

No. 953

30 September 2005

**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Civil Engineering and Construction

Registered by Organising Field 12, Physical Planning and Construction, publishes the following qualification and unit standards for public comment.

This notice contains the titles, fields, subfields, NQF levels, credits, and purpose of the qualification and unit standards upon which qualifications are based. The full qualification and unit standards can be accessed via the SAQA web-site at www.saqqa.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, Hatfield Forum West, 1067 Arcadia Street, Hatfield.

Comment on the unit standards should reach **SAQA** at the address **below and no later than 29 October 2005**. All correspondence should be marked **Standards Setting - SGB Civil Engineering and Construction** and addressed to

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:

Further Education and Training Certificate: Computer Aided Drawing Office Practice

| SAQA QUAL ID | QUALIFICATION TITLE | | |
|------------------------------------|--|--------------------------------|-------------------------|
| 50018 | Further Education and Training Certificate: Computer Aided Drawing Office Practice | | |
| SGB NAME | NSB 12 | PROVIDER NAME | |
| SGB Civil Engineering Construction | Physical Planning and Construction | | |
| QUAL TYPE | FIELD | SUBFIELD | |
| Further Ed and Training Cert | Physical Planning and Construction | Civil Engineering Construction | |
| ABET BAND | MINIMUM CREDITS | NQF LEVEL | QUALIFICATION CLASS |
| Undefined | 120 | Level 4 | Regular-Unit Stds Based |

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

Any learners, who are, or wish to be involved in the Computer Aided Drawing, will have access to this qualification. This qualification is intended to serve the architectural, engineering and construction industries by providing skilled draftspersons who can produce design drawings which address the need to move from traditional manual drafting to Computer Aided Drawing and Draughting. Portability across other National Qualifications in Engineering and Draughting is therefore ensured.

The specific purpose of this qualification represents the skills, knowledge and understanding required by draughtspersons to:

- > Use and operate a computer system
- > Establish client requirements and gather and apply the required design information
- > Produce computer-aided drawings for an appropriate area of draughting
- > Use a wide variety of measuring instruments to improve the quality and end result of computer-aided drawings
- > Plan and layout a computer-aided drawing
- > Create a free hand drawing in preparation for a computer-aided drawing

Rationale:

The FETC in Computer Aided Drawing Office Practice: Level 4 is designed to meet the needs of those learners who enter the field of Computer Aided Drawing.

The FETC in Computer Aided Drawing Office Practice will provide a broad base of knowledge and skills needed in the industry and will help those learners progressing along a career path who:

- > Were previously disadvantaged or who were unable to complete their schooling and were therefore denied access to Further Education and Training
- > Have worked in Computer Aided Drawing for many years, but have no formal qualification in Computer Aided Drawing
- > Wish to extend their range of skills and knowledge of the industry so that they can become knowledgeable workers in Computer Aided Drawing and Draughting

The FETC in Computer Aided Drawing Office Practice allows the learner to work towards a nationally recognised qualification. The qualification will allow both those in formal education and those already employed in, but not limited to, architectural, engineering and construction organisations access, due to its

flexibility. It aims to develop learners who are informed and skilled in Computer Aided Drawing and Draughting.

The qualification focuses on the skills, knowledge, values and attitudes required to progress further in this field of learning. The intention is:

- > To provide the development of knowledge and skills that are required in all sub-sectors of Computer Aided Drawing
- > To realise the potential of people in draughting
- > To provide opportunities for people to move up career paths by being more valuable to their organisation, the economy and themselves

The FETC in Computer Aided Drawing Office Practice should produce knowledgeable, skilled Computer Aided Draughtspersons who are able to contribute to improved productivity and efficiency within the draughting industry. It should provide the means for current learners in the Computer Aided Drawing field to receive recognition for prior learning and to upgrade their skills and knowledge base. The qualification is structured in such a way that it exposes learners to a set of core competencies to give a broad understanding of Computer Aided Drawing. The electives will allow for specific competence in a selected area of drawing specialisation. It will also promote the notion of life-long learning.

