

Building Services Engineering Installer (Level 2) – End Point Assessment

Building Services Engineering makes buildings work. It is a specialist branch of engineering within the construction sector. Installers, install components of large-scale industrial and commercial systems such as heating, chilled water, hot water and cold water which are used for heating workplaces such as those found in industrial and commercial buildings like office blocks, factories, schools and hospitals. These engineering systems operate by moving temperature controlled water around the inside of buildings, providing heating and cooling, and utilise fossil fuels and sustainable energy systems.

Its purpose is to inform those involved in delivery and assessment of the apprenticeship:

- **What** will be assessed
- **How** the apprentice will be assessed
- **Who** will carry out the assessment
- **Quality Assurance** arrangements to ensure that assessment of the Installer standard is reliable and consistent across different locations, employers, training and assessment organisations.

Summary of Assessment

The objective of the Building Services Engineering Installer End Point Assessment is to provide a high quality, cost effective means of measuring the apprentice's competence in the final three months of their apprenticeship.

The assessment plan design is driven by the following principles:

- The apprentice demonstrating competence as far as practical through workplace performance
- The apprentice's ability to meet specified industry standards of component performance
- The apprentice's ability to demonstrate the requisite knowledge and behaviours that support workplace performance
- Identification of the apprentice's potential for progression

The Installer End Point Assessment will consist of two components:

- Knowledge Test
- Installer Skills Test

The following diagram provides a summary of the End Point Assessment process.

On-programme

Level 2 Heating and Ventilating Installer Qualification

- Knowledge Tests, Practical Assignments and Portfolio of Evidence

Assessment Gateway

- Confirmation from Employer and Training Provider that the learner is ready to access the End Point Assessment.
- Level 2 Heating and Ventilating Installer Qualification achieved
- Level 2 English and Maths and Level 1 Information & Communication Technology achieved

End Point Assessment

Assessments must be accessed in order given – apprentice must pass each competent before moving onto the next assessment.

The Independent Assessment Organisation must be registered on the Register of Apprenticeship Assessment Organisations. It has overall responsibility for coordinating the End Point Assessment and for the final sign off of the apprenticeship as having been satisfactorily completed.

1. Knowledge Test

- Synoptic knowledge assessment, delivered as an onscreen multiple choice examination.
- Administered in an examination venue which is recognised by the Independent Assessment Organisation
- Designed, maintained and marked by Independent Assessment Organisation

2. Installer Skills Test

- Timed Synoptic practical assessment
- Administered in an examination venue which is recognised by the Independent Awarding Organisation
- Marked and scored by Independent Assessor on behalf of Independent Assessment Organisations

Assessment Overview		
Assessment	Knowledge Test	Installer Skills Test
Assessment Method	Onscreen multiple choice test	Observation of Practical Task
Area assessed	Underpinning and applied knowledge	Performance – application of skills, behaviours & knowledge
Assessed by	Independent Assessment Organisation	Independent Assessor on behalf of Independent Assessment Organisation
Grading	Pass/ Merit/ Distinction/ Fail	Pass/ Merit/ Distinction/ Fail
Weighting to Apprenticeship Grade	33%	67%

On-programme Assessment

Health and Safety

- It is recommended that the apprentice receives basic health and safety induction prior to attending a work site. It is also recommended that apprentices acquire a Trainee SKILLcard in order to gain access to most construction sites.

All apprentices must achieve the following qualifications prior to attempting the End Point Assessment:

- Level 2 Heating and Ventilating Installer Qualification
- English Level 2
- Mathematics Level 2
- Information and Communications Technology Level 1

Assessment gateway

- The assessment gateway allows the apprentice to access the End Point Assessment. This can only be accessed within the final three months of the apprenticeship.
- End Point Assessment will be triggered by achievement of the on programme qualification.
- The employer, in conjunction with the training provider, will decide if the learner has demonstrated the necessary knowledge, skills and behaviours during the on-programme learning so that they are ready to access the End Point Assessment.

End Point Assessment

What

The apprentice will be assessed on their ability to demonstrate the higher level skills, knowledge and behaviours detailed in the [Installer Apprenticeship Standard](#) through two assessment opportunities.

How and Who

- The assessment will be undertaken in the following sequence:
 - Knowledge Test
 - Installer Skills Test
- The apprentice must achieve a minimum of a pass against the Knowledge Test to progress onto the

Skills Test. The apprentice must achieve a minimum of a pass against all components of the End Point Assessment to complete the apprenticeship successfully.

