

PHASE 1: Presentation requirements

1. **Identify the primary and secondary problem(s)** and formulate a **comprehensive design brief**.
Include the following as part of the design brief:
 - Your own **comprehensive** list of **specifications**
 - Your own list of **constraints**
 - A list of the **main points** of ALL the **presentation requirements** together with a **management plan** for the development of the PAT
2. Conduct your own **research** on the following:
 - All the **materials** that are used for **ALL the parts/components** of the selected jack/lifting device
 - **Specific design features** and/or **function (purpose)** of each individual part/component of the selected jack/lifting device
 - In-depth research of the design, components/parts and mechanical movement (working) of **at least TWO other models or makes of portable hand-operated jacks/lifting devices** that are **similar** to the jack/lifting device you have selected.

NOTE:

- The research must be **relevant** and **usable**.
- Evidence of **ALL the research conducted** and the **relevant resource material used** must be **presented as proof** that the required research had been done.
The **first two** research requirements will be primarily **hands-on investigative research**, which can be presented by freehand drawings and/or photographs, with labels and/or notes indicating the material and the function of each part/component.
The **evidence** of the **other TWO jacks/lifting devices** may be in the form of a **comprehensive set of pictures and/or photographs together with explanatory labels and notes** of each.
- There must be clear evidence that the **research was used**.
- Include a list of ALL **references (sources)**.

3. **Generate THREE sets** of detailed **freehand drawings** that will clearly show **THREE different possible improvements, modifications or re-designs** to the identified **main part(s)/component(s)** of the **selected jack/lifting device**.

Each set of freehand drawings must consist of **relevant self-explanatory orthographic views** and an **isometric drawing(s)** that must show **dimensions, labels and notes**, as well as the **correct presentation** of ALL the **features**. **Include a short narrative explanation** of the possible improvement, modification or re-design.

NOTE:

- ALL the features should be drawn **proportionally the same size**. **Grid/Graph paper** should therefore be used.
- These drawings must provide clear evidence that a high level of competency has been attained in **freehand drawings** as one of the required **EGD drawing methods**.
- All the drawings must comply with the *SANS 10111 Guidelines*.

4. **Select the best improvement/modification/re-design** which demonstrates an in-depth understanding of the design brief within the context of the specifications and constraints, by **evaluating and comparing** the possible design solutions of the **THREE freehand drawings**. Include a **comprehensive summary** of the reasons for the selected solution.

PHASE 2: Presentation requirements

5. **Present the selected jack/lifting device** and the **selected improvement/modification/re-design** as a set of **working drawings** and a **pictorial drawing** (5.1, 5.2 and 5.3) that adhere to the following:
- All the drawings must be presented on appropriately sized drawing sheets, correctly set up with borders. Only the **first working drawing** (5.1) has to be set up with an **appropriate and complete mechanical title block**.
 - The drawings must provide clear evidence that a high level of competency had been attained in the following **TWO** required **EGD drawing methods**:
 - Instrument drawings
 - CAD (Computer-aided Drawing/Design)

NOTE:

- **ONE working drawing** (i.e. 5.1 or 5.2) must be prepared as an **instrument drawing** and the **other** using a **CAD system**.
 - The **isometric drawing** (5.3) may be prepared **either** as an instrument drawing **or** by using a CAD system.
 - **Schools that do not have CAD facilities must prepare all the required drawings** (5.1, 5.2 and 5.3) **as instrument drawings**.
- All drawings must comply with the *SANS (SABS) 10111 Guidelines*.
- 5.1 Draw an **assembly drawing** of the **selected jack/lifting device** clearly showing all the parts **before** any improvements, modifications or re-designs have been effected. The drawing must show a **minimum** of **FOUR appropriate** orthographic views drawn to a suitable scale.

The views must include:

- 5.1.1 The **front view**
- 5.1.2 A **second primary (main) view**
- 5.1.3 Any **TWO** other **secondary views**

NOTE: TWO of the **views must be sectioned** or contain **types of section**.

The following must be included:

- Scale
- Dimensions
- Labels and notes
- Cutting planes
- ALL hatching detail

- 5.2 Draw a **detailed drawing** of the **identified main part(s)/component(s)** of the selected jack/lifting device, clearly showing the **selected improvement/modification/re-design**. The drawing must show a **minimum of THREE appropriate** orthographic views drawn to a suitable scale.