Career pathways:

- > Surveying
- > Electronic Engineering
- > Mining Engineering
- > Electrical Engineering
- > Automotive Engineering
- > Structural steel detailing.
- > Piping and plant design.
- > Building and Civil Engineering
- > Instrumentation Engineering
- > Engineering and design draughting
- > Air-conditioning and ventilation design
- > Architecture
- > Wood manufacturing
- > Town and regional planning
- > Road construction

RECOGNIZE PRIOR LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

It is assumed that learners are already competent in the following at NQF Level 3:

- > Mathematical Literacy and Communication

The unit Standards:

- > "Plan and determine the drawing requirements to produce a drawing"
- > "Demonstrate basic understanding of the workflow"
- > "Demonstrate an understanding of the drawing office orientation"

Recognition of Prior Learning:

The structure of this Unit Standard based Qualification makes the Recognition of Prior Learning possible, if the learner is able to demonstrate competence in the knowledge, skills, values and attitudes implicit in this Computer Aided Drawing Qualification. Recognition of Prior Learning will be done by means of an Integrated Assessment as mentioned in the previous paragraph.

This Recognition of Prior Learning may allow

- > For accelerated access to further learning
- > Gaining of credits towards a unit standard

All recognition of Prior Learning is subject to quality assurance by the relevant accredited Education, Training, Quality, Assurance Body and is conducted by a registered workplace assessor.

Access to the Qualification

Access to this qualification is open bearing in mind learning assumed to be in place.

QUALIFICATION RULES

Rules of combination:

Fundamentals: 56 credits

> All the unit standards are compulsory

Core: 33 credits

> All the unit standards are compulsory

Electives: Minimum of 31 credits should be chosen from any of the specialisations below:

> Learning pathway for a Mechanical and Piping draughtsperson:

> Demonstrate an understanding of production, manufacturing and construction processes as it affects the drawing

> Demonstrate an understanding of engineering materials, heat treatment and machining

> Demonstrate an understanding of various mechanical components

> Identify, interpret and produce working mechanical drawings

> Identify, interpret and produce working piping drawings

> Set up and prepare 3d model space and produce a 3d model

> Learning pathway for a Electrical and Air conditioning, ventilation duct and plant draughtsperson:

> Demonstrate an understanding of production, manufacturing and construction processes as it affects the drawing

> Demonstrate an understanding of engineering materials, heat treatment and machining

> Demonstrate an understanding of various mechanical components

> Identify, interpret and produce working electrical drawings

> Identify, interpret and produce working air conditioning, ventilation duct and plant drawings

> Set up and prepare 3d model space and produce a 3d model

> Learning pathway for Building draughtsperson:

> Produce a bill of materials, working drawings and cost a design

> Set up a survey instrument to take observations

> Identify, interpret and produce working building drawings

> Identify, interpret and produce working electrical drawings

> Set up and prepare 3d model space and produce a 3d model

> Apply contract documentation

> Learning pathway for a Reinforced Concrete detailing and Structural Steel detailing draughtsperson:

> Identify, interpret and produce working structural steel drawings

> Identify, interpret and produce working reinforced concrete detail drawings

> Demonstrate understanding of regulations, codes and drawing office practices for structural steel detailing

> Set up and prepare 3d model space and produce a 3d model

> Demonstrate an understanding of basic contract planning functions, workshop and site procedures for structural projects

> Learning pathway for a Civil Construction draughtsperson:

> Identify, interpret and produce working civil construction drawings

> Identify, interpret and use construction drawings and specifications

> Set up and prepare 3d model space and produce a 3d model

> Produce a bill of materials, working drawings and cost a design

EXIT LEVEL OUTCOMES

1. Use and operate a computer system.

2. Establish client requirements and gather and apply the required design information.

3. Produce computer aided drawings for an appropriate area of draughting.
 - > Range: electrical, building, piping, mechanical and structural steel.
4. Use a wide variety of measuring instruments to improve the quality and end result of computer aided drawings.
 - > Range: Venier caliper, micrometers, venier height gauges, venier protractors, steel rule, measuring tape, thread pitch, radius and feeler gauges, theodolite, electronic distance measuring devices.
5. Plan and layout a computer aided drawing.
6. Produce a free hand drawing in preparation for a computer aided drawing.

