

Level 1 Certificates and Level 2 Diploma in Access to Building Services Engineering (2000)

Qualification handbook for centres



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Level 1 Certificates and Level 2 Diploma in Access to Building Services Engineering (2000)

Qualification handbook for centres

Qualification title	Number	QAN
Level 1 Certificate in Access to Building Services Engineering	2000-01	600/0986/X
Level 1 Certificate in Introduction to Refrigeration & Air-conditioning Skills	2000-11	600/5438/4
Level 1 Certificate in Introduction to Electrical Installation Skills	2000-12	600/5440/2
Level 1 Certificate in Introduction to Heating and Ventilating Skills	2000-13	600/5441/4
Level 1 Certificate in Introduction to Plumbing Skills	2000-14	600/5442/6
Level 2 Diploma in Access to Building Services Engineering	2000-02	600/0989/5

Version and date	Change detail	Section
2.0 March 2012	<p>New Level 1 pathways added:</p> <ul style="list-style-type: none"> • L1 Certificate in Introduction to Refrigeration and Air-conditioning Skills • L1 Certificate in Introduction to Electrical Installation Skills • L1 Certificate in Introduction to Heating and Ventilating Skills • L1 Certificate in Introduction to Plumbing Skills 	1
2.1 September 2017	<p>Added TQT and GLH details</p> <p>Deleted QCF</p>	<p>Qualification at a Glance, Structure</p> <p>Appendix</p>

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1 Introduction

This document contains the information that centres need to offer the following qualifications:

Qualification title and level	City & Guilds qualification number	Qualification accreditation number	Registration and certification
Level 1 Certificate in Access to Building Services Engineering	2000-01	600/0986/X	
Level 1 Certificate in Introduction to Refrigeration & Air-conditioning Skills	2000-11	600/5438/4	
Level 1 Certificate in Introduction to Electrical Installation Skills	2000-12	600/5440/2	See Walled Garden/ Online Catalogue for last dates
Level 1 Certificate in Introduction to Heating and Ventilating Skills	2000-13	600/5441/4	
Level 1 Certificate in Introduction to Plumbing Skills	2000-14	600/5442/6	
Level 2 Diploma in Access to Building Services Engineering	2000-02	600/0989/5	

This qualification is intended as a taster qualification for those who wish to enter any of the following industries:

- plumbing
- refrigeration and air-conditioning
- electrical installation
- heating and ventilating.

1.1 Qualification structure

To achieve the **Level 1 Certificate in Access to Building Services Engineering (2000-01)**, learners must achieve **34** credits from the mandatory units.

Unit accreditation number	City and Guilds unit number	Unit title	Credit value
F/502/8173	101	Understand and demonstrate fundamental safe working practices in Building Services Engineering	5
H/502/8179	102	Understand fundamental environmental protection measures within Building Services Engineering	2
Y/502/8180	103	Understand fundamental scientific principles within Building Services Engineering	3
D/502/8178	104	Introduction to Building Services Engineering	4
L/502/8175	105	Understand and demonstrate fundamental refrigeration and air conditioning operations	5
J/502/8174	106	Understand and demonstrate fundamental electrical installation operations	5
R/502/8176	107	Understand and demonstrate fundamental heating and ventilating operations	5
Y/502/8177	108	Understand and demonstrate fundamental plumbing operations	5

To achieve the **Level 1 Certificate in Introduction to Refrigeration and Air-conditioning Skills (2000-11)**, learners must achieve **15** credits from the four mandatory units in the table below.

Unit accreditation number	City & Guilds unit	Unit title	Credit value
Mandatory			
F/502/8173	101	Understand and demonstrate fundamental safe working practices in building services engineering	5
H/502/8179	102	Understand fundamental environmental protection measures in building services engineering	2
Y/502/8180	103	Understand fundamental scientific principles within building services engineering	3
L/502/8175	105	Understand and demonstrate fundamental refrigeration and air conditioning operations	5

To achieve the **Level 1 Certificate in Introduction to Electrical Installation Skills (2000-12)**, learners must achieve **15** credits from the four mandatory units in the table below.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
F/502/8173	101	Understand and demonstrate fundamental safe working practices in building services engineering	5
H/502/8179	102	Understand fundamental environmental protection measures in building services engineering	2
Y/502/8180	103	Understand fundamental scientific principles within building services engineering	3
J/502/8174	106	Understand and demonstrate fundamental electrical installation operations	5

To achieve the **Level 1 Certificate in Introduction to Heating and Ventilating Skills (2000-13)**, learners must achieve **15** credits from the four mandatory units in the table below.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
F/502/8173	101	Understand and demonstrate fundamental safe working practices in building services engineering	5
H/502/8179	102	Understand fundamental environmental protection measures in building services engineering	2
Y/502/8180	103	Understand fundamental scientific principles within building services engineering	3
R/502/8176	107	Understand and demonstrate fundamental heating and ventilating operations	5

To achieve the **Level 1 Certificate in Introduction to Plumbing Skills (2000-14)**, learners must achieve **15** credits from the four mandatory units in the table below.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
Mandatory			
F/502/8173	101	Understand and demonstrate fundamental safe working practices in building services engineering	5
H/502/8179	102	Understand fundamental environmental protection measures in building services engineering	2
Y/502/8180	103	Understand fundamental scientific principles within building services engineering	3
Y/502/8177	108	Understand and demonstrate fundamental plumbing operations	5

To achieve the **Level 2 Diploma in Access to Building Services Engineering (2000-02)**, learners must achieve **45** credits from the following mandatory units.

Unit accreditation number	City and Guilds unit number	Unit title	Credit value
L/502/8175	105	Understand and demonstrate fundamental refrigeration and air conditioning operations	5
J/502/8174	106	Understand and demonstrate fundamental electrical installation operations	5
R/502/8176	107	Understand and demonstrate fundamental heating and ventilating operations	5
Y/502/8177	108	Understand and demonstrate fundamental plumbing operations	5
J/602/2479	201	Understand and carry out safe working practices in building services engineering	10
D/602/2486	202	Understand how to apply environmental protection measures within building services engineering	4
D/502/8181	203	Understand the roles, responsibilities and procedures in building services engineering	4
J/602/2496	204	Understand how to apply scientific principles within mechanical services engineering	7

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 1 Certificate in Access to Building Services Engineering	304	340
Level 2 Diploma in Access to Building Services Engineering	399	450

1.2 Opportunities for progression

Once learners have successfully completed this qualification they can progress onto any of the following qualifications:

- 2357 Level 3 Diploma in electro-technical technology
- 6187 Level 2 and 3 NVQ Certificate/Diploma in Refrigeration and air-conditioning
- 6188 Level 3 NVQ Certificate/Diploma in heating and ventilating
- 6189 Level 3 NVQ Diploma in Plumbing and heating installation.

1.3 Qualification support materials

City & Guilds is currently developing Smartscreen materials to support the units and assessments within this qualification. For further information please visit the City & Guilds website at www.cityandguilds.com and type in '2000' in the search engine at the top of the page.

2 Centre requirements

This section outlines the approval processes for Centres to offer these qualifications and any resources that Centres will need in place to offer the qualifications including qualification-specific requirements for Centre staff.

New City & Guilds centres

Centres wishing to offer City & Guilds qualifications must gain approval. Full details of the process for both centre and scheme approval are given in *Centre Manual - Supporting Customer Excellence* which is available from City & Guilds' regional centres.

Centres already offering City & Guilds qualifications in this subject area

Fast track approval is not available for this qualification. Existing centres wishing to offer this qualification must use the **standard** Qualification Approval Process.

2.1 Resource requirements

Centres must be able to provide sufficient:

- materials and components
- tools and equipment
- space

to meet the requirements of the **four disciplines** of the qualification:

- electrical installation
- plumbing
- refrigeration and air-conditioning
- heating and ventilation.

Trainers

Trainers should have **occupational expertise** matching the following:

- be **technically knowledgeable** in the area(s) being trained
- have **recent relevant experience** in the area being assessed
- have **credible experience** of providing training.

Staff may undertake more than one role, but must never internally verify their own assessments.

Assessors

Assessors must have:

- a relevant assessor qualification to A1 / A2 / TAQA standards
- knowledge evidence of fundamental working principles, installation options and regulatory requirements for the relevant qualification being delivered
- evidence of above in the form of:
 - a qualification or certificate from a recognised awarding / certification organisation in one or more of the qualification disciplines, and /or;
 - sound technical knowledge of the other disciplines, and a;
 - sound understanding of the qualification requirements as per NOS and qualification handbook, plus;
 - CV (5years) and up-to-date CPD record.

Internal Verifiers

Internal verifiers must have:

- a relevant internal verifier qualification to V1 standard / TAQA standards, or;
- alternative recorded evidence to confirm IV competence
- BSE occupational experience evidenced by a BSE sector related:
 - qualification at N/SVQ L3 or;
 - proven sector competence / experience + access to
 - occupational expertise, to perform the IV role fully.

2.2 Candidate entry requirements

Candidates should not be entered for a qualification of the same type, content and level as that of a qualification they already hold.

There are no formal entry requirements for candidates undertaking these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualifications successfully.

Age restrictions

These qualifications are not approved for use by candidates under the age of 16, and City & Guilds cannot accept any registrations for candidates in this age group.

3 Course design and delivery

Teacher/assessors should familiarise themselves with the structure and content of the award before designing an appropriate course.

City & Guilds does not itself provide courses of instruction, training, programmes of learning or specify entry requirements.