Knowledge Test

Duration: 60 minutes

Installer apprentices are required to demonstrate the knowledge areas identified in Annex A:

- basic knowledge of the systems and components they install
- knowledge of how to work safely and sustainably
- how to plan and prepare the work area.

The Knowledge Test will use multiple choice questions to assess underpinning and applied knowledge in these areas. The underpinning questions will cover the “how” and “why” elements of the content. Applied knowledge will use scenario type questions to assess the apprentice’s judgement and decision making. The distribution of these types of questions will be made available in a test specification and published within the assessment strategy for this apprenticeship.

This knowledge will be tested by the Independent Assessment Organisation, through centrally set and centrally marked multiple choice online examination. The examination venue must have been approved by the Independent Assessment Organisation prior to the examination taking place. The examination venue must have access to appropriate resources to conduct the assessment such as appropriately trained invigilation staff. The assessment will be synoptic of all topics covered in the Apprenticeship standard. It will comprise 40 questions to be completed over 60 minutes.

Grading for this assessment will be as follows: Pass/Merit/ Distinction/ Fail. If the apprentice has to re-sit this assessment they will only be able to achieve Pass/Fail grading.

Apprentices will be able to access distinction grades by being able to reach a particular grade boundary which is determined below;

Grade	Percentage Achieved
Pass	65
Merit	75
Distinction	85

Installer Skills Test

Duration: 10 Hours over 2 days

This assessment will be used to confirm that the apprentice can organise and undertake pipework installation to specified standards, within the specified timescale.

The assessment will take place at a venue which has been approved by the Independent Assessment Organisation prior to the assessment taking place. This may be the training provider’s or employer’s facilities. The assessment will be invigilated. This can be administered by the training provider or employer, provided they have appropriately trained representatives to carry out the role. Apprentices will be assessed by observation throughout the task by the Independent Assessor, a representative of the Independent Assessment Organisations, who is occupationally competent within the industry and qualified to assess. They will then grade the apprentice against grading characteristics.

The Independent Assessor is appointed by the Independent Assessment Organisation.

The Skills Test will require apprentices to demonstrate they can **work safely, work sustainably, plan prepare and install components** as set out in the apprenticeship standard and shown in Annex A . The test must include the following activities:

- reading drawings
- setting out
- listing materials
- fixing brackets
- venting
- draining
- pipe bending (Copper and Steel)
- pipe threading and jointing
- pipe crimping
- jointing techniques (copper capillary, grooved system, plastic solvent)
- pressure testing

The Independent Assessor will interact with the apprentice either during or at the end of the skills test. This allows the Independent Assessor to question the apprentice further around how and why they have carried out the task in the way they have; and to ensure the full complement of skills and behaviours are assessed as shown below and in more detail at Annex A:

- communicating effectively
- working effectively and efficiently
- taking responsibility
- working with others
- continuing professional development
- working ethically

It is expected that up to four apprentices will undertake the skills test at any one time. This requires apprentices to share larger tools and equipment, which enhances the opportunity to assess; planning, organising, safety, communication, and working with others

The Independent Assessor will provide a report on the skill test result and grading outcomes to the Independent Assessment Organisation, who will issue the result.

This component will be graded Pass/Merit/Distinction/Fail. If an apprentice has to re-sit this competent the maximum grade they will achieve is a Pass/Fail.

Skills Test Grading characteristics

Apprentices will need to demonstrate the following characteristics in order to meet the stated grades. Merit builds on demonstration of the Pass characteristics and distinction builds on both Pass and Merit.

Fail	Pass	Merit	Distinction
<p>The apprentice is unable to:</p> <ul style="list-style-type: none"> • complete the installation, testing and draining of the pipework within the allocated time 	<p>The apprentice has:</p> <ul style="list-style-type: none"> • completed the task of fabricating pipework, testing the fabrication and draining the fabrication within 	<p>The apprentice must meet all Pass criteria and has:</p> <ul style="list-style-type: none"> • completed the task without requesting further materials due to errors or 	<p>The apprentice must meet all Pass and Merit criteria and has:</p> <ul style="list-style-type: none"> • completed the task in at least 10% less than the