ASSOCIATED ASSESSMENT CRITERIA

1.
 - > Basic computer hardware components are connected to a computer system.
 - > Keyboard and mouse are used to access a computer.
 - > Computer, software and peripherals are used to process information.
2.
 - > The client brief is identified and analysed to meet the client requirements.
 - > A survey is conducted to gather the pertinent information.
 - > Data is analysed and applied to the design.
3.
 - > Computer aided drawing commands are used and applied to perform the drawing operations.
 - > Views are projected according to the requirements of the brief.
 - > Relevant dimensions and assemblies are constructed in accordance with design requirements.
 - > Drawing complies to the codes of practice for engineering drawing.
4.
 - > The functions and usage of measuring instruments are described.
 - > Measuring instruments are used to measure and give scale readings as per specifications and requirements.
 - > The object to be drawn is identified and measured to meet the requirements.
 - > The drawing produced meets the set requirements>
5.
 - > Drawing requirements are checked, verified and interpreted in accordance with instructions.
 - > The required detail instructions are recorded to worksite and job requirements.
 - > Components and drawing parameters are selected from specifications obtained to meet the requirements.
 - > Computer aided drawing software programme is selected, activated and configured to link to all the available peripherals.
6.
 - > The object to be drawn is identified and measured to meet requirements.
 - > A drawing is produced and shows the dimensions to meet the requirements.
 - > The drawing is produced using a pencil to represent the different line types.
 - > A given reading is represented by a line drawing.

Integrated Assessment:

Because assessment practices must be open, transparent, fair, valid, and reliable and ensure that no learner is disadvantaged in any way whatsoever, an integrated assessment approach is incorporated into the qualification.

Learning, teaching and assessment are inextricably linked. Whenever possible, the assessment of knowledge, skills, attitudes and values shown in the unit standards should be integrated.

Assessment of the communication, language, literacy and numeracy should be conducted in conjunction with other aspects and should be assessed in authentic Computer Aided Drawing contexts wherever possible.

A variety of methods must be used in assessment and tools and activities must be appropriate to the

context in which the learner is working. Where it is not possible to assess the learner in the workplace or on-the-job, simulations, case studies, role-plays and other similar techniques should be used to provide a context appropriate to the assessment.

The term 'Integrated Assessment' implies that theoretical and practical components should be assessed together. During integrated assessments the assessor should make use of formative and summative assessment methods and assess combinations of practical, applied, foundational and reflective competencies.

Assessors and moderators should make use of a range of formative and summative assessment methods. Assessors should assess and give credit for the evidence of learning that has already been acquired through formal, informal and non-formal learning and work experience.

Assessment should ensure that all specific outcomes, embedded knowledge and critical cross-field outcomes are evaluated. The assessment of the critical cross-field outcomes should be integrated with the assessment of specific outcomes and embedded knowledge.

INTERNATIONAL COMPARABILITY

The Computer Aided Drawing Industry is a discipline with globally recognised best practices, standards and qualifications. This qualification and set of unit standards utilises international and locally recognised best practice and standards in Computer Aided Drawing practice.

Benchmarking was done by comparison to Unit Standards/Outcomes of learning against:

- > The New Zealand qualifications - National Certificate in Design (Draughting) (Level 2) total credit value 70
- > New Zealand Unit Standards in Design - Computer Graphics:

- > Produce orthographic, scale-working drawings using computer aided draughting (CAD) programs
 - 7 Produce scale production drawings using computer aided draughting (CAD) programmes
- > Produce scale production drawings using computer aided draughting (CAD) programmes
- > Demonstrate knowledge of numerical data used in the draughting industry
- > Technical And Further Education Authority (TAFE) New South Wales was also used as a resource for international benchmarking

A direct comparison with each unit standard was undertaken and the best practice points were highlighted and incorporated into each unit standard. However the points incorporated were written in a South African context.