As long as the requirements for the award are met, teachers/assessors may design courses of study in any way that they feel best meets the needs and capabilities of the candidates.

3.1 Health and safety

The requirement to follow safe working practices is an integral part of all City & Guilds qualifications and assessments, and it is the responsibility of centres to ensure that all relevant health and safety requirements are in place before candidates start practical assessments.

Should a candidate fail to follow health and safety practice and procedures during an assessment (eg practical assignment) the test must be stopped and the candidate advised of the reasons why. The candidate should be informed that they have failed the assessment. Candidates may retake the assessment at a later date, no less than seven days after the failure.

4 Assessment

4.1 Summary of assessment methods

For these qualifications, candidates will be required to complete the following assessments:

Unit	Title	Assessment method	Where to obtain assessment materials
101	Understand and demonstrate fundamental safe working practices in building services engineering	Assignment The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. Externally set assignment, locally marked and externally verified.	Go to cityandguilds.com and navigate to the 2000 webpage. Password available on Walled Garden.
102	Understand fundamental environmental protection measures within building services engineering	City & Guilds online multiple choice test The assessment covers all of the knowledge outcomes.	N/A Examinations provided by e-assessment.
103	Understand fundamental scientific principles within building services engineering	City & Guilds online multiple choice test The assessment covers all of the knowledge outcomes.	N/A Examinations provided by e-assessment.
104	Introduction to building services engineering	City & Guilds online multiple choice test The assessment covers all of the knowledge outcomes.	N/A Examinations provided by e-assessment.
105	Understand and demonstrate fundamental refrigeration and air conditioning operations	Assignment The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. Externally set assignment, locally marked and externally verified.	Go to cityandguilds.com and navigate to the 2000 webpage. Password available on Walled Garden.
106	Understand and demonstrate fundamental electrical installation operations	Assignment The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. Externally set assignment, locally marked and externally verified.	Go to cityandguilds.com and navigate to the 2000 webpage. Password available on Walled Garden.

Unit	Title	Assessment method	Where to obtain assessment materials
107	Understand and demonstrate fundamental heating and ventilating operations	<p>Assignment</p> <p>The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to cityandguilds.com and navigate to the 2000 webpage.</p> <p>Password available on Walled Garden.</p>
108	Understand and demonstrate fundamental plumbing operations	<p>Assignment</p> <p>The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit.</p> <p>Externally set assignment, locally marked and externally verified.</p>	<p>Go to cityandguilds.com and navigate to the 2000 webpage.</p> <p>Password available on Walled Garden.</p>
201	Understand and carry out safe working practices in building services engineering	<p>City & Guilds online multiple choice test and an Assignment</p> <p>The assessment covers all of the knowledge outcomes.</p>	<p>N/A</p> <p>Examinations provided by e-assessment.</p>
202	Understand how to apply environmental protection measures within building services engineering	<p>City & Guilds online multiple choice test</p> <p>The assessment covers all of the knowledge outcomes.</p>	<p>N/A</p> <p>Examinations provided by e-assessment.</p>
203	Understand the roles, responsibilities and procedures in building services engineering	<p>City & Guilds online multiple choice test</p> <p>The assessment covers all of the knowledge outcomes.</p>	<p>N/A</p> <p>Examinations provided by e-assessment.</p>
204	Understand how to apply scientific principles within Mechanical Engineering Services	<p>City & Guilds online multiple choice test</p> <p>The assessment covers all of the knowledge outcomes.</p>	<p>N/A</p> <p>Examinations provided by e-assessment.</p>

4.2 Test specifications

The test specifications for the online multiple choice tests are below.

Test 102: Understand fundamental environmental protection measures in building services engineering.

Duration: 30 minutes

Unit	Outcome	No. of questions	%
102	1 Know the applications of energy sources used in the building services engineering industry	6	40
	2 Know the methods of reducing waste and conserving energy while working in the building services engineering industry	2	13
	3 Know how to safely dispose of materials used in the building services engineering industry	3	20
	4 Know the methods of conserving and reducing wastage of water within the building services engineering industry	4	27
	Total	15	100

Test 103: Understand fundamental scientific principles within building services engineering

Duration: 45 minutes

Unit	Outcome	No. of questions	%
103	1 Know the applications of energy sources used in the building services engineering industry	4	20
	2 Know the properties of materials used in the building services engineering industries	3	15
	3 Know the basic principles for energy, heat and power in the building services engineering industry	4	20
	4 Know the principles of force and pressure and their application in the building services engineering industries	3	15
	5 Know simple mechanical principles and their application in the building services engineering industries	2	10
	6 Know the principles of electricity as they relate to the building services engineering industries	4	20
	Total	20	100

Test 104: Introduction to building services engineering

Duration: 60 minutes

Unit	Outcome	No. of questions	%
104	1 Know the impact of building services engineering on people's lives and the built environment	3	10
	2 Know about the different job opportunities and the career pathways within the building services engineering sector	9	30
	3 Know about a range of building services engineering systems	12	40
	4 Know about the key legislation and codes of practice within the building services engineering sector	6	20
	Total	30	100

Test 201: Understand and carry out safe working practices in building services engineering

Duration: 110 minutes

Unit	Outcome	No. of questions	%
201	1 Know the health and safety legislation that applies to the building services industry	6	11
	2 Know how to recognise and respond to hazardous situations while working in the building services industry	10	25
	3 Know the safe personal protection measures while working in the building services industry	3	5
	4 Know how to respond to accidents that occur while working in the building services industry	6	11
	5 Know the procedures for electrical safety when working in building services industry	6	11
	6 Know the methods of working safely with heat producing equipment in the building services industry	8	15
	7 Know the methods of safely using access equipment in the building services industry	7	13
	8 Know the methods of working safely in excavations and confined spaces in the building services industry	5	9
	Total	51	100

Test 202: Understand how to apply environmental protection measures within building services engineering

Duration: 50 minutes

Unit	Outcome	No. of questions	%
202	1 Know the energy conservation legislation that applies to the building services industry	2	8
	2 Know the applications of energy sources used in building services industry	7	28
	3 Know the importance of energy conservation when commissioning building services systems	2	8
	4 Know the methods of reducing waste and conserving energy while working in the building services industry	3	12
	5 Know how to safely dispose of materials used in the building services industry	5	20
	6 Know the methods of conserving and reducing wastage of water within the building services industry	6	24
Total		25	100

Test 203: Understand the roles, responsibilities and procedures in building services engineering

Duration: 60 minutes

Unit	Outcome	No. of questions	%
203	1 Know about a range of building services engineering systems	6	24
	2 Know the roles, responsibilities and career opportunities within the building services engineering sector	10	40
	3 Know how to identify and use different documents, documentary procedures for building services engineering work activities	4	16
	4 Know the different types of businesses and companies with which building services industry work	5	20
Total		25	100

Test 204: Understand how to apply scientific principles within mechanical engineering systems

Duration: 80 minutes

Unit	Outcome	No. of questions	%
204	1 Know the standard units of measurement used in the mechanical services industry	3	7
	2 Know the properties of materials used in the mechanical services industry	17	43
	3 Know the relationship between energy heat and power in mechanical services industry	6	15
	4 Know the principles of force and pressure and their application in the mechanical services industry	8	20
	5 Know simple mechanical principles and their application in the mechanical services industry	2	5
	6 Know the principles of electricity as they relate to the mechanical services industry	4	10
	Total	40	100

5 Units

Availability of units

The units for these qualifications follow. The learning outcomes and assessment criteria are also viewable on the Register of Regulated Qualifications at <http://register.ofqual.gov.uk/>

Structure of units

The units in these qualifications are written in a standard format and comprise the following:

- City & Guilds reference number
- unit reference number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria.

Unit 101

Understand and demonstrate fundamental safe working practices in building services engineering

Level:	1
Credit value:	5
UAN:	F/502/8173

Unit aims

This combination unit provides learning in the essential health and safety job knowledge required to prepare a learner to work safely in the building services engineering industries. The knowledge covered relates to work carried out in a building services environment. The unit also provides learning in the practical application of a range of key health and safety requirements under simulated conditions.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

1. Know the health and safety legislation that applies to the building services engineering industry
2. Know how to recognise and respond to hazardous situations while working in the building services engineering industry
3. Know how to recognise and respond to the dangers presented by asbestos in the workplace
4. Know the safe personal protection measures while working in the building services engineering industry
5. Be able to apply manual handling techniques
6. Know how to respond to accidents that occur while working in the building services engineering industry
7. Know the procedures for electrical safety when working in the building services engineering industry
8. Know the methods of safely using access equipment in the building services engineering industry
9. Be able to safely use access equipment in the building services engineering industry
10. Know the methods of working safely with heat producing equipment in the building services engineering industry

Guided learning hours

It is recommended **48** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

- SummitSkills' 'Access to Building Services Engineering' Qualification Structure
- SummitSkills NOS M1

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- a centre marked assignment.

Unit 101

Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 1

Know the health and safety legislation that applies to the building services engineering industry

Assessment criteria

The learner can:

- 1.1 outline the aims of general health and safety legislation in protecting the workforce and members of the public
- 1.2 indicate the responsibilities of persons under health and safety legislation:
 - employers (including employer representatives)
 - employees
 - clients (customers).