<p>or to the expect standard</p> <ul style="list-style-type: none"> • use tools and pipework materials appropriately resulting in an unstable fabrication and damage to the working area and materials used • ensure that 60% of measurements are within tolerance • demonstrate safe working practices and does not use the appropriate PPE throughout the task 	<p>the provided time frame</p> <ul style="list-style-type: none"> • fixed the fabrication securely with suitable use of brackets • produced a fabrication that passes a soundness test to industry standards • produced a fabrication without damage to fittings and components and without tool marks present • produced a fabrication with 60% of measurements within the defined tolerance (+/- 2mm) plumb and level • worked safely in accordance with health and safety procedures • maintained a safe and clear working environment for the duration of the task 	<p>miscalculations</p> <ul style="list-style-type: none"> • avoided damage to fittings and components, avoided tool marks and damage to building fabric and surfaces • produced a fabrication with 70% of measurements within the defined tolerance (+/- 2mm) plumb and level 	<p>time frame that is given</p> <ul style="list-style-type: none"> • completed the task without requesting further materials due to error or miscalculations • produced a fabrication with 80% of measurements within the defined tolerance (+/-2mm) plumb and level • produced a fabrication which is water tight upon the first soundness test
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Delivery Requirements

Minimum requirements for Independent Assessors and training provider assessors

- Independent Assessors and training provider assessors must be occupationally competent within the industry and competent to assess. The requirements for these are as follows:
- Occupational competence – is recognised within the industry as a heating and ventilating craftsperson holding a NVQ or SVQ level 3, Gold Engineering Services SKILLcard or equivalents
- Competence to assess – must be working towards or have achieved a relevant recognised assessor qualification such as a Level 3 Certificate in Assessing Vocational Achievement and continue to practice to that standard. Assessors who hold earlier qualifications (D32 or D33 or A1 or TQFE/TQSE) should have CPD evidence to the most current standards

Independent Assessors will be recruited, trained, standardised and contracted by the Independent Assessment Organisation.

End Point – final judgement

The Independent Assessment Organisation, advised by the Independent Assessor, makes the judgement on whether the apprentice has passed the End Point Assessment or not. The Independent Assessment Organisation will also provide the overall apprenticeship grading based on the apprentices combined results from the Knowledge Test and Installer Skills Test.

The Independent Assessor will report on the grading outcome from the Skills Test to the Independent Assessment Organisation, who will issue the result to the apprentice, their employer and training provider.

The Independent Assessment Organisation is responsible for allocating the overall apprenticeship grading and making the final decision on apprenticeship completion.

End Point - Grading

The apprentice must pass all of the End Point Assessment components; Knowledge Test and Installer's Skills Test before the apprenticeship can be achieved.

The overall apprenticeship grade will be derived from the grading of the two graded end assessments. Due to the importance of practical skills within this job role the outcome or grade from the practical assessment is double weighted compared to the knowledge assessment.

The overall apprenticeship will be graded as follows:

Pass

Demonstrates the ability to consistently apply skills, knowledge and behaviours as an installer in the workplace to the industry standard. Particularly in the quality of work and problem solving areas. Commitment and understanding of all theoretical work has been to industry standard. Requires minimum supervision with practical tasks.

Merit

Demonstrates the ability to consistently apply skills, knowledge and behaviours as an installer in the workplace to a high standard. Particularly in the quality of work, problem solving, communicating and reporting areas. Shows potential for progression onto the role of a craftsperson. Often works unsupervised on practical tasks which are completed to a good standard.

Distinction

Demonstrates outstanding ability to consistently apply skills, knowledge and behaviours in the workplace to

an exceptional standard as an installer. Particularly in the quality of work, work planning and foresight, problem solving, communicating, reporting and applying initiative. Shows innovation and is creative to new concepts and ideas. Not only works unsupervised on own practical tasks but finds time to help and assist others. Shows potential for progression into supervisory or craftsperson roles.

Re-sits

The maximum grade (and hence point allocation) for any component re-sit is a Pass. For this reason it is important that apprentices are not entered for the end assessment until the employer and training provider feel the apprentice is ready for the End Point Assessment

The grade will be awarded by the Independent Assessment Organisation using the points based system shown below:

Graded assessment components	Points		
	Pass	Merit	Distinction
Knowledge assessment	1	2	3
Installer Skills Test assessment	2	4	6

Points	Overall apprenticeship grade
3-4	Pass
5-7	Merit
8-9	Distinction

Independence

Independence is provided to the Installer apprenticeship by:

- the multiple choice Knowledge Test being centrally set, maintained and marked by the Independent Assessment Organisation
- the End Point Assessment being co-ordinated by the Independent Assessment Organisation
- the Independent Assessment Organisation being responsible for the overall decision on apprenticeship completion
- the Independent Assessment Organisation being responsible for the grading of the apprenticeship.