Because of the difference in levels across the different countries, difficulty was found in making actual direct comparisons, level to level. It was found that the South African unit standards seem to contain more detail and therefore are slightly more complex and the qualification is longer in duration as they only have 70 credits.

The work groups also referred to other facets of national and international benchmarking, which occurred continuously throughout the qualifications and unit standard writing process.

These facets were:

- > The methods and techniques for writing standards
- > The contents of the unit standards
- > The levels in other countries compared to South Africa

It is the Computer Aided Drawing standard generating workgroup's intent to benchmark on a continuous basis with other unit standards both locally and internationally.

ARTICULATION OPTIONS

This qualification allows for both horizontal and vertical articulation.

Horizontal articulation:

- 7 National Certificate in Mechanical Engineering: Fitting and Machining NQF Level 4
- > National Certification in Polymer Composites Fabrication NQF Level 4
- > National Certificate in Electrical Engineering NQF Level 4

- > National Certificate in Automotive Components Manufacturing and Assembling NQF Level 4
- > National Certificate in Air Conditioning, Refrigeration and Ventilation NQF Level 4
- > National Certificate in Road Works Construction NQF Level 4

Vertical articulation:

- > National Diploma in Structural Steel Detailing: NQF Level 5

MODERATION OPTIONS

Assessment of learner achievements takes place at providers accredited by relevant ETQA or any ETQA which has signed a Memorandum of Understanding (MoU) with the relevant ETQA in accordance with ETQA Regulations (RSA, 1998b).

- > Anyone assessing a learner or moderating the assessment of a learner against this qualification must be registered as an assessor with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.
- > Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.
- > Assessment and moderation of assessment will be overseen by the relevant Education, Training, Quality, Assurance (ETQA) Body, or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.
- > Moderation must include both internal and external moderation of assessments at exit points of the Qualification, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described both in individual Unit Standards as well as the integrated competence described in the Qualification.

| | UNIT STANDARD ID AND TITLE | LEVEL | CREDITS | STATUS |
|----------|--|--------------|----------------|----------------------------|
| Core | 9532 Demonstrate basic knowledge of computers | Level 3 | 6 | Reregistered |
| Core | 14467 Establish client requirements and gather and apply required design information | Level 4 | 6 | Registered |
| Core | 14471 Plan drawing layout | Level 4 | 6 | Registered |
| Core | 14473 Develop and produce computer aided drawings | Level 4 | 4 | Registered |
| Core | 14474 Plan and schedule workflow | Level 4 | 3 | Registered |
| Core | 14476 Apply drawing office administration procedures | Level 4 | 3 | Registered |
| Core | 14478 Demonstrate an understanding of drawing office orientation | Level 4 | 2 | Registered |
| Core | 14486 Demonstrate an understanding of measuring instruments and produce free-hand drawings | Level 4 | 3 | Registered |
| Elective | 11637 Set up a survey instrument to take observations | Level 3 | 4 | Reregistered |
| Elective | 120199 Set up and prepare 3D model space and produce a 3D model | Level 3 | 6 | Draft - Prep for P Comment |

