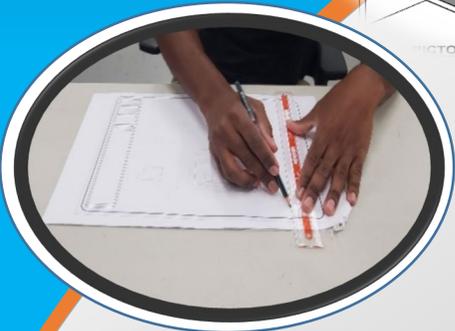
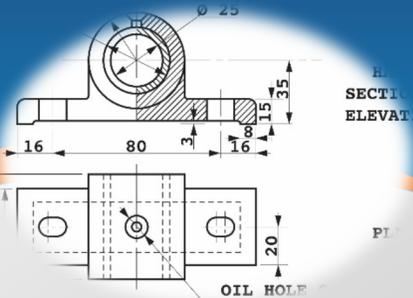
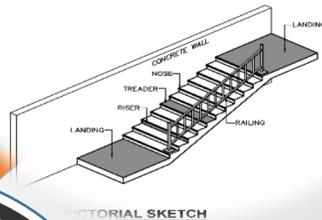




CARIBBEAN EXAMINATIONS COUNCIL

CSEC[®] TECHNICAL DRAWING



Subject Report
with
Exemplars
May/June 2024

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE[®]
EXAMINATION**

MAY/JUNE 2024

**TECHNICAL DRAWING
GENERAL PROFICIENCY**

**Copyright © 2024 Caribbean Examinations Council
St Michael, Barbados
All rights reserved.**

Table of Contents

INTRODUCTION	1
PAPER 01 — MULTIPLE CHOICE	2
PAPER 02 OPTION A — BUILDING DRAWING	3
Section I — Working Drawing.....	3
Question 1	3
Recommendations.....	4
Section II — Sketch and Design	9
Question 2	9
PAPER 02 OPTION B — MECHANICAL ENGINEERING DRAWING	13
Section I — Assembly Drawing.....	13
Question 1	13
Recommendations.....	16
Section II — Sketch and Design	17
Question 2	17
Recommendations.....	22
GENERAL RECOMMENDATIONS	23

INTRODUCTION

This guide has been compiled using candidate's responses to the 2024 May/June examination in CSEC Technical Drawing. The examination consists of the following papers.

- Paper 01 — Multiple Choice
- Paper 02 — Structured Questions
- Paper 03 — School-Based Assessment

Paper 02 consists of two papers which are as follows.

- Paper 021 — Building and Drawing
- Paper 022 — Mechanical Engineering Drawing

In 2024, the number of candidates entered for this subject was 10 237, compared with 9425 in 2023 and 8419 in 2022. An analysis of the performance of candidates on the 2024 exam showed that the number of candidates achieving Grade I was slightly below that of 2023 but on par with 2022. There was a marginal decrease in the number of candidates achieving Grades I–III when compared with 2023. Overall, the percentage of candidates achieving acceptable grades (Grades I–III) was 78.62 per cent compared with 81.33 per cent in 2023 and 75.19 per cent in 2022.

PAPER 01 — MULTIPLE CHOICE

Paper 01 consisted of 60 multiple-choice questions that tested the profile dimensions of Knowledge (Profile 1), Application (Profile 2) and Practical Ability (Profile 3). Each question was worth one mark. The paper focused on Section 1 (Fundamentals of Technical Drawing) and Section 2 (Geometrical Construction — Plane and Solid Geometry) of the syllabus.

In 2024, the mean score of 35.25 (58.75 per cent) was consistent with candidates' performance over the previous three years. The maximum score gained by any candidate was 60 and the standard deviation was 11.49.

Section I — Working Drawing

Question 1

Question 1 was divided into two parts. Both sections were mandatory. Candidates were presented with a line drawing of a floor plan for single storey dwelling house. The drawing included the outline of the roof. It also indicated the positions of windows, doors and the outline of the roof type. Candidates were instructed not to reproduce the line drawing or draw a floor plan.

Question 1 (a)

For Part 1 (a), candidates were required to produce two elevations, front (north) and side (east), at a scale of 1:50. They were required to include the windows and door positions, roof outline, and patio and handrail. Candidates were also required to label the overhang, the windows and the doors. In addition, they were expected to show three vertical dimensions on each elevation and print suitable titles and the scale used on each elevation.

Overall, most candidates attempted this part. Most of them were able to produce one or both elevations. Some candidates misunderstood what they were required to do and so they drew a floor plan, a roof plan or a foundation plan.

It was noted that candidates were comfortable generating elevations based on the given information using both the traditional medium and CAD. Generally, candidates were able to represent the following as required.

- The correct view of the hip roof in both elevations.
- The three components labelled correctly — windows, door and overhang.
- The correct dimensioning technique for three dimensions on each elevation.

Many candidates provided responses in which they demonstrated that they were able to interpret the question and display knowledge of different elevations of the same building. It was clear that candidates' knowledge of the elevations and how they applied it was acceptable. However, their practical ability and neatness need to be improved.

Candidates had difficulties doing the following.