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 2 Know how to recognise and respond to hazardous situations while working in the building services engineering industry

Assessment criteria

The learner can:

- 2.1 list the types of general workplace hazards that may be encountered while at work:
 - site/work area cleanliness:
 - tripping hazards
 - slipping hazards
 - using equipment:
 - correct personal protective equipment
 - defective (unsafe) equipment
 - manual handling
- 2.2 indicate the methods that can be used to prevent accidents or dangerous situations occurring during work activities:
 - working practices and personal responsibilities under health and safety:
 - safety notices
 - mandatory signs
 - prohibition signs
 - hazard signs
 - fire fighting signs
- 2.3 indicate how hazardous substance legislation classifies the following substances:
 - toxic
 - harmful
 - corrosive
 - irritant
- 2.4 indicate the general precautions necessary for working with commonly encountered substances in building engineering service
- 2.5 state what action to take should a hazardous situation occur while at work.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 3 Know how to recognise and respond to the dangers presented by asbestos in the workplace

Assessment criteria

The learner can:

- 3.1 identify the situations where asbestos may be commonly found in the workplace including:
- insulating material
 - within the building fabric
 - sheeting materials, floors, roofs, walls
 - coating materials, eg Artex
 - asbestos cement materials, gutters, flues, tanks
 - heat proofing materials, gaskets, boiler components
- 3.2 state the sources of information available in raising awareness of the dangers of asbestos
- 3.3 state what actions to take should asbestos materials be identified in the workplace.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 4 Know the safe personal protection measures while working in the building services engineering industry

Assessment criteria

The learner can:

- 4.1 state the purpose of, and application of protective equipment:
 - clothing protection including high visibility
 - eye protection
 - hand protection
 - head protection
 - foot protection
 - hearing protection
- 4.2 state the procedures for manually handling heavy and bulky items:
 - assessment of a safe load that a person can lift
 - application of safe kinetic lifting technique
 - use of simple mechanical lifting aids – sack trolley.

Unit 101

Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 5

Be able to apply manual handling techniques

Assessment criteria

The learner can:

- 5.1 demonstrate manual handling of heavy and bulky items:
 - plan the lift
 - safely move the load
 - assist in a two-person lift
- 5.2 manually handle loads using a sack trolley.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 6 Know how to respond to accidents that occur while working in the building services engineering industry

Assessment criteria

The learner can:

- 6.1 indicate the actions that should be taken when an accident or emergency is discovered:
 - raising the alarm
 - the role of the emergency services and contact methods
 - typical emergency evacuation procedures
- 6.2 outline the procedures for dealing with minor/major injuries that can occur while working:
 - cuts
 - minor burns
 - objects in the eye
 - placing the casualty in the recovery position
 - electric shock:
 - removal from the supply
 - CPR method
- 6.3 indicate the importance for recording accidents and near misses at work:
 - statutory requirements for the reporting of accidents/serious occurrences
 - the use of company accident books
 - the details to be recorded on a simple accident/incident report form.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 7 Know the procedures for electrical safety when working in the building services engineering industry

Assessment criteria

The learner can:

- 7.1 indicate the common electrical dangers encountered on construction sites and in private dwellings:
 - faulty electrical equipment
 - signs of damaged or worn electrical cables – power tools and property hard wiring system
 - trailing cables
- 7.2 indicate the methods of safely using electrical tools and equipment on site:
 - battery powered supplies
 - 110 volt supplies
 - 230 volt supplies
- 7.3 outline how to conduct a visual inspection of a power tool for safe condition before use:
 - checking for a valid PAT test
 - inspection for general condition
- 7.4 state the procedure that should be applied for tools and equipment that fail safety checks.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 8 Know the methods of safely using access equipment in the building services engineering industry

Assessment criteria

The learner can:

- 8.1 indicate the situations where it may be necessary to work at height
- 8.2 state the safety requirements for the types of equipment used to permit work at heights in the building services industry including:
 - step ladders
 - ladders
 - mobile elevated work platforms
- 8.3 list the safety checks required to be carried out on access equipment before it is used:
 - step ladders
 - ladders
 - mobile elevated work platforms.

Unit 101

Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 9

Be able to safely use access equipment in the building services engineering industry

Assessment criteria

The learner can:

9.1 demonstrate the safe method of assembly and use of:

- step ladders
- ladders.

Unit 101 Understand and demonstrate fundamental safe working practices in building services engineering

Outcome 10 Know the methods of working safely with heat producing equipment in the building services engineering industry

Assessment criteria

The learner can:

- 10.1 identify the various types of gases used in pipe jointing processes:
 - bottle colours
- 10.2 identify the various types of heat producing equipment:
 - hoses
 - flashback arrestors
 - control valves
 - gauges
 - blowpipes
 - nozzles
- 10.3 identify how gas heating equipment is safely used:
 - bottle location and position
 - safe lighting and extinguishing procedure
 - actions in the event of leakage
- 10.4 identify the three elements of the fire triangle and how combustion takes place
- 10.5 state the dangers of working with heat producing equipment and how to prevent fires occurring
- 10.6 state the method for fighting small localised fires that can occur in the workplace:
 - when to avoid tackling fires
 - types of extinguisher
 - selection of extinguisher by fire type
 - method of use.

Unit 102

Understand fundamental environmental protection measures within building services engineering

Level:	1
Credit value:	2
UAN:	H/502/8179

Unit aims

This knowledge unit provides learning in a range of basic measures associated with protection of the environment. Areas covered include the basic operating principles of solar thermal, wind turbine and solar photovoltaic. The unit also provides learning in:

- reducing waste and conserving energy
- material disposal
- conserving and reducing water wastage

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Know the applications of energy sources used in the building services engineering industry
2. Know the methods of reducing waste and conserving energy while working in the building services engineering industry
3. Know how to safely dispose of materials used in the building services engineering industry
4. Know the methods of conserving and reducing wastage of water within building services engineering industry

Guided learning hours

It is recommended **19** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

- SummitSkills' 'Access to Building Services Engineering' Qualification Structure
- SummitSkills NOS M2

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 102

Understand fundamental environmental protection measures within building services engineering

Outcome 1

Know the applications of energy sources used in the building services engineering industry

Assessment criteria

The learner can:

- 1.1 outline the types of energy used in properties:
 - high carbon:
 - natural gas / LPG
 - fuel oils
 - solid fuels (coal and peat)
 - electricity (from non-renewable sources)
 - low carbon:
 - solar thermal
 - solid fuel (biomass)
 - hydrogen fuel cells
 - heat pumps
 - combined heat and power (CHP)
 - combined cooling, heat and power (CCHP)
 - zero carbon:
 - electricity - wind
 - electricity - tidal
 - hydroelectric
 - solar photovoltaic
- 1.2 state the importance of reducing carbon emissions from buildings
- 1.3 give examples of how building services engineering industries are working to reduce carbon emissions from buildings
- 1.4 outline the basic operating principles of installations containing environmental energy sources:
 - solar thermal
 - wind turbine
 - solar photovoltaic
- 1.5 list organisations which give guidance and advice on energy saving and conservation techniques.

Unit 102

Understand fundamental environmental protection measures within building services engineering

Outcome 2

Know the methods of reducing waste and conserving energy while working in the building services engineering industry

Assessment criteria

The learner can:

- 2.1 outline the working practices that can be employed to conserve energy and protect the environment
- 2.2 indicate the methods used for reducing material wastage:
 - planning work activities
 - accurate measurement and cutting
 - reuse of off-cuts.

Unit 102

Understand fundamental environmental protection measures within building services engineering

Outcome 3

Know how to safely dispose of materials used in the building services engineering industry

Assessment criteria

The learner can:

- 3.1 indicate the methods of safely disposing of waste materials:
 - licensed waste disposal
 - waste carriers license
 - recycling
- 3.2 list the types of materials that can be recycled
- 3.3 identify what action to take if work activities endanger the environment.

Unit 102

Understand fundamental environmental protection measures within building services engineering

Outcome 4

Know the methods of conserving and reducing wastage of water within the building services engineering industry

Assessment criteria

The learner can:

- 4.1 state the importance of water conservation within buildings
- 4.2 list the methods for reducing water wastage:
 - flow reducing valves
 - spray taps
 - low volume flush WC
 - regular maintenance of terminal fittings and float valves
 - promoting user awareness
- 4.3 indicate the methods available for capturing surface and the uses of water and recycling used water.

Unit 103

Understand fundamental scientific principles within building services engineering

Level:	1
Credit value:	3
UAN:	Y/502/8180

Unit aims

This knowledge unit provides learning in the basic scientific principles that underpin the sectors within the Building Engineering Services Industries.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Know the standard units of measurement used in the building services engineering industry
2. Know the properties of materials used in the building services engineering industry
3. Know the basic principles for energy, heat and power in the building services engineering industry
4. Know the principles of force and pressure and their application in the building services engineering industries
5. Know the simple mechanical principles and their application in the building services engineering industries
6. Know the principles of electricity as they relate to the building services engineering industries

Guided learning hours

It is recommended **28** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 1

Know the standard units of measurement used in the building services engineering industry

Assessment criteria

The learner can:

- 1.1 define internationally recognised (SI) units of measurement for:
 - metre (length) m
 - kilogram (mass) kg
 - second (time) s
 - kelvin (temperature) OK
- 1.2 define SI derived units for:
 - area (m²)
 - volume (m³)
 - litres (L)
 - density (kg/m³)
 - velocity (m/s).

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 2

Know the properties of materials used in the building services engineering industry

Assessment criteria

The learner can:

- 2.1 identify the types of solid materials used in the building services industry:
 - metals
 - plastics
 - fireclays/ceramics
- 2.2 give examples of the properties of solid materials:
 - strength – tensile and compressive
 - hardness
 - ductility
 - malleability
 - conductivity – heat and electricity.