End Point Assessment – summary of roles and responsibilities

Assessor	Role
Apprentices Employer	<ul style="list-style-type: none"> • Contributes to the assessment gateway by observing and authenticating the workplace evidence to substantiate that it is authentic and meets industry standards • Decides on the timing of and makes arrangements for the on programme and End Point Assessment, with the support of the training provider as required • Ensures the apprentice has the necessary documentation for End Point Assessment • Works with the training provider to agree remedial action required by the apprentice before re-sitting any unsuccessful component/s
Training Provider	<ul style="list-style-type: none"> • Provides and manages Assessors who are occupationally competent and qualified to assess

	<ul style="list-style-type: none"> • Manages the administration, preparation, operation and invigilation of the Installer Skills Test • Supports the employer in deciding the timing of and arrangement of the End Point Assessment • Provides the apprentice with training on the End Point Assessment process • Supports the employer in agreeing remedial action required by the apprentice before re-sitting any unsuccessful component/s • They may administer and invigilate the end point Knowledge Test on behalf of the Independent Assessment Organisation
Independent Assessors	<ul style="list-style-type: none"> • Bring an independent view as they as they have not been previously involved with the apprentice • Undertake marking, scoring and grading of the end point installer Skills Test • Advise the Independent Assessment Organisation upon completion of the apprenticeship and submit grade given for end Skills Test • Participate in annual standardisation events which will be arranged by the Independent Assessment Organisation
Independent Assessment Organisation	<ul style="list-style-type: none"> • Confirms apprentice's competence and grading of apprenticeship. • Approves and maintains a network of End Point Assessment centres • Provides independent assessment of knowledge by centrally setting, maintaining and marking online multiple choice examinations • Provides and manages Independent Assessors to mark and score craftsperson Skills Test • Provides documentation, training and support for independent verifiers and Independent Assessors to ensure rigour and consistency • Contributes to maintenance and implementation of the Building Services Engineering Assessment Plans
Quality Assurance – Internal	
<ul style="list-style-type: none"> • Quality assurance of End Point Assessment is provided by the Independent Assessment Organisation who will: <ul style="list-style-type: none"> - Enforce criteria for approved assessment centres by defining the staff, resources, processes and procedures required to undertake the Knowledge Test and Skills Test - Provide and manage a network of Independent Assessors to undertake marking and scoring of the end point craftsperson Skills Test - Provide and manage a network of independent verifiers to undertake moderation of the training providers/assessment centres and the assessment process - Develop, manage and maintain online multiple choice examinations to test knowledge of apprentices • Independent Assessment Organisation's independent verifiers will visit centres on at least one occasion per year to review the assessments made by training provider assessors. During these visits they will: <ul style="list-style-type: none"> - review operation of the multiple choice knowledge examinations - review operation of the Skills Tests • Multiple choice examinations will be formulated, reviewed and moderated by the Independent Assessment Organisation to meet a common assessment specification 	

Quality Assurance - external
<ul style="list-style-type: none"> External quality assurance of the end point assessment for this apprenticeship standard will be managed by the Institute for Apprenticeships.
Implementation
<p>Affordability:</p> <ul style="list-style-type: none"> The percentage proportion of End Point Assessment against the overall cost of the apprenticeship is 13.5%
<p>Consistency</p> <ul style="list-style-type: none"> Independent Assessment Organisations will develop the assessment content detail, to meet the apprenticeship standard. The Independent Assessment Organisations will provide documentation, training and support for independent verifiers and Independent Assessors to ensure rigour and consistency The independent verifiers and Independent Assessors will attend at least two meetings per year, arranged and managed by the Independent Assessment Organisations. The purpose of these meetings will be: <ul style="list-style-type: none"> to improve consistency and rigour in the approach and execution of their quality assurance responsibilities to ensure that where any technical or assessment variation (or scope for variation) is identified, a standard interpretation is established and applied. Independent Assessors will be provided with marking schemes and marking schedules for the Installer Skills Test.
<p>Volumes:</p> <ul style="list-style-type: none"> Based on previous apprenticeship training patterns it is expected that there will be an intake of 400 Installer apprentices each year <p>Capacity:</p> <ul style="list-style-type: none"> Employers can currently choose from a network of 15 providers delivering craftsperson apprenticeship throughout England. The training providers are experienced in the delivery of training, administering on screen Knowledge Tests They give varying level of supports dependent on the needs of the employer. The overall grading of the apprenticeship provided to the Independent Assessment Organisation by an Independent Assessor brings an appropriate cost effective enhancement to the process for this level of apprenticeship.
Annex
<ul style="list-style-type: none"> Annex A provides an overview of what an apprentice can expect to be covered in each assessment method

Annex A

Assessment Method Identification

This chart provides an overview of what an apprentice can expect to be covered in each assessment method

Key to assessment method identification within tables:

IEA - Independent End Assessment activity – identifies which assessment method will be used for that section of the standard

K - Assessment will be through the on demand knowledge test

S - Assessment will be through the skills test

Note: Some sections of the standard can be demonstrated by more than one assessment method.