- Representing the correct view of the hip roof
- Mirroring of the elevations' components
- Representing sash windows in different elevations
- Printing the drawings to scale
- Producing appropriate lineweight and linework
- Printing with correct CAD settings and as such not being able to achieve the correct lineweights
- Printing in black and white

- Printing the title and the scale

Question 1 (b)

Candidates were required to draw to a cross section of the sash window, W1, to a scale of 1:10. The drawing was expected to include specific components. Candidates were also required to print a suitable title and the scale, and label each of the given components.

Despite being mandatory, many candidates did not attempt this part. Fewer than half the candidates were able to generate a cross-section of a sash window that included all the required parts. This suggests that few candidates had knowledge of how to draw a window section. Candidates who produced an acceptable response were able to represent and label the required components which were a

- concrete beam/ lintel
- window frame
- window frame cross stile
- window frame sill
- concrete windowsill.

Some candidates were able to interpret the question and display knowledge of how to produce a cross-section of a sash window and label it appropriately. It was evident that candidates' knowledge of how to produce the window was acceptable, however their practical ability and neatness need to be improved. Candidates had difficulty doing the following.

- Drawing the window in the required section
- Showing the conventions for the concrete windowsill extended beyond the wall or sloping away from the window frame
- Indicating that the window detail was part of a wall
- Proper labelling techniques (text and leader lines with arrows)
- Printing a suitable title or scale

Recommendations

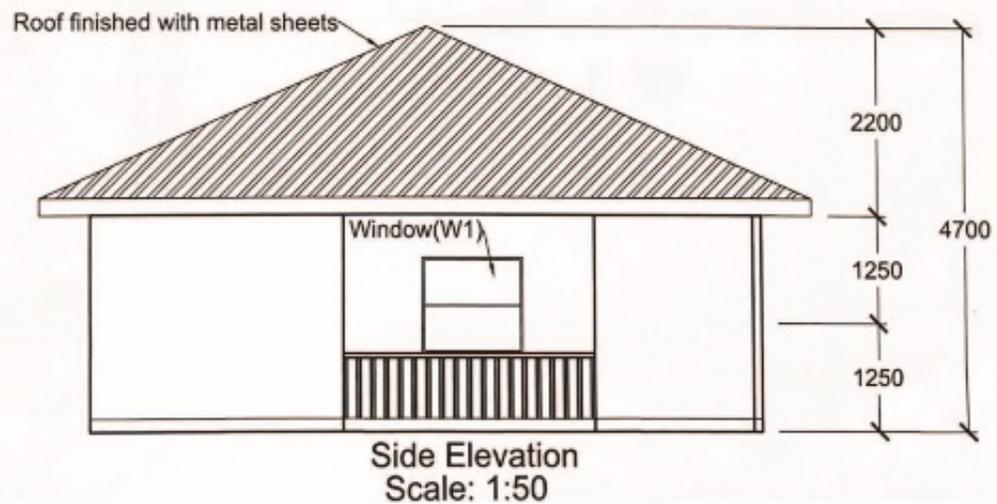
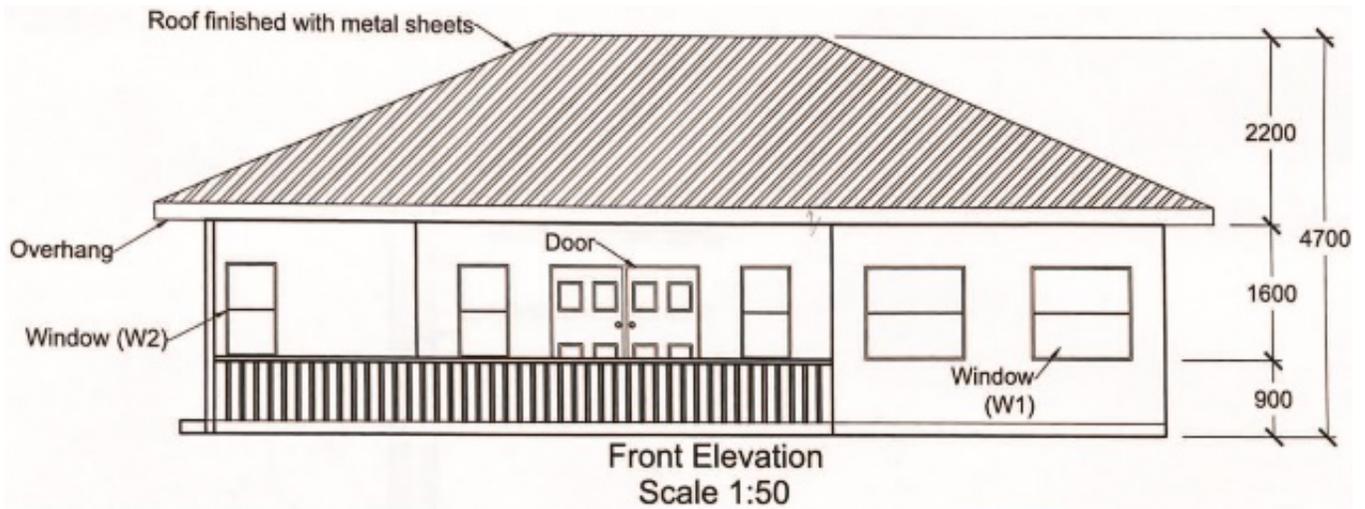
Teachers must train students to do the following when using the CAD option.