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 3

Know the basic principles for energy, heat and power in the building services engineering industry

Assessment criteria

The learner can:

- 3.1 indicate the relationship between the Celsius and Kelvin temperature scales:
 - units of temperature measurement
 - temperature measurement devices used
- 3.2 identify the terminology associated with a change of state:
 - solid, liquid and gas
- 3.3 give examples of heat transfer:
 - conduction in solids
 - convection in liquids and gases
 - radiation between two bodies
- 3.4 indicate how units of energy and heat are related:
 - energy – joules (J)
 - specific heat capacity (kJ/kg/°C)
 - power – watts (W).

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 4

Know the principles of force and pressure and their application in the building services engineering industry

Assessment criteria

The learner can:

- 4.1 give examples of the relationship between velocity, pressure and flow rate in systems:
 - effects of increasing/reducing pipe size on velocity and flow rate at constant pressure
- 4.2 identify the reasons why pipework restricts the flow of liquids and gases:
 - changes of direction, bends and tees
 - pipe size
 - friction.

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 5

Know the simple mechanical principles and their application in the building services engineering industry

Assessment criteria

The learner can:

- 5.1 state the principles behind simple machines:
 - mechanical advantage
- 5.2 indicate the principles of basic mechanics:
 - theory of moments
 - action and reaction
 - centre of gravity
 - equilibrium.

Unit 103

Understand fundamental scientific principles within building services engineering

Outcome 6

Know the principles of electricity as they relate to the building services engineering industry

Assessment criteria

The learner can:

- 6.1 outline the basic principles of electron flow theory:
 - measurements of electrical flow
 - material conductivity and resistance
 - direct and alternating current
- 6.2 use simple units of electrical measurement:
 - current (amps)
 - voltage (volts)
 - resistance (ohms)
 - power (watts)
- 6.3 state how to carry out simple electrical calculations:
 - Ohm's law
 - voltage, current and resistance in series circuits.

Level: 1
Credit value: 4
UAN: D/502/8178

Unit aims

This knowledge unit provides learning in the general requirements of the Building Engineering Services Industry. It includes coverage of the relevant sectors within building services and the jobs that underpin these sectors

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Know the impact of building services engineering on people's lives and the built environment
2. Know about the different job opportunities and the career pathways within the building services engineering sector
3. Know about a range of building services engineering systems
4. Know about the key legislation and codes of practice within the building services engineering sector

Guided learning hours

It is recommended **38** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 104

Outcome 1

Introduction to building services engineering

Know the impact of building services engineering on people's lives and the built environment

Assessment criteria

The learner can:

- 1.1 define the main industries that make up the building services engineering sector including:
 - plumbing
 - electrical
 - heating and ventilating
 - refrigeration and air conditioning
- 1.2 state how the building services sector has an effect on everyday life including its relevance to buildings
- 1.3 indicate how the building services engineering sector (plumbing, electrical, heating and ventilating, and refrigeration and air conditioning) interacts with construction and the built environment sector.

Unit 104

Outcome 2

Introduction to building services engineering

Know about the different job opportunities and the career pathways within the building services engineering sector

Assessment criteria

The learner can:

- 2.1 list the key job functions for the following building services occupations:
 - domestic plumber
 - industrial and commercial plumber
 - gas fitter
 - installation electrician
 - maintenance electrician
 - heating installer
 - ductwork installer
 - service and maintenance engineer
 - refrigeration engineer
 - air conditioning engineer
- 2.2 outline career progression within the sector for a minimum of 4 occupations listed in 2.1.

Unit 104

Outcome 3

Introduction to building services engineering

Know about a range of building services engineering systems

Assessment criteria

The learner can:

- 3.1 identify a range of basic systems within:
- plumbing:
 - cold water
 - hot water
 - heating
 - sanitation
 - electrical:
 - power circuits
 - lighting circuits
 - heating and ventilating:
 - cold water
 - hot water
 - heating
 - ductwork
 - specialist (eg chilled water)
 - refrigeration and air conditioning:
 - small refrigeration systems
 - small air conditioning systems (eg units)
- 3.2 state the basic functions of the systems listed in 3.1
- 3.3 label the main components for the systems in 3.1.

Unit 104

Outcome 4

Introduction to building services engineering

Know about the key legislation and codes of practice within the building services engineering sector

Assessment criteria

The learner can:

- 4.1 identify key legislation and codes of practice relating to the building services engineering sector including:
 - plumbing
 - electrical
 - heating and ventilating
 - refrigeration and air conditioning
- 4.2 identify the difference between legislation, British and European standards, codes of practice.

Unit 105

Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Level:	1
Credit value:	5
UAN:	L/502/8175

Unit aims

This combination unit provides learning in basic refrigeration and air conditioning tasks. The unit is designed to give the learner a taste of what types of tools, materials and equipment are used in the RAC industry.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to follow health and safety procedures to carry out basic RAC practical applications
2. Know the types of hand tools used to carry out basic RAC tasks safely
3. Be able to use hand tools to carry out basic RAC tasks safely
4. Know the types of basic RAC materials and components
5. Be able to select materials and components for basic RAC practical applications
6. Know how to carry out basic RAC practical applications
7. Be able to carry out basic RAC practical applications

Guided learning hours

It is recommended **42** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS M16

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- a centre marked assignment.

Unit 105

Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Outcome 1

Be able to follow health and safety procedures to carry out basic RAC practical applications

Assessment criteria

The learner can:

- 1.1 demonstrate the correct use of personal protective equipment for basic RAC practical applications
- 1.2 use the relevant health and safety practices throughout the task
- 1.3 identify and report any potential workshop hazards
- 1.4 demonstrate how to reduce risks for workshop activities.

Unit 105 **Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations**

Outcome 2 Know the types of hand tools used to carry out basic RAC tasks safely

Assessment criteria

The learner can:

- 2.1 state how to use RAC hand tools safely
- 2.2 identify the key RAC hand tools and their uses
- 2.3 state the basic maintenance requirements for RAC hand tools.

Unit 105

Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Outcome 3

Be able to use hand tools to carry out basic RAC tasks safely

Assessment criteria

The learner can:

3.1 demonstrate the safe use of the following hand tools:

- adjustable spanner
- screwdriver (crosshead and flat)
- junior hack saw
- pipe cutters (for use on refrigeration copper tube)
- de-burr tool
- flaring/swaging tools
- brazing equipment
- tape measure
- level

3.2 demonstrate the care and maintenance required for the RAC hand tools listed in 3.1.

Unit 105 Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Outcome 4 Know the types of basic RAC materials and components

Assessment criteria

The learner can:

4.1 identify copper pipe, fittings and components used for basic RAC practical applications:

- sizes
- type of copper used for refrigeration systems
- fittings, elbows, tees and unions, jointing methods, brazed and flared
- a thermal expansion valve, condensing and evaporating units – from a typical domestic fridge
- clips

4.2 identify associated materials for RAC applications:

- cleaning materials, flux and solder/brazing rods
- fixing devices, ie screws.

Unit 105 **Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations**

Outcome 5 Be able to select materials and components for basic RAC practical applications

Assessment criteria

The learner can:

- 5.1 select RAC materials for joining copper pipe:
 - fittings, elbows, tees, and unions, jointing methods, brazed and flared
 - cleaning materials, flux and solder/brazing rods
- 5.2 select RAC materials for fixing copper pipe:
 - clips
 - fixing devices, ie screws.

Unit 105 Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Outcome 6 Know how to carry out basic RAC practical applications

Assessment criteria

The learner can:

- 6.1 identify typical drawings and specifications used for basic practical applications
- 6.2 state the industry procedures for:
 - measuring and marking out for pipework
 - cutting pipework
 - bending copper pipe, 90° bends and offsets
 - fabricating pipework
 - jointing copper pipe using brazed and flared joints
 - fixing copper pipework
 - pressure testing pipework and fittings.

Unit 105 Understand and demonstrate fundamental Refrigeration and Air Conditioning (RAC) operations

Outcome 7 Be able to carry out basic RAC practical applications

Assessment criteria

The learner can:

- 7.1 carry out the following tasks safely:
- interpret typical drawings and specifications used for basic practical applications
 - measure accurately and record the requirements for the installation
 - cut pipework to given sizes
 - bending techniques to form 90° bends and offsets
 - fabricate small copper tube frame using flared and brazed joint techniques
- 7.2 safely pressure test completed pipe frame
- 7.3 demonstrate that the work area is left in a safe condition after completion of the task:
- area is left clean and tidy
 - return tools and equipment
 - return excess materials
 - dispose of any waste materials.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Level:	1
Credit value:	5
UAN:	J/502/8174

Unit aims

This combination unit provides learning in basic electrical tasks. The unit is designed to give the learner a taste of what types of tools, materials and equipment are used in the electrical industry.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to follow health and safety methods to carry out basic electrical practical applications
2. Know the types of hand tools used to carry out basic electrical tasks safely
3. Be able to use hand tools to carry out basic electrical tasks safely
4. Know the types of basic electrical materials and components
5. Be able to select materials and components for basic electrical practical applications
6. Know how to carry out basic electrical practical applications
7. Be able to carry out basic electrical practical applications

Guided learning hours

It is recommended **45** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS EL9

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- a centre marked assignment.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 1

Be able to follow health and safety methods to carry out basic electrical practical applications

Assessment criteria

The learner can:

- 1.1 demonstrate the correct use of personal protective equipment for basic electrical practical applications
- 1.2 use the relevant health and safety practices throughout the task
- 1.3 identify and report any potential workshop hazards
- 1.4 demonstrate how to reduce risks for workshop activities.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 2

Know the types of hand tools used to carry out basic electrical tasks safely

Assessment criteria

The learner can:

- 2.1 state how to use electrical hand tools safely
- 2.2 identify the key electrical hand tools and their uses
- 2.3 state the basic maintenance requirements for electrical hand tools.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 3

Be able to use hand tools to carry out basic electrical tasks safely

Assessment criteria

The learner can:

- 3.1 demonstrate the safe use of the following hand tools:
 - pliers
 - screwdriver (crosshead and electrical)
 - wire stripper
 - multi-meter
 - tape measure
 - level
- 3.2 demonstrate the care and maintenance required for the electrical hand tools listed in 3.1.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 4

Know the types of basic electrical materials and components

Assessment criteria

The learner can:

- 4.1 identify materials and components used for basic electrical practical applications:
 - cable and flex (ie, flat twin and earth)
 - conduit (plastic and steel)
 - earth sheathing
 - trunking
 - switched socket outlets (single and double with back boxes)
 - light switch plates (ie, single, integral or multiple)
 - consumer unit
 - circuit breakers and fuses (ie, MCB, RCB, RCD)
 - ceiling rose and lamp holders
 - plug tops
- 4.2 identify associated materials for electrical applications:
 - various fixings (ie, clips and cleats).