Knowledge and Understanding		IEA	
The Installer will understand:		K	S
Working Safely	<ul style="list-style-type: none"> safe working practices applying to themselves and others in building services engineering working environments. 	✓	
Working Sustainably	<ul style="list-style-type: none"> basic scientific principles underpinning building services engineering industrial and commercial systems including measurement, force and pressure, heat and power, materials and electricity. 	✓	
	<ul style="list-style-type: none"> environmental protection measures within building services engineering for effective use of material resources, minimising wastage, the legislation surrounding the effective use of energy, gas and water resources. 	✓	
Planning and Preparing	<ul style="list-style-type: none"> how to plan and organise allocated component installation work tasks including: how to interpret instructions correctly; how to organise the sequence of activities to be undertaken; how to ensure the necessary tools and components are available as required; when and how to involve other trades; how and when to report problems. 	✓	✓
	<ul style="list-style-type: none"> how to prepare work areas to undertake allocated component installation work tasks including: how to maintain safe access and egress for self and others; how to work with and alongside other trades; how and where to store tools, equipment and components to ensure safe and efficient work flow; and how to correctly identify mechanical services and electrical tool supply connections. 	✓	✓
Installing Components	<ul style="list-style-type: none"> the basic operating principles, and basic installation, testing, pre-commissioning, commissioning and decommissioning processes of industrial and commercial cold water systems, hot water systems, heating systems, chilled water systems, compressed air and steam systems. 	✓	✓
	<ul style="list-style-type: none"> how system components relate to each other within each of the industrial and commercial systems, including the assembly, positioning, orientation and fixing requirements of storage vessels, heat emitters, pressure vessels, controls. 	✓	✓
Skills		IEA	
The Installer will:		K	S

Working Safely	<ul style="list-style-type: none"> apply relevant safety legislation, codes of practice and safe working practices to self and others in building services engineering working environments. 		✓
Preparing and Working Sustainably	<ul style="list-style-type: none"> plan, organise and undertake the installation of industrial and commercial system components in ways which use resources effectively to complete allocated work tasks, effectively, safely and with consideration to environmental impact using industry recognised practices. 		✓
	<ul style="list-style-type: none"> prepare work areas in new and existing sites to undertake allocated component installation work tasks ensuring: safe access and egress for self and others is maintained; components, tools and equipment are stored and positioned safely and to allow efficient workflow; mechanical supply services and electrical tool supply connections are correctly identified; and the need for other trades support is identified and arranged. 		✓
Installing Components	<ul style="list-style-type: none"> apply pipework fabrication, installation and jointing techniques for industrial and commercial system components to industry recognised standards. This includes prefabricated and/or modularised components and distribution systems, and including the assembly, positioning, orientation and fixing of storage vessels, heat emitters, pressure vessels, controls. 		✓
	<ul style="list-style-type: none"> undertake allocated work tasks in the testing, pre-commissioning, commissioning and decommissioning of industrial and commercial cold water systems, hot water systems, heating systems and chilled water systems. 		✓
Behaviours		IEA	
The Installer will:		K	S
Communicating Effectively	<ul style="list-style-type: none"> use oral, written and electronic methods to communicate information with work colleagues, other tradespeople, client's representatives, supervisors, and other members of the building services engineering and wider construction team. 		✓
Working Effectively and Efficiently	<ul style="list-style-type: none"> work reliably and effectively under close, but not constant supervision to the appropriate industry recognised practices and be aware of the needs and concerns of others, especially where related to diversity and equality. 		✓
	<ul style="list-style-type: none"> solve problems within their own scope of responsibility, by applying technical and behavioural skills and knowledge to define the problem, identify, evaluate and select alternatives and implement solutions. 		✓
Taking Responsibility	<ul style="list-style-type: none"> accept responsibility for their own work. 		✓
Working with Others	<ul style="list-style-type: none"> work effectively with colleagues, other trades, clients, suppliers and the public. 		✓
Continuing Personal Development	<ul style="list-style-type: none"> maintain and enhance competence in own area. 	✓	✓
Working Ethically	<ul style="list-style-type: none"> exercise responsibilities in an ethical manner. 	✓	✓