The views must include:

5.2.1 The **front view**

5.2.2 Any **TWO** other **views**

NOTE: ONE of the **views must be sectioned** or contain a **type of section**.

The following must be included:

- A comprehensive list of explanatory labels and notes
- Relevant welding and/or machining symbols
- Scale
- Dimensions
- Cutting plane(s)
- ALL hatching detail

- 5.3 Draw a detailed **isometric drawing** of the **selected jack/lifting device** or of the improved, modified or re-designed main part(s)/component(s) of the jack/lifting device, to a suitable scale.

Evidence of the following must be shown:

- All views/drawings used to produce the drawing
- The constructions/methods used to produce the drawing

NOTE:

- Include relevant labels and notes.
- A copy of the isometric drawing, which may contain artistic features, should be used as the picture for the cover page of the PAT file/portfolio.

PHASE 3: Presentation requirements

Create a PAT file/portfolio containing:

- A complete **cover page**
- An **index**
- The **2016 SUMMATIVE ASSESSMENT SHEET** (see page 25)
- The completed **DECLARATION OF AUTHENTICITY** (see page 26)

Present the following Phase 1 and Phase 2 presentation requirements in the PAT file/portfolio after the DECLARATION OF AUTHENTICITY:

- ALL the **design brief** requirements
- The evidence of ALL the relevant resource material used for the **required research**
- The **THREE freehand drawings** of THREE possible design solutions
- ALL the evidence of the **selection** of the **best solution**
- ALL the required **working drawings** (5.1 and 5.2) and the **pictorial drawing** (5.3)
- Provide clear evidence in the form of (a) **checklist(s)**, **continuous self-evaluation** of the **entire process** and the **meeting** of all the **deadlines** during the development of the PAT.

NOTE:

Include the following on each page of each presentation requirement:

- Clear **numbering** according to the numbers of the presentation requirements
- **Your** (the learner's) **name**
- The **date** of **completion** and **submission**

Assessment criteria and checklist for the 2016 EGD Mechanical PAT

- The **SUMMATIVE ASSESSMENT SHEET** on page 25 of the EGD PAT document must be used to indicate the final totals out of 10 for each assessment criterion.
- The **contribution** of each aspect of the PAT is as follows:
 - The **design process**, i.e. presentation requirements numbers 1, 2, 3, 4, 6 and 7, will contribute **25 marks** to the final PAT mark out of 100
 - The **working drawings and a pictorial drawing**, i.e. presentation requirement number 5, will contribute **50 marks** to the final PAT mark out of 100
 - **Drawing methods, drawing skills** and **presentation**, which should be assessed according to ANNEXURE A, will contribute **25 marks** to the final PAT mark out of 100.