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 5

Be able to select materials and components for basic electrical practical applications

Assessment criteria

The learner can:

- 5.1 select materials and components for basic electrical practical applications
- 5.2 select electrical materials used for fixing cables and components:
 - clips
 - fixing devices, ie screws.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 6

Know how to carry out basic electrical practical applications

Assessment criteria

The learner can:

- 6.1 identify typical drawings and specifications used for basic electrical circuits and cables
- 6.2 state the industry procedures for:
 - accurately measuring and recording the requirements for the practical application
 - wiring a 3 pin plug
 - assembling a simple one-way electrical lighting circuit with battery supply
 - inserting a simple switch mechanism into the completed wiring circuit
 - safely testing for continuity on a completed wiring circuit.

Unit 106

Understand and demonstrate fundamental electrical installation operations

Outcome 7

Be able to carry out basic electrical practical applications

Assessment criteria

The learner can:

- 7.1 carry out the following tasks safely:
 - interpret typical drawings and specifications related to basic practical applications
 - measure accurately and record the requirements for the installation
 - correctly wire a 3 pin plug
 - assemble a simple one-way electrical lighting circuit with battery supply
 - insert a simple switch mechanism into the completed wiring circuit
- 7.2 safely test for continuity completed wiring circuit
- 7.3 demonstrate that the work area is left in a safe condition after completion of the task:
 - area is left clean and tidy
 - return tools and equipment
 - return excess materials
 - dispose of any waste materials.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Level:	1
Credit value:	5
UAN:	R/502/8176

Unit aims

This combination unit provides learning in basic heating and ventilating applications. The unit is designed to give the learner an indication of what types of tools, materials and equipment are used in the H and V pipe-fitting industry.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to follow health and safety methods to carry out heating and ventilation practical applications
2. Know the types of hand tools used to carry out basic heating and ventilating tasks safely
3. Be able to use hand tools to carry out basic heating and ventilating tasks safely
4. Know the types of basic heating and ventilating materials and components
5. Be able to select materials and components for basic heating and ventilating practical applications
6. Know how to carry out basic heating and ventilating practical applications
7. Be able to carry out basic heating and ventilating practical applications

Guided learning hours

It is recommended **42** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS M21

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- a centre marked assignment.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 1

Be able to follow health and safety methods to carry out heating and ventilating practical applications

Assessment criteria

The learner can

- 1.1 demonstrate the correct use of personal protective equipment for basic H and V practical applications
- 1.2 use the relevant health and safety practices throughout the task
- 1.3 identify and report any potential workshop hazards
- 1.4 demonstrate how to reduce risks for workshop activities.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 2

Know the types of hand tools used to carry out basic heating and ventilating tasks safely

Assessment criteria

The learner can:

- 2.1 state how to use H and V hand tools safely
- 2.2 identify the key H and V hand tools and their uses
- 2.3 state the basic maintenance requirements for H and V hand tools.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 3

Be able to use hand tools to carry out basic heating and ventilating tasks safely

Assessment criteria

The learner can:

- 3.1 demonstrate the safe use of the following hand tools:
 - stillson pattern pipe wrench
 - adjustable spanner
 - screwdriver (crosshead and flat)
 - hack saw frame
 - pipe cutters (for use on steel)
 - file
 - pipe reamer
 - hand stocks and dies for threading steel pipe
 - tape measure
 - hydraulic bending machine
 - pipe vice
 - spirit level
- 3.2 demonstrate the care and maintenance required for the H and V hand tools listed in 3.1.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 4

Know the types of basic heating and ventilating materials and components

Assessment criteria

The learner can:

- 4.1 identify LCS pipe, fittings and components used for basic H and V practical applications:
 - sizes
 - tees, elbows, unions, isolation, drain off and air vents
 - clips and brackets
- 4.2 identify associated materials for H and V applications:
 - jointing materials
 - fixing devices, ie screws.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 5

Be able to select materials and components for basic heating and ventilating practical applications

Assessment criteria

The learner can:

- 5.1 select H and V materials for joining LCS pipe:
 - tees, elbows, unions, isolation, drain off and air vents
 - jointing materials
- 5.2 select H and V materials for fixing LCS pipe:
 - clips and brackets
 - fixing devices, ie screws.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 6

Know how to carry out basic heating and ventilating practical applications

Assessment criteria

The learner can:

- 6.1 identify typical drawings and specifications used for basic practical applications
- 6.2 state the industry procedures for:
 - measuring and marking out for pipework
 - cutting pipework
 - bending LCS pipe, 90° bends and offsets
 - threading and jointing LCS pipe using fittings
 - fabricating pipework rig
 - fixing LCS pipework rigs
 - pressure testing pipework and fittings.

Unit 107

Understand and demonstrate fundamental heating and ventilating operations

Outcome 7

Be able to carry out basic heating and ventilating practical applications

Assessment criteria

The learner can:

- 7.1 carry out the following tasks safely:
 - interpret typical drawings and specifications used for basic practical applications
 - measure accurately and record the requirements for the practical application
 - cut pipework to given sizes
 - use bending techniques (hydraulic machine) to form right angles
 - install a small pre-fabricated flange set
 - fabricate small steel pipe frame with a variety of screwed joints
- 7.2 safely pressure test completed pipe frame
- 7.3 demonstrate that the work area is left in a safe condition after completion of the task:
 - area is left clean and tidy
 - return tools and equipment
 - return excess materials
 - dispose of any waste materials.

Unit 108

Understand and demonstrate fundamental plumbing operations

Level:	1
Credit value:	5
UAN:	Y/502/8177

Unit aims

This combination unit provides learning in basic plumbing tasks. The unit is designed to give the learner a taste of what types of tools, materials and equipment are used in the plumbing industry.

Learning outcomes

There are **seven** learning outcomes to this unit. The learner will:

1. Be able to follow health and safety methods to carry out basic plumbing practical applications
2. Know the types of hand tools used to carry out basic plumbing tasks safely
3. Be able to use hand tools to carry out basic plumbing tasks safely
4. Know the types of basic plumbing materials and components
5. Be able to select materials and components for basic plumbing practical applications
6. Know how to carry out basic plumbing practical applications
7. Be able to carry out basic plumbing practical applications

Guided learning hours

It is recommended **42** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS M10

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- a centre marked assignment

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 1

Be able to follow health and safety methods to carry out basic plumbing practical applications

Assessment criteria

The learner can:

- 1.1 demonstrate the correct use of personal protective equipment for basic plumbing practical applications
- 1.2 use the relevant health and safety practices throughout the task
- 1.3 identify and report any potential workshop hazards
- 1.4 demonstrate how to reduce risks for workshop activities.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 2

Know the types of hand tools used to carry out basic plumbing tasks safely

Assessment criteria

The learner can:

- 2.1 state how to use plumbing hand tools safely
- 2.2 identify the key plumbing hand tools and their uses
- 2.3 state the basic maintenance requirements for plumbing hand tools.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 3

Be able to use hand tools to carry out basic plumbing tasks safely

Assessment criteria

The learner can:

- 3.1 demonstrate the safe use of the following hand tools:
 - adjustable spanner
 - screwdriver (crosshead and flat)
 - junior hack saw
 - pipe cutters
 - file
 - tape measure
 - propane heating equipment (small blowlamp)
 - bending spring and bending machine
 - water pump pliers
 - spirit level
- 3.2 demonstrate the care and maintenance required for the plumbing hand tools listed in 3.1.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 4

Know the types of basic plumbing materials and components

Assessment criteria

The learner can:

- 4.1 identify copper pipe, fittings and components used for basic plumbing practical applications:
 - sizes
 - tees, elbows, couplings, compression and capillary
 - clips and brackets
- 4.2 identify associated materials for plumbing applications:
 - wire wool, flux and lead free solder
 - fixing devices, ie screws.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 5

Be able to select materials and components for basic plumbing practical applications

Assessment criteria

The learner can:

- 5.1 select plumbing materials for joining copper pipe:
 - tees, elbows, couplings, compression and capillary
 - wire wool, flux and lead free solder
- 5.2 select plumbing materials for fixing copper pipe:
 - clips and brackets
 - fixing devices, ie screws.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 6

Know how to carry out basic plumbing practical applications

Assessment criteria

The learner can:

- 6.1 identify typical drawings and specifications used for basic practical applications
- 6.2 state the industry procedures for:
 - measuring and marking out for pipework
 - cutting pipework
 - bending copper pipe, 90° bends and offsets using spring and machine
 - fabricating pipework
 - jointing copper pipe using compression and capillary fittings
 - fixing copper pipework
 - pressure testing pipework and fittings.