| | | | | |
|-------------|--|--------|----|----------------------------|
| Elective | 14426 Read, interpret and use construction drawings and specifications | Level4 | 10 | Registered |
| Elective | 14489 Identify, interpret and produce electrical working drawings | Level4 | 8 | Registered |
| Elective | 14490 Identify, interpret and produce working building drawings | Level4 | 8 | Registered |
| Elective | 14492 Identify, interpret and produce working piping drawings | Level4 | 6 | Registered |
| Elective | 14495 Identify, interpret and produce working mechanical drawings | Level4 | 8 | Registered |
| Elective | 14497 Identify, interpret and produce working structural steel drawings | Level4 | 8 | Registered |
| Elective | 114194 Demonstrate understanding of regulations codes and drawing office practices for structural steel detailing | Level4 | 7 | Registered |
| Elective | 120198 Identify, interpret and produce working reinforced concrete detail drawings | Level4 | 10 | Draft - Prep for P Comment |
| Elective | 120200 Produce a bill of material, working drawings and cost design | Level4 | 8 | Draft - Prep for P Comment |
| Elective | 120201 Identify, interpret and produce working air conditioning and ventilation duct and plant drawings | Level4 | 6 | Draft - Prep for P Comment |
| Elective | 120213 Read, interpret and produce working civil construction drawings | Level4 | 8 | Draft - Prep for P Comment |
| Elective | 14469 Demonstrate an understanding of production, manufacturing and construction processes as it affects the drawing | Level5 | 5 | Registered |
| Elective | 14485 Demonstrate an understanding of engineering materials, heat treatment and machinery | Level5 | 6 | Registered |
| Elective | 14488 Demonstrate an understanding of various mechanical components | Level5 | 6 | Registered |
| Elective | 15137 Apply contract documentation | Level5 | 10 | Registered |
| Elective | 114221 Demonstrate an understanding of basic contract planning functions workshop and site procedures for structural steel projects | Level5 | 5 | Registered |
| Fundamental | 8969 Interpret and use information from texts | Level3 | 5 | Reregistered |
| Fundamental | 8970 Write texts for a range of communicative contexts | Level3 | 5 | Reregistered |
| Fundamental | 8971 Analyse and respond to a variety of literary texts | Level3 | 5 | Reregistered |
| Fundamental | 7468 Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues | Level4 | 6 | Reregistered |
| Fundamental | 8974 Engage in sustained oral communication and evaluate spoken texts | Level4 | 5 | Reregistered |
| Fundamental | 8975 Read analyse and respond to a variety of texts | Level4 | 5 | Reregistered |
| Fundamental | 8976 Write for a wide range of contexts | Level4 | 5 | Reregistered |
| Fundamental | 8977 Evaluate literary texts | Level4 | 5 | Reregistered |
| Fundamental | 9015 Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems | Level4 | 6 | Reregistered |
| Fundamental | 9016 Represent analyse and calculate shape and motion in 2-and 3-dimensional space in different contexts | Level4 | 4 | Reregistered |



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UNIT STANDARD:

1

| SAQA US ID | UNIT STANDARD TITLE | | |
|------------------------------------|---|--|--------------------|
| 120198 | Identify, interpret and produce working reinforced concrete detail drawings | | |
| SGB NAME | NSB 12 | PROVIDER NAME | |
| SGB Civil Engineering Construction | Physical Planning and Construction | | |
| UNIT STANDARD TYPE | FIELD DESCRIPTION | SUBFIELD DESCRIPTION | |
| Regular | Physical Planning and Construction | Physical Planning, Design and Management | |
| ABET BAND | CREDITS | NQF LEVEL | UNIT STANDARD TYPE |
| Undefined | 10 | Level 4 | Regular |

SPECIFIC OUTCOME 2

Detail and show beams, foundations and pile caps according to a specified requirement.

SPECIFIC OUTCOME 3

Use drawings to detail and position columns and pipes.

SPECIFIC OUTCOME 4

Demonstrate an understanding of floor slabs.

SPECIFIC OUTCOME 5

Produce detailed drawings for staircases.

SPECIFIC OUTCOME 6

Produce and present bending schedules.



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UNIT STANDARD:

3

| SAQA US ID | UNIT STANDARD TITLE | | |
|------------------------------------|--|--------------------------------|---------------------------|
| 120200 | Produce a bill of material, working drawings and cost a design | | |
| SGB NAME | NSB 72 | PROVIDER NAME | |
| SGB Civil Engineering Construction | Physical Planning and Construction | | |
| UNIT STANDARD TYPE | FIELD DESCRIPTION | SUBFIELD DESCRIPTION | |
| Regular | Physical Planning and Construction | Civil Engineering Construction | |
| ABET BAND | CREDITS | NQF LEVEL | UNIT STANDARD TYPE |
| Undefined | 8 | Level 4 | Regular |

SPECIFIC OUTCOME 2

Produce a bill of material to the correct sizes and quantities.