- Utilize the correct processes for saving and printing drawings to scale in orthographic projection layout.
- Select correct line weights and line-types.

Candidate's Response to Part (a)

Figure 1, on the enclosed sheet, shows an outline of a line drawing of the floor plan for a single dwelling house including the outline of the roof. Do NOT reproduce or draw the line drawing or the floor plan.

- (a) (i) Draw to a scale of 1:50, the front (north) and side (east) elevations to include the following:
- Windows and door positions
 - Roof outline
 - Patio and handrail **(41 marks)**
- (ii) Label the following components:
- Overhang
 - Window
 - Door **(4 marks)**
- (iii) Show THREE vertical dimensions on **each** elevation. **(5 marks)**
- (iv) Print suitable titles and the scale used on **each** elevation. **(2 marks)**

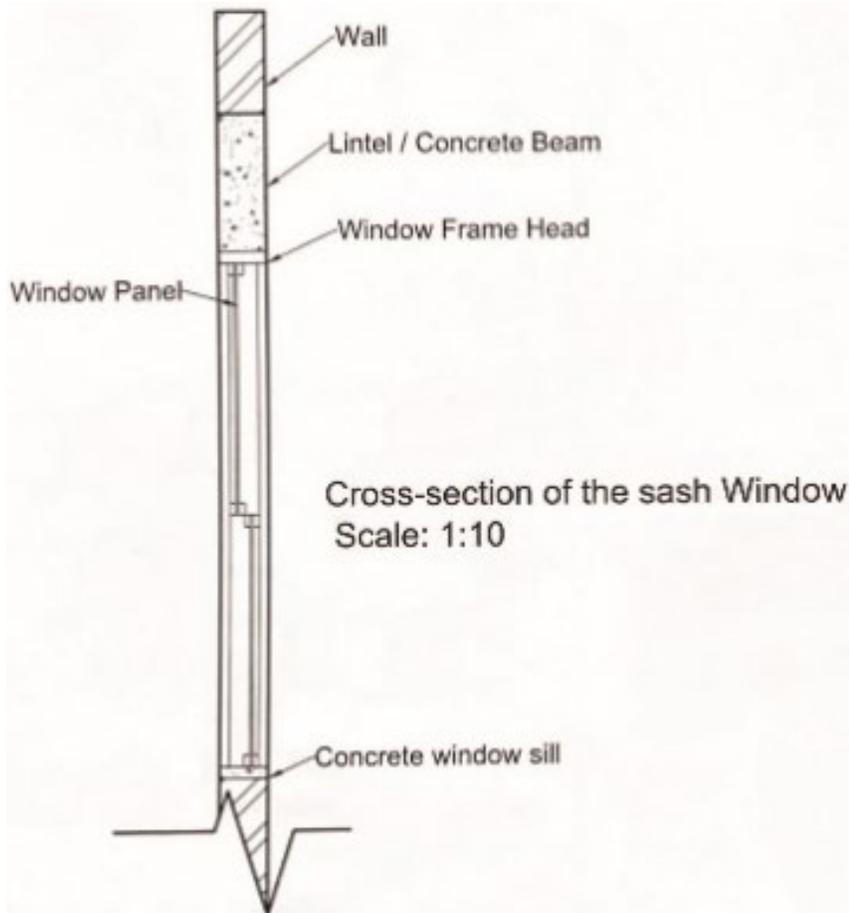


Examiner's Comments

The candidate's response reflects that he/she had a comprehensive understanding of producing two elevations from a given a line diagram. The candidate correctly produced a representation of a hip roof in two different views. The drawing also showed the placement of windows, doors and patio railings. The convention for a sash window in elevation was clearly represented. The candidate demonstrated that he/she had an excellent knowledge of labelling and dimensioning techniques. Overall, correct linetypes and lineweights were applied to identify different components on the elevations. This was a well-executed CAD response.

Candidate's Response to Part (b)

- (b) (i) Draw to a scale of 1:10, a cross-section of the sash window, W1, in the given specifications, to include the following components:
- Concrete beam/lintel
 - Window frame head
 - Window frame cross stile
 - Window frame sill
 - Concrete windowsill **(32 marks)**
- (ii) Label EACH of the components in (b) (i). **(4 marks)**
- (iii) Print a suitable title and the scale used. **(2 marks)**



Examiner's Comments

The candidate produced a response that was thorough. The candidate demonstrated that he/she had a high level of understanding of how to draw the components in correct relationship to each other and how to correctly label them. The section of the window was drawn correctly indicating that one half of the window moves vertically in a different plane from the other half of the window. The frame cross stile's label was omitted and the short depth concrete windowsill did not have a slope or its lip overhanging the wall below. Overall, the correct linetypes and lineweights were applied to identify different components on the sectional detail.