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2016 EGD MECHANICAL PAT										
1 mark level descriptive		0	No evidence/not done or not correct/complete/compliant/achieved/very poor					Checked	Suggested mark allocation	Own notes/Comments
		1	All evidence shown/correct/complete/compliant/achieved/clear							
2 mark level descriptive		0	No evidence/not done/very poor							
		1	Evidence shown but not correct/complete/compliant/achieved/average							
		2	All evidence shown/correct/complete/compliant/achieved/clear/very good							
1 Design Brief										
	1.1	Identifying the primary problem and secondary problems in own words						2		
	1.2	Formulating of a design brief in own words						2		
	1.3	Creating a comprehensive list of the specifications for the selected jack and task						2		
	1.4	List of constraints for the selected jack and/or task						2		
	1.5	List of the entire process together with a management plan						2		
TOTAL							10			
2 Research (This should be restricted to a maximum of THREE A4 or TWO A3 pages per research topic)										
Relevant and usable research on:	2.1	Materials that are used for the parts/components of the selected jack						2		
	2.2	Design features and/or function (purpose) of each individual part						2		
	2.3.1	The design and mechanism (working) of another jack No. 1						2		
	2.3.2	The design and mechanism (working) of another jack No. 2						2		
	Clear evidence that the research was used						1			
Sources included						1				
TOTAL							10			
3 Freehand drawings of THREE possible design solutions										
Assess each freehand solution as follow:	Relevant orthographic views				2	Final mark for each solution				
	Isometric drawing				2	Solution 1	10			
	Correct presentation of ALL the features				2					
	The relative size of all features and fixtures to each other				2					
	Labels and notes				2	Solution 2	10			
	Dimensioning				2					
	Narrative of improvement, modification or redesign				2					
	Functionality of improvement, modification or redesign				1	Solution 3	10			
(Use 7-mark rubric on page 45 of the EGD CAPS)				Subtotal = 15 ÷ 1,5 = TOTAL					10	
(1 = 1 ; 2 = 1 ; 3 = 2 ; 4 = 3 ; 5 = 3 ; 6 = 4 ; 7 = 5 ; 8 = 5 ; 9 = 6 ; 10 = 7 ; 11 = 7 ; 12 = 8 ; 13 = 9 ; 14 = 9 ; 15 = 10)										
4 Selecting the best freehand solution (This must be a separate presentation)										
Appropriate and easily understandable presentation of the selection process						2				
Using the requirements and specifications as criteria for the evaluation						2				
Relevant and comprehensive reasons (evaluating and comparing)						2				
A rating scale to score each solution, i.e. a mark allocation of each criteria						2				
A summary of the reasons for the selected solution(s)						2				
TOTAL							10			
5 Working drawings and a pictorial drawing of selected jack/lifting device and solution										
Drawing sheet preparation										
Appropriately sized drawing sheets						1				
Borders on all the drawing sheets of working drawings and pictorial drawing						2				
Appropriate and complete mechanical title block on the first working drawing (5.1)						7				
(Use 7-mark rubric on page 45 of the EGD CAPS)					TOTAL		10			
5.1 Assembly drawing of the selected jack/lifting device, before any improvements/modifications/redesigns										
5.1.1 Front view before any changes										
	ALL the parts included and drawn correctly according to actual jack/lifting device						2			
	All hatching detail or, if not sectioned, ALL external features						2			
	ALL bolts and nuts and other fastening methods correct in ALL FOUR views						2			
	Labels and notes for ALL FOUR views						2			
	Projection symbol						1			
	Suitable scale selected and indicated correctly for ALL FOUR views						1			
TOTAL							10			

ASSESSMENT CRITERIA AND CHECKLIST FOR THE 2016 EGD MECHANICAL PAT				
5.1.2	Second primary (main) view before any changes			
	ALL the parts included and drawn correctly according to actual jack/lifting device		2	
	All hatching detail or, if not sectioned, external features		2	
	Dimensions for ALL FOUR views		2	
	ALL centre lines on ALL FOUR views		2	
	ALL FOUR views drawn correctly in third-angle orthographic projection		2	
TOTAL			10	
5.1.3	TWO other secondary views before any changes			
	Appropriate secondary views selected		2	
	ALL the parts included and drawn correctly according to actual jack/lifting device		2	
	All hatching detail or, if not sectioned, external features		2	
	TWO views sectioned or contain types of section		2	
	Correct cutting planes for the TWO sectional views and/or types of sections		2	
TOTAL			10	
5.2	Detailed drawing of the selected improvement/modification/redesign of the main part(s)/component(s)			
	Appropriate view selected as the front view and is drawn correctly		2	
	TWO other relevant views selected and drawn correctly		2	
	Improvement/modification/re-design correlates with selected freehand solution		2	
	Comprehensive list of explanatory labels and notes		2	
	Dimensions		2	
	ONE view sectioned , or contain types of section , and drawn correctly		2	
	Cutting plane(s)		1	
	ALL hatching detail		2	
	Relevant welding symbols and/or machining symbols and/or tolerances		2	
	Projection symbol		1	
	Suitable scale selected and indicated correctly		1	
	Drawing is in third-angle orthographic projection		1	
Subtotal = 20 ÷ 2 = TOTAL			10	
5.3	Detailed isometric drawing			
	Suitable scale selected and indicated correctly		1	
	Evidence of views/drawings and construction/method used for the drawing		2	
	Isometric drawing/answer (Use 7-mark rubric on page 45 of the EGD CAPS)		7	
TOTAL			10	
6	Continuous self-evaluation and the meeting of deadlines			
	Checklist(s) of continuous self-evaluation of the entire process (mark out of 10 ÷ 2)		5	
	The meeting of ALL the deadlines during the development (mark out of 10 ÷ 2)		5	
	TOTAL		10	
7	Presentation of the complete PAT file/portfolio			
	Cover page		1	
	Index		1	
	Summative assessment sheet and declaration		1	
	Correct sequencing of ALL presentation requirements		1	
	Name and numbering on ALL the presentation requirements		1	
	General impression of file/portfolio, e.g. binding, appearance etc. (mark out of 10 ÷ 2)		5	
TOTAL			10	
Assessment of drawing methods, drawing skills and presentation				
a	Freehand drawings			
	Freehand drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
b	Instrument drawings			
	Use of drawing instruments, drawing methods and skills (See ANNEXURE A on page 23)		10	
	Neatness, line work/line quality and printing (See ANNEXURE A on page 23)		10	
c	CAD drawings			
	Competence displayed in using a CAD system/program (See ANNEXURE A on page 23)		10	
	Layout and correctness of the drawings presentation (See ANNEXURE A on page 23)		10	