Unit 108

Understand and demonstrate fundamental plumbing operations

Outcome 7

Be able to carry out basic plumbing practical applications

Assessment criteria

The learner can:

- 7.1 carry out the following tasks safely:
- interpret typical drawings and specifications used for basic practical applications
 - measure accurately and record the requirements for the installation
 - cut pipework to given sizes
 - bending techniques (spring and machine) to form 90° bends and offsets
 - fabricate small copper tube frame using capillary and compression jointing techniques
- 7.2 safely pressure test completed pipe frame
- 7.3 demonstrate that the work area is left in a safe condition after completion of the task:
- area is left clean and tidy
 - return tools and equipment
 - return excess materials
 - dispose of any waste materials.

Unit 201

Understand and carry out safe working practices in building services engineering

Level:	2
Credit value:	5
UAN:	J/602/2479

Unit aims

This combination unit provides learners with basic skills to carry out safe working practices in building services engineering.

Learning outcomes

There are **twelve** learning outcomes to this unit. The learner will:

1. Know the health and safety legislation that applies to the building services industry.
2. Know how to recognise and respond to hazardous situations while working in the building services industry
3. Know the safe personal protection measures while working in the building services industry
4. Be able to apply manual handling techniques
5. Know how to respond to accidents that occur while working in the building services industry
6. Know the procedures for electrical safety when working in the building services industry
7. Be able to apply basic electrical safety measures in the building services industry
8. Know the methods of working safely with heat producing equipment in the building services industry
9. Be able to safely work with gas heating equipment in the building services industry
10. Know the methods of safely using access equipment in the building services industry
11. Be able to safely use access equipment in the building services industry
12. Know the methods of working safely in excavations and confined spaces in the building services industry

Guided learning hours

It is recommended **88** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 1

Know the health and safety legislation that applies to the building services industry

Assessment criteria

The learner can:

- 1.1 state the aims of health and safety legislation in protecting the workforce and members of the public:
 - general legislation
 - construction specific legislation
 - building services specific legislation
- 1.2 identify the responsibilities of members of the construction team under health and safety legislation:
 - employers (including employer representatives)
 - designers
 - main contractors
 - sub-contractors
 - employees
 - self-employed (labour only)
 - clients (customers)
- 1.3 state the legal status of health and safety guidance materials:
 - Acts of Parliament
 - regulations
 - approved codes of practice
 - HSE guidance notes
- 1.4 state the role of enforcing authorities under health and safety legislation:
 - Health and Safety Executive
 - Local Authority
- 1.5 identify the powers of inspectors under health and safety legislation:
 - improvement notice
 - prohibition notice
 - powers of prosecution
 - role in providing advice and guidance.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 2

Know how to recognise and respond to hazardous situations while working in the building services industry

Assessment criteria

The learner can:

- 2.1 identify the types of general site hazards that may be encountered while at work:
 - site/work area cleanliness:
 - tripping hazards
 - slipping hazards
 - using equipment:
 - inadequate or lack of personal protective equipment
 - defective (unsafe) equipment
 - personal conduct:
 - manual handling
 - working at heights
- 2.2 state the potential dangers to the workforce and members of the public when work is carried out:
 - on construction sites (all property types)
 - in industrial commercial premises (occupied and unoccupied refurbishment)
 - in dwellings (occupied and unoccupied refurbishment)
- 2.3 identify the methods that can be used to prevent accidents or dangerous situations occurring during work activities:
 - working practices (use and understanding of):
 - method statements
 - permit to work systems
 - risk assessments
 - safety notices (use and understanding of):
 - mandatory signs
 - prohibition signs
 - hazard signs
 - fire fighting signs
 - safe condition signs
 - combinations signs
- 2.4 identify how hazardous substance legislation classifies substances and the direct precautions to be taken while working with those substances:
 - toxic
 - harmful
 - corrosive
 - irritant
 - oxidising
 - extremely flammable

- 2.5 identify the general precautions necessary for working with commonly encountered substances:
- lead – solid and fume
 - solvents and lubricants
 - fluxes
 - jointing compounds
 - sealants
 - gases – LPG, Oxy-acetylene and carbon dioxide
 - cleaning agents
- 2.6 state the range of common building materials and services components that may contain asbestos
- 2.7 identify the types of asbestos that may be encountered in the workplace:
- white asbestos (Chrysotile)
 - brown or grey asbestos (Amosite)
 - blue asbestos (Crocidolite)
 - asbestos cement materials
- 2.8 state the procedures that must be used to safely work with asbestos cement based materials:
- flue, soil, rainwater pipes and gutters
 - tanks and cisterns
 - artex
 - small gaskets and seals
- 2.9 identify the actions to be taken when asbestos is encountered while undertaking work activities:
- protection of the workforce and members of the public
 - licensing requirements for asbestos removal organisations
 - safe disposal requirements.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 3

Know the safe personal protection measures while working in the building services industry

Assessment criteria

The learner can:

- 3.1 state the purpose of, and application of protective equipment:
 - clothing protection including high visibility
 - eye protection
 - hand protection
 - head protection
 - foot protection
 - hearing protection
 - respiratory protection
- 3.2 identify the procedures for manually handling heavy and bulk items:
 - assessment of a safe load that a person can lift
 - application of a safe kinetic lifting technique
 - use of simple mechanical lifting aids – sack trolley
 - application and use of mechanical lifting aids on large construction sites.

Unit 201

Understand and carry out safe working practices on building services engineering

Outcome 4

Be able to apply manual handling techniques

Assessment criteria

The learner can:

- 4.1 perform manually handling of heavy and bulky items:
 - plan the lift
 - safely move the load
 - assist in a two-person lift
- 4.2 manually handle loads using mechanical lifting aids.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 5

Know how to respond to accidents that occur while working in the building services industry

Assessment criteria

The learner can:

- 5.1 identify the requirements for first aid provision while working:
 - in small occupied properties
 - on construction sites (new build and refurbishment)
- 5.2 identify the actions that should be taken when an accident or emergency is discovered:
 - raising the alarm
 - the role of the emergency services and contact methods
 - typical emergency evacuation procedures
- 5.3 state the procedures for dealing with minor injuries that can occur while working:
 - cuts
 - minor burns
 - objects in the eye
 - exposure to fumes
- 5.4 state the procedures for dealing with major injuries that can occur while working:
 - bone fractures
 - unconscious co-workers:
 - placing the casualty in the recovery position
 - concussion
 - electric shock
 - removal from the supply
 - CPR method
- 5.5 state the procedures for recording accidents and near misses at work:
 - statutory requirements for the reporting of accidents/serious occurrences
 - the use of company accident books
 - the details to be reported on a simple accident/incident report form.

Unit 201

Understand and carry out the safe working practices in building services engineering

Outcome 6

Know the procedures for electrical safety when working in the building services industry

Assessment criteria

The learner can:

- 6.1 identify the common electrical dangers encountered on construction sites and in private dwellings:
 - faulty electrical equipment
 - signs of damaged or worn electrical cables – power tools and property hard wiring systems
 - trailing cables
 - proximity of cables to services pipework
 - buried/hidden cables
 - inadequate over-current protection devices
- 6.2 identify the methods of safely using electrical tools and equipment on site:
 - battery powered supplies
 - 110 volt supplies
 - 230 volt supplies
- 6.3 identify how to conduct a visual inspection of a power tool for safe condition before use:
 - checking for a valid PAT test
 - inspection for general condition
- 6.4 state the procedure that should be applied for tools and equipment that fail safety checks
- 6.5 state the electrical industry safe isolation procedure that should be applied to building services equipment before carrying out work on them
- 6.6 state the use of temporary continuity bonding when working on pipework components.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 7

Be able to apply basic electrical safety measures in the building services industry

Assessment criteria

The learner can:

- 7.1 demonstrate the electrical industry safe isolation procedure to safely isolate an item of fixed mechanical or electrical plant or equipment
- 7.2 carry out a visual safety inspection of power tools before use and report on their condition
- 7.3 demonstrate the application of temporary continuity bonding when cutting into a fixed metallic pipework system.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 8

Know the methods of working safely with heat producing equipment in the building services industry

Assessment criteria

The learner can:

- 8.1 identify the various types of gases used in pipe and sheet jointing processes:
 - bottle colours
 - properties of gas used
 - uses within the industry
- 8.2 identify how bottled gases and equipment should be safely transported and stored
- 8.3 identify the various types of heat producing equipment and how to check them for safety:
 - hoses
 - colours used
 - thread directions
 - flashback arrestors
 - control valves
 - gauges
 - blowpipes
 - direct connecting combined units (aeration in the nozzle)
- 8.4 identify how gas heating equipment is safely assembled and used:
 - bottle location and position
 - equipment location and position
 - equipment assembly sequence
 - leak detection procedures
 - safe purging procedure
 - safe lighting and extinguishing procedure
 - actions in the event of leakage
- 8.5 identify the three elements of the fire triangle and how combustion takes place
- 8.6 state the dangers of working with heat producing equipment and how to prevent fires occurring
- 8.7 state the method for fighting small localised fires that occur in the workplace:
 - when to avoid tackling fires
 - types of extinguishers
 - selection of extinguisher by fire type
 - method of use
- 8.8 perform a safety check on gas heating equipment.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 9