Section II — Sketch and Design

Question 2

Candidates were presented with instructions to draw neatly, proportioned sectional sketches of a load bearing (masonry) wall and a non-load bearing (masonry) wall. Candidates were awarded marks for proportion and lineweight.

Candidates were required to label three components. These were as follows.

- Ring (belt) beam
- Floor slab
- Foundation

Candidates who attempted this question demonstrated that they

- had knowledge of the components that differentiate a load bearing masonry wall from a non-load bearing masonry wall
- knew the conventions for representing masonry walls, beams slabs and footings in section
- had general knowledge of labelling the appropriate items.

The following are general weaknesses observed.

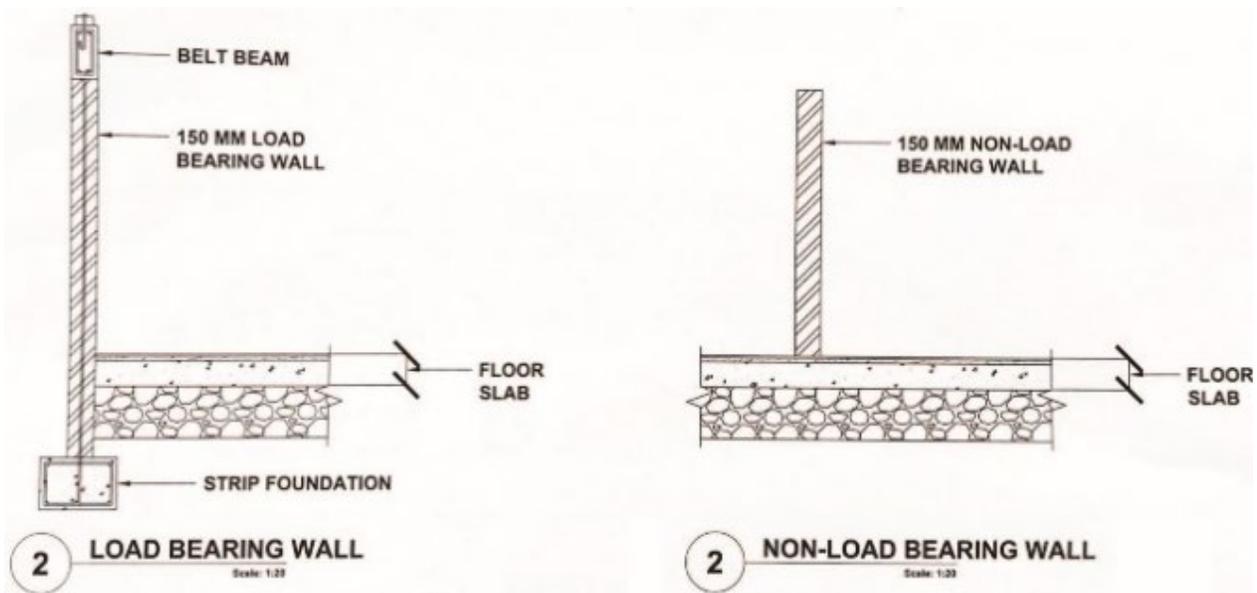
- Drawing elevations of walls instead of the required section
- Incorrectly placing a foundation wall with a footing under the non-load bearing wall
- Representing the correct floor slab for the non-load bearing wall
- Misrepresenting the concrete ring (belt) beam as a wooden wall plate
- Drawing a section of a wood wall
- Using incorrect hatching conventions for concrete, hardcore, masonry block and earth
- Sketching disproportionately

Candidate's Response to Question 2 — Sample 1

- (a) Make neat proportional sectional sketches of EACH of the following:
- (i) Load-bearing block (masonry) wall **(10 marks)**
 - (ii) Non-load bearing block (masonry) wall **(8 marks)**
- (b) Label the following components:
- Ring (belt) beam
 - Floor slab
 - Foundation **(9 marks)**