SPECIFIC OUTCOME 3

Determine the availability and costing of materials as specified in the bill of materials.

SPECIFIC OUTCOME 4

Compile and present a final design proposal



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UNIT STANDARD:

5

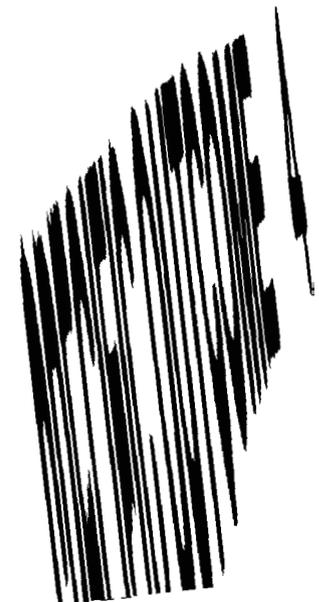
| | | | |
|------------------------------------|---|------------------------------------|--|
| SQA US ID | UNIT STANDARD TITLE | | |
| 120213 | Read, interpret and produce working civil construction drawings | | |
| SGB NAME | | NSR 12 | PROVIDER NAME |
| SGB Civil Engineering Construction | | Physical Planning and Construction | |
| UNIT STANDARD TYPE | FIELD DESCRIPTION | | SUBFIELD DESCRIPTION |
| Regular | Physical Planning and Construction | | Physical Planning, Design and Management |
| ABET BAND | CREDITS | NQF LEVEL | UNIT STANDARD TYPE |
| Undefined | 8 | Level 4 | Regular |

SPECIFIC OUTCOME 2

Interpret drawings for waterproofing.

SPECIFIC OUTCOME 3

Use drawings to interpret the structure of a building.





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UNIT STANDARD:

2

| | | | |
|--|--|---|--|
| 120199 | Set up and prepare 3D model space and produce a 3D model | | |
| SGB Manufacturing and Assembly Processes | | Manufacturing, Engineering and Technology | |
| UNIT STANDARD T | | FIELD DESCRIPTION | |
| R 1 | | Manufacturing, Engineering and Technology | |
| ABET BAND | | CREDITS | |
| Undefined | | 6 | |
| NQF LEVEL | | UNIT STANDARD TYPE | |
| Level 3 | | Regular | |

SPECIFIC OUTCOME 1

Prepare and set up a 3D design environment.

SPECIFIC OUTCOME 2

Display a 3D model in either solid or surface format by changing the definition settings.

SPECIFIC OUTCOME 3

Identify and apply the correct spatial or pre-set coordinate system in the 3D model space.

SPECIFIC OUTCOME 4

Create 3D objects using 2D profiles and view or display the model in a standard or isometric view.

SPECIFIC OUTCOME 5

Select objects in 2D and 3D model space using the selection criteria.



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UNIT STANDARD:

4

| SAQA US ID | UNIT STANDARD TITLE | | |
|--|--|---|--------------------------------|
| 120201 | Identify, interpret and produce working air conditioning and ventilation duct and plant drawings | | |
| SGB NAME | | NSB 06 | PROVIDER NAME |
| SGB Air-conditioning Refrigeration and Ventilation | | Manufacturing, Engineering and Technology | |
| UNIT STANDARD TYPE | | FIELD DESCRIPTION | SUBFIELD DESCRIPTION |
| Regular | | Manufacturing, Engineering and Technology | Engineering and Related Design |
| ABET BAND | CREDITS | NQF LEVEL | UNIT STANDARD TYPE |
| Undefined | 6 | Level 4 | Regular |

SPECIFIC OUTCOME 1

Understand air conditioning and ventilation duct layout.

SPECIFIC OUTCOME 2

Identify and draw a schematic duct layout drawing.

SPECIFIC OUTCOME 3

Draw ductwork schematic within an architectural layout drawing.

SPECIFIC OUTCOME 4

Identify, describe Air Conditioning and Ventilation plant and equipment in relation to a duct layout.