Be able to safely work with gas heating equipment in the building services industry

Assessment criteria

The learner can:

- 9.1 perform a safety check of gas heating equipment:
 - transportation of gas bottles to the work area
 - assess components and equipment for safety
- 9.2 perform the safe assembly of gas heating equipment for use:
 - hose and blowpipe or combined unit attachment
 - leak detection procedures
 - purging procedures
 - lighting and extinguishing procedures
- 9.3 demonstrate the use of a fire extinguisher in extinguishing a small solid fuel fire.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 10

Know the methods of safely using access equipment in the building services industry

Assessment criteria

The learner can:

- 10.1 identify the situations where it may be necessary to work at height
- 10.2 identify the types of equipment used to permit work at heights in the building services industry:
 - step ladders
 - ladders
 - mobile mini towers/scaffolds
 - roof ladders and crawling boards
 - mobile tower scaffolds
 - fixed scaffold and edge protection
 - mobile elevated work platforms including scissor lifts and cherry pickers
- 10.3 identify how to select suitable equipment for carrying out work at heights based on the work being carried out
- 10.4 state the range of safety checks to be carried out on access equipment before it is used:
 - step ladders
 - ladders
 - mobile mini towers/scaffold
 - roof ladders and crawling boards
 - mobile tower scaffolds
 - fixed scaffolds and edge protection (appreciation only)
- 10.5 state the method of assembly and use of access equipment:
 - step ladders
 - ladders
 - roof ladders
 - mobile tower scaffolds.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 11

Be able to safely use access equipment in the building services industry

Assessment criteria

The learner can:

- 11.1 demonstrate the safe method of assembly and use of:
 - step ladders
 - ladders
- 11.2 demonstrate the safe method of assembly and use of mobile tower scaffolds.

Unit 201

Understand and carry out safe working practices in building services engineering

Outcome 12

Know the methods of working safely in excavations and confined spaces in the building services industry

Assessment criteria

The learner can:

- 12.1 identify the situations in which it may be necessary to work in excavations
- 12.2 state how excavations should be prepared for safe working:
 - safe access into the excavation
 - trench support systems
- 12.3 state the measures that need to be applied to prevent persons or equipment falling into excavations:
 - use of warning signs
 - use of barriers for pedestrians
 - vehicle proximity to excavation edges
- 12.4 identify where work in confined spaces may be required
- 12.5 state the potential dangers when working in confined spaces:
 - drainage systems
 - plant rooms
 - main service duct-rooms
 - in tanks, cylinders, boilers or cisterns
 - under suspended timber floors
 - in roof spaces.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Level:	2
Credit value:	4
UAN:	D/602/2486

Unit aims

The aim of this unit is to provide learners with a general understanding of how to apply environmental protection measures within building services engineering.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Know the energy conservation legislation that applies to the building services industry
2. Know the application of energy sources used in the building services industry
3. Know the importance of energy conservation when commissioning building services system
4. Know the methods of reducing waste and conserving energy while working in the building services industry
5. Know how to safely dispose of materials in the building services industry
6. Know the methods of conserving and reducing wastage within the building services industry

Guided learning hours

It is recommended **38** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure
SummitSkills NOS

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Outcome 1

Know the energy conservation legislation that applies to the building services industry

Assessment criteria

The learner can:

- 1.1 state the aims of energy conservation legislation:
 - general legislation
 - construction specific legislation
 - building services specific legislation
- 1.2 identify the responsibilities of members of the construction team under energy conservation legislation:
 - clients (customers)
 - designers
 - employers
 - employees.

Unit 202 Understand how to apply environmental protection measures within building services engineering

Outcome 2 Know the application of energy sources used in the building services industry

Assessment criteria

The learner can:

- 2.1 identify the types of energy used in properties:
- high carbon:
 - natural gas/LPG
 - fuel oils
 - solid fuels (coal and peat)
 - electricity (from non-renewable sources)
 - low carbon:
 - solar thermal
 - solid fuel (biomass)
 - hydrogen fuel cells
 - heat pumps
 - Combined Heat and Power (CHP)
 - Combined Cooling, Heat and Power (CCHP)
 - zero carbon:
 - electricity – wind
 - electricity – tidal
 - hydroelectric
 - solar photovoltaic
- 2.2 identify the basic operating principles of installations containing environmental energy sources:
- solar thermal
 - solid fuel (biomass)
 - heat pumps (water, air and ground source)
 - Combined Heat and Power (CHP)
 - Combined Cooling, Heat and Power (CCHP)
 - wind turbine
 - solar photovoltaic
- 2.3 identify organisations which give guidance and advice on energy saving and conservation techniques
- 2.4 identify how to use energy rating tables and their effect on component selection
- 2.5 state where to find information on alternative energy sources.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Outcome 3

Know the importance of energy conservation when commissioning building services systems

Assessment criteria

The learner can:

- 3.1 state the role of the commissioning process in conserving energy usage
- 3.2 state the actions to be covered during the system handover procedure to the customer that will contribute to conserving energy usage.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Outcome 4

Know the methods of reducing waste and conserving energy while working in the building services industry

Assessment criteria

The learner can:

- 4.1 identify the working practices that can be employed to conserve energy and protect the environment
- 4.2 state the methods used for reducing material wastage:
 - planning work activities
 - accurate measurement and cutting
- 4.3 identify the methods of conserving material usage:
 - reducing material over ordering
 - minimising damage to stored materials
 - prevention of loss/theft.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Outcome 5

Know how to safely dispose of materials used in the building services industry

Assessment criteria

The learner can:

- 5.1 identify the statutory legislation for waste management on construction sites
- 5.2 state the methods of safely disposing of waste materials:
 - licensed waste disposal
 - waste carriers license
 - recycling
 - specialist disposal – asbestos and other forms of hazardous waste
- 5.3 specify the approved processes for recycling materials:
 - metals
 - plastics
 - wood/cardboard
- 5.4 identify the disposal requirements of potentially hazardous materials:
 - asbestos
 - electrical and electronic equipment
 - refrigerants (fluorinated gases)
- 5.5 identify what action to take if work activities endanger the environment.

Unit 202

Understand how to apply environmental protection measures within building services engineering

Outcome 6

Know the methods of conserving and reducing wastage of water within the building services industry

Assessment criteria

The learner can:

- 6.1 identify the statutory legislation for water wastage and misuse
- 6.2 state the criteria for water efficiency calculations for new dwellings
- 6.3 state the methods for reducing water wastage:
 - flow reducing valves
 - spray taps
 - low volume flush WC
- 6.4 identify the methods available for capturing surface water and recycling used water
- 6.5 identify the uses of captured and recycled water in properties
- 6.6 state the basic working principles of captured and recycled water systems.

Unit 203

Understand the roles, responsibilities and procedures within building services engineering

Level: 2
Credit value: 4
UAN: D/502/8181

Unit aims

This knowledge unit provides learning in the general requirements of the roles, responsibilities and purpose of those working in the Building Engineering Services Industry.

Learning outcomes

There are **four** learning outcomes to this unit. The learner will:

1. Know about a range of building services engineering systems
2. Know the roles, responsibilities and career opportunities within the building services engineering sector
3. Know how to identify and use different documents, documentary procedures for building services engineering work activities.
4. Know the different types of businesses and companies with which building services industry work

Guided learning hours

It is recommended **38** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 203

Understand the roles, responsibilities and procedures within building services engineering

Outcome 1

Know about a range of building services engineering systems

Assessment criteria

The learner can:

- 1.1 identify a range of building services engineering systems
- 1.2 state the basic functions of building services engineering systems within:
 - a domestic building
 - a large building used by business and/or the public
 - commercial and industrial buildings and structures
- 1.3 label the main components for each of the following systems:
 - plumbing
 - electrical
 - heating and ventilating
 - refrigeration and air conditioning
 - building environmental management.

Unit 203 Understand the roles, responsibilities and procedures within building services engineering

Outcome 2 Know the roles, responsibilities and career opportunities within the building services engineering sector

Assessment criteria

The learner can:

- 2.1 outline the career and progression opportunities in building services engineering
- 2.2 identify the key roles and responsibilities of the following 'off site' based members of the building services work team:
 - client
 - customer
 - architect
 - consultants
 - main contractor
 - clerk of works
 - quantity surveyor
 - estimator
 - sub contractor
 - supplier/wholesaler contracts manager
- 2.3 identify the key roles and responsibilities of the following 'on site' based members of the building services work team:
 - apprentices
 - unskilled operatives
 - building services engineers
 - building services operatives (installation; maintenance; servicing) – electrical; plumbing; handv including ductwork; RAC; signal reception; domestic electrical appliances; consumer electronics
 - charge hand
 - foreman
 - site manager
 - supervisor
 - hands officer
- 2.4 identify the key roles and responsibilities of site visitors, including:
 - training officers and assessors
 - building control inspector
 - water inspector
 - hse inspector
 - electrical services inspector.

Unit 203

Understand the roles, responsibilities and procedures within building services engineering

Outcome 3

Know how to identify and use different documents, documentary procedures for building services engineering work activities

Assessment criteria

The learner can:

- 3.1 identify the purpose of the following documents that are used in the workplace:
 - job specifications
 - plans/drawings
 - work programmes
 - purchase orders
 - delivery notes
 - time sheets
 - policy documentation – health and safety, environmental, customer service
- 3.2 identify the purpose of the following documents that are provided to customers/clients:
 - quotations/tenders
 - estimates
 - invoices
 - account statements
 - contracts
 - contract variations
 - handover information (commissioning documents, installation certificates etc).