NOTE

Candidates will be awarded marks for proportion and line weight. **(3 marks)**



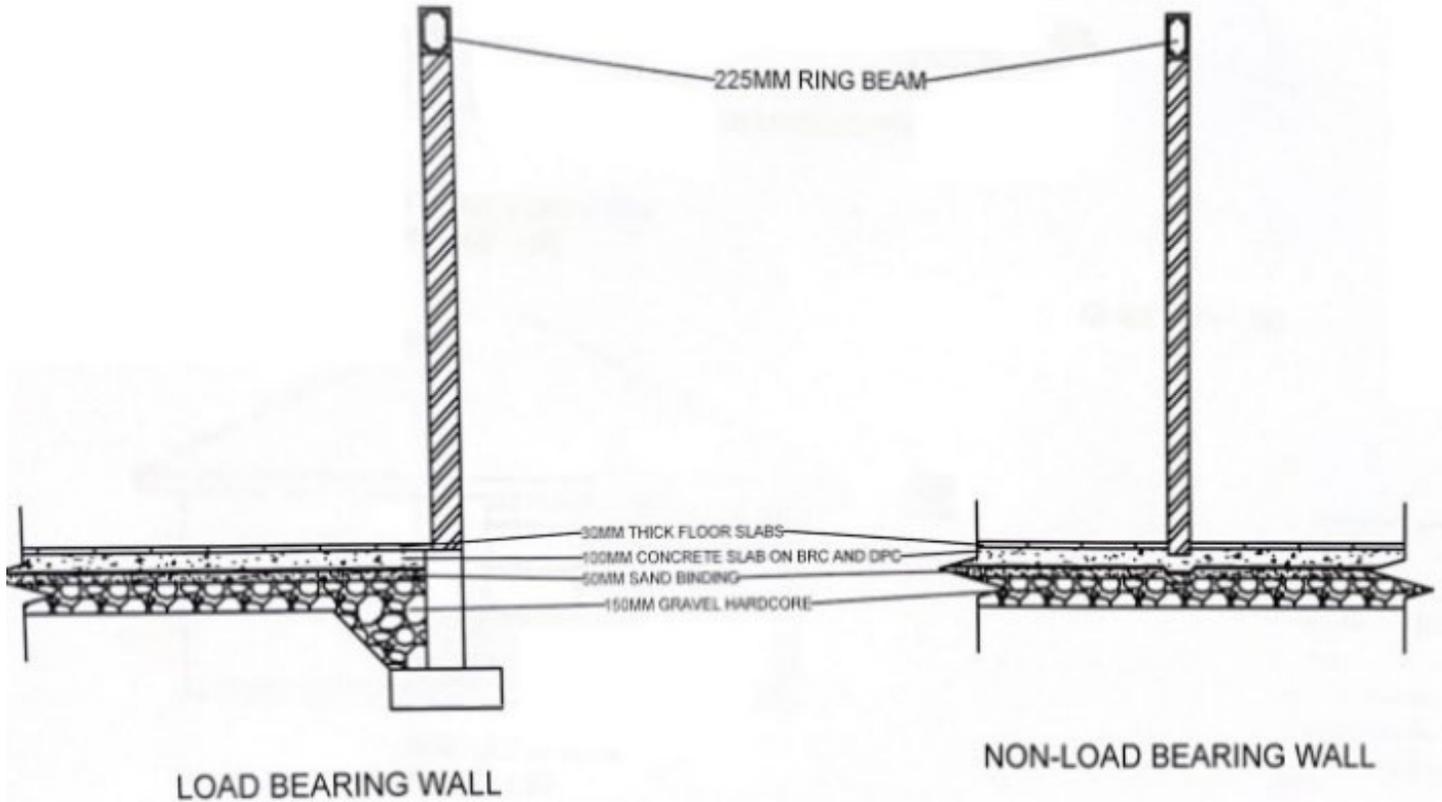
Examiner's Comments

The candidate's response reflects that he/she had comprehensive knowledge of how to use neat, proportional sketches to depict the significant differences between a load bearing and a non-load bearing masonry wall.

The candidate correctly used standard conventional symbols to indicate the different types of hatches for masonry walls, reinforced concrete, compacted marl fill and earth. The required components were also correctly labelled.

Overall, this was a well-executed CAD response where the correct linetypes and lineweights were applied to identify different components on the sketch.

Candidate's Response to Question 2 — Sample 2



Examiner's Comments

The candidate's neat, proportional response shows that he/she had a thorough understanding of the significant differences between a load bearing and a non-load bearing masonry wall. This is exemplified through the thickening of the slab for the non-load bearing and the foundation wall with a footing for the load bearing wall.

Correctly drawn are the standard conventional symbols used to indicate the different types of hatches for masonry walls, reinforced concrete, compacted marl fill and earth. The required components were correctly labelled.

Overall, this was a well-executed CAD response in which the correct linetypes and lineweights were applied to identify different components on the sketch.

Section I — Assembly Drawing

Question 1

Candidates were presented with enclosed sheets containing orthographic details of parts that made up a table clamp assembly.

In Part (a), candidates were required to draw full size in either first-angle or third-angle orthographic projection the following views of the table clamp assembly when fully assembled.

- A full sectional front elevation of the assembled table clamp taken on cutting plane X–X
- An end elevation of the assembled table clamp, which showed all hidden details

In Part (b), candidates were required to show a parts list and six main dimensions, including a length, a diameter, a radius and a metric screw thread specification.

In Part (c), candidates were required to print the title “Table Clamp Assembly”, the scale used and the projection method used by symbol.

Question 1 was worth a total of 90 marks.

Most candidates demonstrated that they were competent in assembling the given parts of the table clamp assembly to maximize its intended functionality.

Some candidates possessed limited knowledge of assembly and sectional drawings. This was determined to be so because such candidates drew the parts sheet, depicted an inaccurate placement of the locking device and produced incomplete drawings. Other candidates had difficulty interpreting and relating the direction of the cutting plane to obtain the correct sectional elevation.

Further, some candidates had difficulty manipulating cross hatching lines to differentiate multiple parts of the assembly.

Most candidates who responded to Option B utilized the Computer Aided Drawing (CAD) software in the provision of a final product. However, in some instances, candidates had difficulty printing and fitting the complete response on one drawing page. This resulted in candidates presenting their solutions out of the orthographic projection layout, which is a basic principle of orthographic projection.