8. ANNEXURE A: RUBRIC FOR ASSESSING DRAWING METHODS, DRAWING SKILLS AND PRESENTATION

LEVELS OF PERFORMANCE													
MARK ALLOCATION			10	9	8	7	6	5	4	3	2	1	0
			100%	99%–90%	89%–80%	79%–70%	69%–60%	59%–50%	49%–40%	39%–30%	29%–20%	19%–1%	0%
Freehand drawings	METHODS AND SKILLS	The drawings display correct freehand drawing methods and skills as well as the method used to ensure good proportion and size	The drawings display excellent drawing methods and skills and the method used to ensure outstanding proportion and size .			The drawings display satisfactory drawing methods and skills and the method used to ensure satisfactory proportion and size .			The drawings display poor drawing methods and skills and there is little to no evidence of the method used which resulted in poor proportion and size .		The drawings display very poor drawing methods and skills and no method was used to ensure correct proportion .		
	Final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning		Drawings are very neat and all line work/line quality, printing and dimensioning are outstanding and consistent .			Drawings are neat and line work/line quality, printing and dimensioning are generally good and mostly consistent .			Drawings are untidy with inconsistent line work/line quality, printing and dimensioning .		The line work/line quality, printing and dimensioning are unacceptable .		
Pencil instrument drawings	METHODS AND SKILLS	The drawings display the correct use of drawing instruments, drawing methods and skills .	The drawings display the correct use of drawing instruments and an outstanding application of drawing methods and skills .			The drawings display the correct use of drawing instruments and a satisfactory and mostly correct application of drawing methods and skills .			The drawings display poor use of drawing instruments and a poor and incorrect application of drawing methods and skills .		The drawings display an incorrect use of drawing instruments with incorrect applications of drawing methods and skills .		
	The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning		Drawings are very neat and all line work/line quality, printing and dimensioning are outstanding and consistent .			Drawings are neat and the line work/line quality, printing and dimensioning are generally good and mostly consistent .			Drawings are untidy and the line work/line quality, printing and dimensioning are inconsistent .		The line work/line quality, printing and dimensioning are unacceptable .		
CAD drawings	METHODS AND SKILLS	The level of competence displayed in using a CAD system	Displays a high level of skills, knowledge and ability in using a CAD system			Displays a satisfactory level of skills, knowledge and ability in using a CAD system			Displays a poor level of skills, knowledge and ability in using a CAD system		Shows little to no skills , knowledge or ability in using a CAD system		
	The layout of the final drawing is correct and the line work, printing and dimensioning is compliant and consistent		The layout of the drawings is correct and the line work, printing and dimensioning are compliant and consistent			The layout of the drawings is acceptable and the line work, printing and dimensioning are mostly compliant and consistent			The layout of the drawings is very poor and the line work, printing and dimensioning are not compliant and inconsistent		The layout, line work, printing and dimensioning are unacceptable .		

9. A SIMPLIFIED RUBRIC FOR THE VERIFICATION AND ALLOCATION OF MARKS

NOTE:

- The final mark out of 10 of each assessment criterion, i.e. the overall level of achievement according to the presentation requirement, **must be verified according to this rubric.**
- This rubric must also be used to allocate marks for all aspects of the assessment criteria which require a mark out of 10.
- The concept of '**benchmarking**', i.e. the identification of and allocation of marks for the best example(s) for each assessment criterion, should be applied when assessing the PATs.