Unit 203 Understand the roles, responsibilities and procedures within building services engineering

Outcome 4 Know the different types of businesses and companies with which building services industry work

Assessment criteria

The learner can:

- 4.1 identify the different types of businesses with which building services engineering companies may engage, including:
- sole traders
 - contractors
 - public funded bodies – eg NHS; Local Authorities
- 4.2 identify the main differences between domestic and industrial/commercial contracts in terms of:
- health and safety requirements
 - work site organisation:
 - key personnel with whom to liaise on job progress
 - key personnel to contact in relation to work related problems/issues
 - arrangement of variations/additional work requirements
 - tools, equipment and materials delivery and storage requirements
 - access requirements
 - documentary and reporting procedures
- 4.3 specify the different appropriate communication methods and documentary procedures that may be relevant to working with:
- sole traders
 - contractors
 - public funded bodies – eg NHS; Local Authorities.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Level:	3
Credit value:	7
UAN:	J/602/2496

Unit aims

The aim of this unit is to provide learners with the knowledge of how to apply scientific principles, including standard units of measurement and properties of materials, used within mechanical services engineering.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will:

1. Know the standard units of measurement used in the mechanical services industry
2. Know the properties of materials used in the mechanical services industry
3. Know the relationship between energy, heat and power in the mechanical services industry
4. Know the principles of force and pressure and their application in the mechanical services industry
5. Know simple mechanical principles and their application in the mechanical services industry
6. Know the principles of electricity as they relate to the mechanical services industry

Guided learning hours

It is recommended **66** guided learning hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details for the relationship between the unit and relevant national occupational standards

SummitSkills' 'Access to Building Services Engineering' Qualification Structure

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SummitSkills

Assessment

This unit will be assessed by:

- an online test.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 1

Know the standard units of measurement used in the mechanical services industry

Assessment criteria

The learner can:

- 1.1 state the application and use of internationally recognised (SI) units of measurement:
 - metre (length) m
 - kilogram (mass) kg
 - second (time) s
 - kelvin (temperature) OK
- 1.2 state the application and use of SI derived units:
 - area (m²)
 - volume (m³)
 - litres (l)
 - density (kg/m³)
 - velocity (m/s).

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 2

Know the properties of materials used in the mechanical services industry

Assessment criteria

The learner can:

- 2.1 calculate the relative densities of common materials:
 - relative density to air
 - relative density to water
- 2.2 state the principle applications of solid materials used in the mechanical services industry:
 - metals:
 - pure metals
 - ferrous metals
 - alloys including solders
 - plastics:
 - thermo plastics
 - thermo-setting plastics
 - fireclays/ceramics
- 2.3 identify the detailed properties of solid materials:
 - strength – tensile and compressive
 - hardness
 - ductility
 - malleability
 - conductivity – heat and electricity
- 2.4 state the reasons why solid materials breakdown:
 - atmospheric corrosion:
 - oxidisation of metals
 - UV damage to plastics
 - heat damage to plastics
 - electrolytic corrosion:
 - electromotive series
 - dissimilar metals in the presence of an electrolyte (water)
 - erosion corrosion
 - methods of preventing corrosion
- 2.5 state the principle applications and basic properties of liquids used in the mechanical services industry:
 - water
 - refrigerant
 - anti- freeze/glycol mixes
 - fuel oils
 - lubricants/greases
- 2.6 identify the detailed properties of water:
 - boiling/freezing point

- change of state and molecular changes:
 - volume and pressure increases
 - density at differing temperatures
 - to steam/super heated steam
- capillarity
- acidity/alkalinity (pH):
 - temporary hard
 - permanently hard

2.7 state the principle applications of gases used in the mechanical services industry:

- air and steam
- LPG
- natural gas
- carbon dioxide
- refrigerant gases

2.8 identify the detailed properties of gases:

- pressure exerted by a gas
- volume occupied by a gas
- temperature of gases found within the industry
- gas laws:
 - Charles' law
 - Boyles' law
- heat pump/refrigeration cycle.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 3

Know the relationship between energy, heat and power in the mechanical services industry

Assessment criteria

The learner can:

- 3.1 identify the relationship between the Celsius and Kelvin temperature scales:
 - units of temperature measurement
 - temperature measurement devices used
- 3.2 identify the terminology associated with a change of state:
 - melting
 - freezing
 - boiling
 - evaporating
- 3.3 identify the terms latent and sensible heat as they apply to liquids and gases
- 3.4 identify the methods of heat transfer:
 - conduction in solids
 - convection in liquids and gases
 - radiation between two bodies
- 3.5 state how units of energy and heat are related and derived:
 - energy – Joules (J)
 - specific heat capacity (kJ/kg/°C)
 - power – Watts (W)
- 3.6 state how to carry out simple heat, energy and power calculations:
 - simple temperature calculations
 - quantity of heat energy required to raise the temperature of a substance.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 4

Know the principles of force and pressure and their application in the mechanical services industry

Assessment criteria

The learner can:

- 4.1 state how units of force and pressure are derived from SI units:
 - acceleration (m/s^2):
 - force due to gravity
 - force – Newton (N)
 - pressure (N/m^2):
 - atmospheric pressure
 - principles of the siphon
 - flow rate (m^3/s)
- 4.2 state the application and use of units of measurement of pressure and flow rate:
 - pressure:
 - bar/millibar
 - kPa
 - Psi
 - metre head
 - flow rate:
 - m^3/s
 - l/s
 - Kg/s
- 4.3 state how to carry out simple force and pressure calculations:
 - simple force calculations
 - pressure head
 - simple pressure calculations:
 - static pressure
 - dynamic pressure
- 4.4 identify the relationship between velocity, pressure and flow rate in systems:
 - effects of increasing/reducing pressure on velocity and flow rate
 - effects of increasing/reducing pipe size on velocity and flow rate at constant pressure
- 4.5 identify the reasons why pipework restricts the flow of liquids and gases:
 - changes of direction, bends and tees
 - pipe size
 - pipe reductions
 - roughness of material surface
 - constrictions such as valves.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 5

Know simple mechanical principles and their application in the mechanical services industry

Assessment criteria

The learner can:

- 5.1 state the principles behind simple machines:
 - mechanical advantage
 - velocity ratio
 - levers
 - wheel and axle
 - pulleys
 - screws
- 5.2 identify the principles of basic mechanics:
 - theory of moments
 - action and reaction
 - centre of gravity
 - equilibrium.

Unit 204

Understand how to apply scientific principles within mechanical services engineering

Outcome 6

Know the principles of electricity as they relate to the mechanical services industry

Assessment criteria

The learner can:

- 6.1 state the basic principles of electron flow theory:
 - measurements of electrical flow
 - material conductivity and resistance
 - direct and alternating current
- 6.2 state the purpose and application of simple units of electrical measurement for use in the mechanical services industry:
 - current (Amps)
 - voltage (Volts)
 - resistance (Ohms)
 - power (Watts)
- 6.3 state how to carry out simple electrical calculations:
 - Ohm's law
 - power consumption of electrical circuits
 - basic over-current protection device size
 - voltage, current and resistance in series and parallel
- 6.4 identify the requirements for earthing of electrical circuits.

Appendix 1 Relationships to other qualifications

Links to other qualifications

These qualifications have connections to the:

- City & Guilds NVQ Certificate/Diploma in Refrigeration, Air-Conditioning and Heat Pump Systems (6187)
- City & Guilds NVQ Diploma in Heating and Ventilating (6188)
- City & Guilds NVQ Diploma in Plumbing and Domestic Heating (6189)
- City & Guilds NVQ Diploma in Electrotechnical Technology (2357).

Literacy, language, numeracy and ICT skills development

These qualifications can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see www.cityandguilds.com/functionalskills
- Essential Skills (Northern Ireland) – see www.cityandguilds.com/essentialskillsni
- Essential Skills Wales (from September 2010) – see www.cityandguilds.com/esw.

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City and Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on www.cityandguilds.com.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification. Specifically, the document includes sections on:

- the centre and qualification approval process and forms
- assessment, verification and examination roles at the centre
- registration and certification of candidates
- non-compliance
- complaints and appeals
- equal opportunities
- data protection
- frequently asked questions.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve ‘approved centre’ status, or to offer a particular qualification, as well as updates and good practice exemplars for City and Guilds assessment and policy issues. Specifically, the document includes sections on:

- the centre and qualification approval process
- assessment, internal quality assurance and examination roles at the centre
- registration and certification of candidates
- non-compliance
- complaints and appeals
- equal opportunities
- data protection
- management systems
- maintaining records
- assessment
- internal quality assurance
- external quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)
- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment and Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City and Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

Useful contacts

UK learners

General qualification information

T: +44 (0)844 543 0033

E: learnersupport@cityandguilds.com

International learners

General qualification information

T: +44 (0)844 543 0033

F: +44 (0)20 7294 2413

E: intcg@cityandguilds.com

Centres

Exam entries, Registrations/enrolment, Certificates, Invoices, Missing or late exam materials, Nominal roll reports, Results

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: centresupport@cityandguilds.com

Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

F: +44 (0)20 7294 2404 (BB forms)

E: singlesubjects@cityandguilds.com

International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: intops@cityandguilds.com

Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

E: walledgarden@cityandguilds.com

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

T: +44 (0)121 503 8993

E: business@cityandguilds.com

Publications

Logbooks, Centre documents, Forms, Free literature

T: +44 (0)844 543 0000

F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that City and Guilds provides, email: feedbackandcomplaints@cityandguilds.com

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and training

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