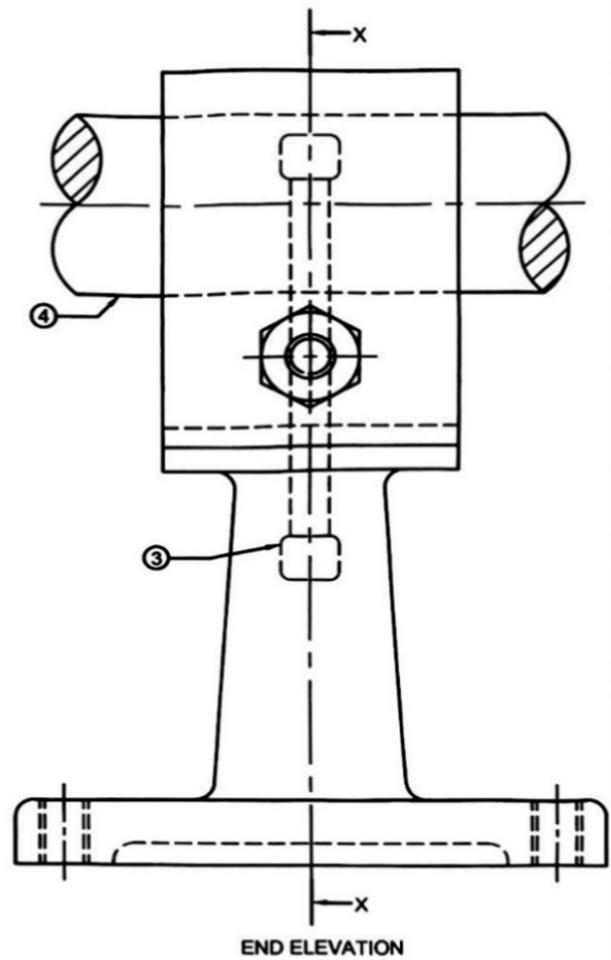
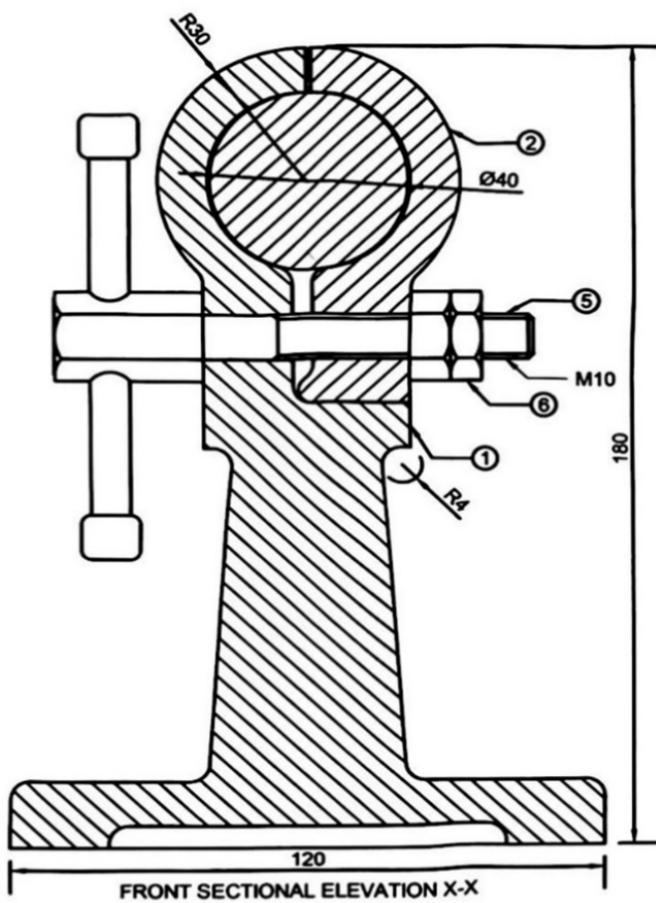
Some candidates had limited knowledge of the requirements of a parts list. Fundamental labels such as title, scale and projection symbol were also omitted by many candidates.

Candidate's Response to Question 1

Figure 1, **on the enclosed sheet**, shows the first-angle orthographic projection details of the parts that make up a table clamp assembly which holds a work piece in place for drilling holes or inserting other details.

In assembling the parts, the arm (2) is aligned with the body (1). The work piece (4) is placed within the space between the arm of the body (1). The M10 bolt (5) is passed through the hole on the body (1) and through the arm (2) and secured in place by the M10 lock nuts (6). The handle (3) is situated through the M8 bolt (5) which tightens the body (1) and the arm (2), keeping the work piece in place.