VERIFICATION AND MARK ALLOCATION			
DESCRIPTION FOR MARK	GENERAL INDICATOR	± %	MARK
ALL/MORE than ALL the REQUIREMENTS are met. - PERFECT -	Error free	100%	10
ALL (ALMOST ALL) the REQUIREMENTS are met. - OUTSTANDING -	Very few errors	90% +	9
ALMOST ALL (MOST OF) the REQUIREMENTS are met. - VERY GOOD -	Few errors	80% +	8
The REQUIREMENTS are met SUBSTANTIALLY . - GOOD -	Some errors	70% +	7
The REQUIREMENTS are met ADEQUATELY . - SATISFACTORY -		60% +	6
The REQUIREMENTS are met MODERATELY . - ACCEPTABLE -	Many errors	50% +	5
ONLY SOME of the REQUIREMENTS are met. - UNACCEPTABLE -		40% +	4
VERY FEW of the REQUIREMENTS are met. - NOT ACHIEVED -	Mostly wrong	30% + Only a few correct features	3
The REQUIREMENTS are NOT met. - VERY POOR -	Completely wrong	29% and LESS	2
		Something done incorrectly/poorly	1
NOT DONE!	No work handed in!	Nothing to mark!	0

10. PRACTICAL ASSESSMENT TASK 2016: SUMMATIVE ASSESSMENT SHEET**PRACTICAL ASSESSMENT TASK 2016
SUMMATIVE ASSESSMENT SHEET**

SCHOOL:

NAME OF LEARNER:

(SURNAME AND INITIALS)

EXAMINATION NUMBER:

PART A: Design Process				PART B: Working and pictorial drawings				Drawing competency and skill					
CRITERIA			MARK	CRITERIA			MARK	CRITERIA			MARK		
1	A design brief demonstrating a clear understanding of the scenario with a list of the specifications and constraints			All drawing sheets are appropriately set up with a border and an appropriate title block/panel .				Freehand drawings ANNEXURE A	METHOD	The drawings display correct freehand drawing methods and skills and the method used to ensure proportion and size			
2	Evidence of relevant and usable research with the inclusion of a source									The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning			
3	THREE freehand drawings of detailed possible solutions	1 st Solution		Orthographic drawings	Assess each view's accuracy and correctness according to the selected solution, the stipulated requirements and EGD drawing principals	5.1.1	View 1 PAT 1: Plan PAT 2: Front view		Pencil instrument drawings: ANNEXURE A	METHOD	The drawings display the correct use of drawing instruments, drawing methods and skills		
		2 nd Solution				5.1.2	View 2 PAT 1: Section PAT 2: 2 nd main view				The final drawing presentation is neat and there is consistency of line work/line quality, printing and dimensioning		
		3 rd Solution				5.1.3	View 3 PAT 1: 2 elevations PAT 2: 2 secondary views						
4	Selecting the final/best solution which demonstrates a clear understanding of the design brief					5.2	PAT 1: Site plan PAT 2: Detailed drawing						
6	Clear evidence of continuous self-evaluation and the meeting of deadlines of all the requirements			Pictorial drawing	5.3	The correct drawing method and the presentation of the drawing PAT 1: 2-point perspective PAT 2: Isometric			CAD drawings ANNEXURE A	METHOD	The level of competence displayed in using a CAD system		
7	The presentation of the complete PAT file/portfolio												
Criteria Total				Criteria Total				TOTAL without CAD					
CALCULATION				CALCULATION				TOTAL with CAD					
Teacher's TOTAL				Teacher's TOTAL				CALCULATION without CAD					
TOTAL: A			/ 25	TOTAL: B			/ 50	CALCULATION with CAD					
Moderated TOTAL				Moderated TOTAL				Teacher's TOTAL					
TOTAL: A			/ 25	TOTAL: B			/ 50	TOTAL: C			/ 25		
TEACHER'S TOTAL: A + B + C =								ASSESSOR: Initial					
MODERATED TOTAL: A + B + C =								MODERATOR: Initial					

11. DECLARATION OF AUTHENTICITY**DECLARATION OF AUTHENTICITY**

To be submitted with each learner's practical assessment task portfolio

NAME OF THE SCHOOL:

NAME OF LEARNER:
(SURNAME AND INITIALS)

EXAMINATION NUMBER:

I hereby declare that all the contents of the practical assessment task submitted by myself for assessment is my own original work and has not been plagiarised, copied from someone else or previously submitted for assessment.

SIGNATURE OF CANDIDATE

DATE / /2016
(DD/MM/YYYY)

NAME OF TEACHER:
(SURNAME AND INITIALS)

As far as I know, the above declaration by the candidate is true and I accept that the PAT offered is his/her own work.

SIGNATURE OF TEACHER

DATE / /2016
(DD/MM/YYYY)

SCHOOL STAMP