- (a) Draw, **FULL SIZE**, in either first-angle or third-angle orthographic projection, the following views of the assembly:
 - (i) A **FULL** sectional front elevation on cutting plane "X-X". **(41 marks)**
 - (ii) An end elevation. Show **ALL** hidden details. **(35 marks)**
- (b) Show a parts list and **SIX main** dimensions to include a length, a diameter, a radius and a metric screw thread specification. **(11 marks)**
- (c) Print the title, "Table clamp assembly", and the scale used. Show the projection method used by symbol. **(3 marks)**



PARTS LIST			
PART NO	PART NAME	NO. OF	
1	BODY	1	
2	ARM	1	
3	HANDLE	1	
4	WORK PIECE	1	
5	M10 BOLT	1	
6	LOCK NUT	1	

TITLE : TABLE CLAMP ASSEMBLY

Examiner's Comments

The candidate's response reflects that he/she had an excellent interpretation of the assembly drawing and drawing to scale. The candidate also had an excellent grasp of assembly of parts and so produced an accurate response. The orthographic projection and alignment of views were well depicted. It was evident from the drawing submitted that the candidate had a clear understanding of sectioning using hatch lines to identify different parts. A parts list, six main dimensions, the title and projection symbol were identified in the drawing.

The candidate was able to apply linetypes, lineweights and linescales correctly. However, while linetypes and lineweights were adequately depicted, the candidate did not use the proper convention for the scale and the correct direction of the cutting plane. The drawing was printed clearly using the correct scale. The parts list was correctly done as the standard format was followed.

Recommendations

Students may benefit from greater guidance on how to read and interpret key components of questions. Additionally, they need to be taught the drawing conventions and about locking devices, including the use of bolts and nuts for joining parts.

Finally, prior to the examination, significant time should be spent developing students' skills in saving their work to PDF format as well as the printing processes when using the CAD. The inability to perform these tasks effectively in the examination negatively affects the outcome of candidates' scores for the alignment and position of views, dimensions and drawing to scale, line weights and line types.

Teachers are reminded that this is the Working Drawing section of the examination. As such, standard practices and conventions for completing working drawings are to be rigorously followed. Emphasis should be placed on

- placement and alignment of views based on orthographic projection
- encouraging reading, interpreting and applying how parts are assembled
- conventions such as cutting planes, metric threading and screw fasteners
- line conventions and thickness
- drawing/printing to scale
- printing the title, scale and projection symbol
- dimensioning techniques
- details required for sectional drawings including the treatment of hatching lines to show different components assembled.

Teachers are reminded to teach students to do the following when using CAD.

- Utilize the correct processes for saving and printing drawings to scale in orthographic projection layout
- Select correct of line weights, line-types and hatches.

Section II — Sketch and Design

Question 2

Question 2 tested candidates' ability to make neat orthographic sketches to illustrate the difference between each pair of the following engineering conventions.

- First-angle and third-angle orthographic projection
- Internal and external screw threads
- Counterbore and countersunk holes
- Diamond and straight knurling
- Broken solid cylindrical shaft and hollow cylindrical tube

This question was worth a total of 30 marks.

Approximately 68 per cent of candidates did not attempt to produce a response. Of the candidates who attempted this question, most of them were able to give satisfactory responses. Some of them attained between 28 and 30 marks. Fifty-five per cent of candidates demonstrated that they had knowledge of how to draw proportional and neat orthographic sketches to illustrate differences between each pair of the engineering conventions.

Most candidates gave good representations of the following.

- Internal and external screw threads
- Counterbore and countersunk holes
- Diamond and straight knurling

However, some candidates had challenges illustrating the following.

- First-angle and third-angle orthographic projection
- Broken solid cylindrical shaft and hollow cylindrical tube

Ninety per cent of candidates used CAD.

Candidate's Response to Question 2 — Sample 1

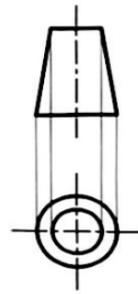
Using neat orthographic sketches, show the difference between EACH pair of the following engineering conventions.

- First-angle and third-angle orthographic projection
- Internal and external screw threads
- Counterbore and countersunk holes
- Diamond and straight knurling
- Broken solid cylindrical shaft and hollow cylindrical tube **(25 marks)**

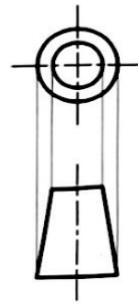
Candidates will also be awarded marks for the following:

- Orthographic views
- Proportion
- Presentation **(5 marks)**

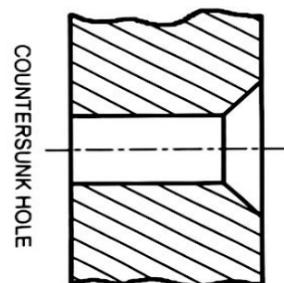
QUESTION TWO - SKETCH AND DESIGN



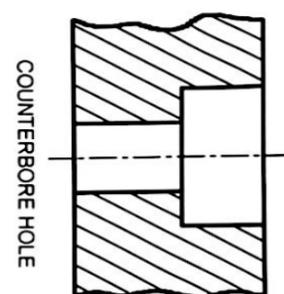
FIRST-ANGLE ORTHOGRAPHIC PROJECTION



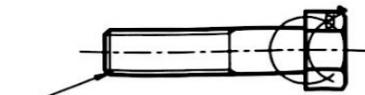
THIRD-ANGLE ORTHOGRAPHIC PROJECTION



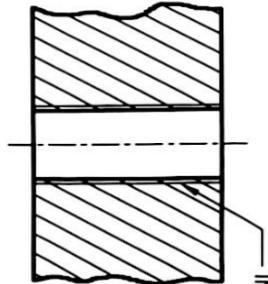
COUNTERSUNK HOLE



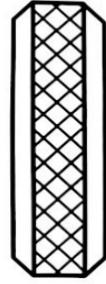
COUNTERBORE HOLE



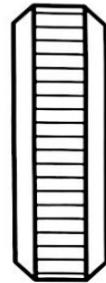
EXTERNAL THREADING



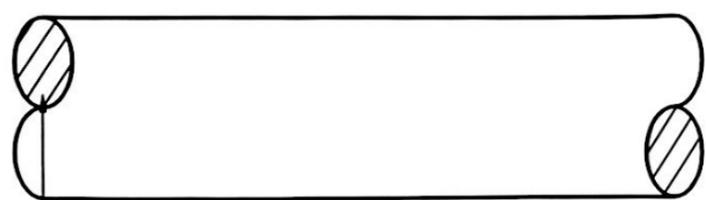
INTERNAL THREADING



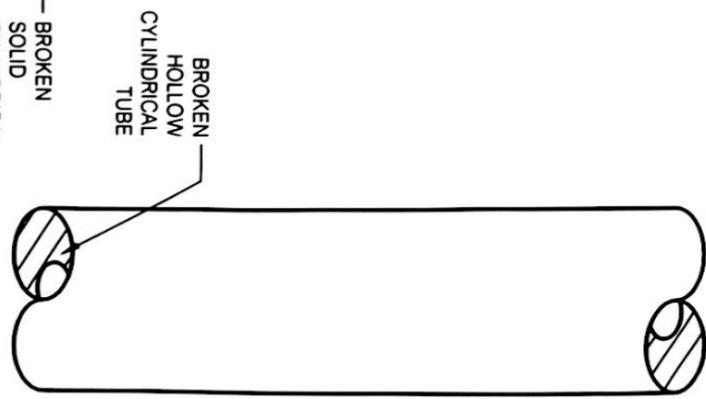
DIAMOND KNURLING



STRAIGHT KNURLING



BROKEN SOLID CYLINDRICAL SHAFT



BROKEN HOLLOW CYLINDRICAL TUBE

Examiner's Comments

The candidate's response shows that he/she had an excellent understanding of the difference between the given pairs of engineering conventions. The candidate was able to articulate concise renditions of engineering symbols while laying out the conventions on the page in an easy-to-read manner. The candidate produced an excellent CAD rendition of engineering convention drawings.

SECTION TWO-NO.2

COUNTERBORE HOLE

COUNTERSUNK HOLE

INTERNAL THREAD

EXTERNAL THREAD

DIAMOND KNURLING

STRAIGHT KNURLING

CYLINDRICAL SOLID SHAFT

CYLINDRICAL HOLLOW TUBE

MAY/JUNE 2024
 CSEC TECHNICAL
 DRAWING, SECTION
 TWO-NO.2. USING
 NEAT ORTHOGRAPHIC
 SKETCHES SHOW THE
 DIFFERENCES
 BETWEEN EACH PAIR
 OF THE FOLLOWING
 ENGINEERING
 CONVENTIONS.

Examiner's Comments

The candidate's response reflects that he/she had an outstanding understanding of the difference between pairs of engineering conventions. The candidate was able to identify all the engineering conventions required and included additional illustrations to support the responses, showing that he/she had a complete understanding of what was required. Overall, this was an excellent CAD response.

Recommendations

Teachers should incorporate more proportional sketching in their instruction to teach students how to approach this section of the examination more effectively. Moreover, students may benefit from additional classroom exercises/assignments that

- encourage students to read the instructions given to understand what information is required prior to formulating solutions
- place emphasis on sketching solutions
- place emphasis on rudimentary aspects of the syllabus such as engineering conventions
- teaching students time management in the classroom when performing drawing exercises so that they learn to better manage their time in an examination.

GENERAL RECOMMENDATIONS

- All syllabus objectives must be taught for the specific option (Building Drawing or Mechanical Engineering and Drawing) to adequately prepare candidates for the examination.
- Students should be given guidance on how to read questions. They should be taught to identify key terms and the requirements of the questions. Having students identify possible responses should be part of classroom activities.
- P021 has a more diverse amalgam of topics which must be covered with samples of practical examples to create an in-depth understanding of the technical skills and theory required to approach the examination.
- Instruction for P022 must include practical sessions on assembling engineering/mechanical objects as well as visual stimulus of sectional views to supplement the abstract teaching of these concepts in the classroom
- Teachers should utilize samples of items such as nuts and bolts, screw fasteners, window types or prioritize visits to workshops or worksites as field trips where possible to create linkages with theoretical content and the physical materials.
- Students need to be taught how to print when using CAD. Many candidates lose marks in the examination because of their lack of knowledge of how to print when using this medium. Scaling is a fundamental concept in Technical Drawing. Therefore, candidates must be given practice in scaling, saving to pdf in the scale required by the question and printing responses prior to the examination when using CAD.