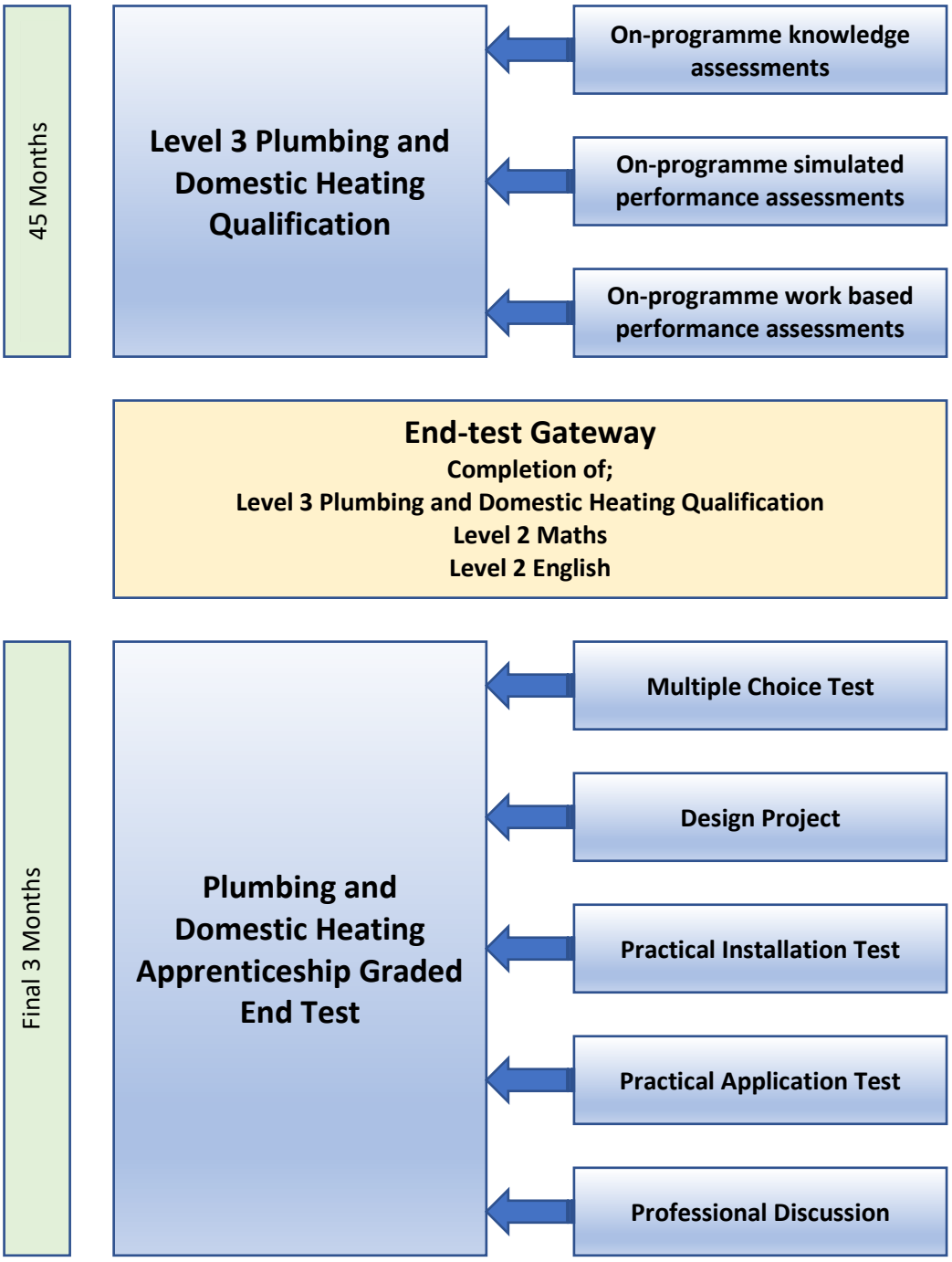
Plumbing and Domestic Heating Technician Apprenticeship (level 3)
Assessment Plan

Summary of Assessment
The Plumbing and Domestic Heating Technician Apprenticeship standard reflects the needs of employers in a diverse industry and apprentices employed in a wide variety of organisations working in domestic properties, commercial and retail buildings, public buildings, heath care and leisure. The Plumbing and Domestic Heating Technician Apprenticeship standard is at Level 3. This apprenticeship is designed to provide the apprentice with the opportunity to develop both the knowledge and skills and core behaviours expected of a competent Plumbing and Domestic Heating Technician operating in a number of regulated areas. This assessment strategy, when delivered by high-quality learning providers and assessed by independent end-point assessment organisations will ensure that candidates can progress towards the achievement of the Apprenticeship. An employer-led approach for quality assurance and governance is being developed to ensure the independent end-point assessment organisations are delivering the end assessment on behalf of employers and continually meet employers' aspirations for their apprentices. Independent end-point assessment organisations referenced within this plan will appear on the ESFA's Register of End Point Assessment Organisations (RoEPAO). Employers have adopted the following broad principles to inform the approach: • The assessment process should add value to both the apprentice and the employer by setting and demonstrating the high skills, performance and knowledge standards required by employers in the plumbing and heating industry. • It should enable and encourage progression and continuing professional development • It should position the apprenticeship, not just as a job, but as the starting point for a career, on which the individual can build. • The assessment methods chosen should ensure relevance and consistency, irrespective of the specific job role of the apprentice. • Costs and practicalities should be appropriate, proportionate and reliable for employers regardless of the number of apprentices. • Assessment should be driven by the Standards and should cover full competence in the relevant occupation. The approach is based on employers' requirements that apprentices: a) are able to perform their role to a demonstrably high standard on completion; and b) make good progress towards this goal throughout the apprenticeship The Apprenticeship will typically take 48 months to complete.

It is recommended that the core skills, knowledge and behaviours will be acquired by the apprentice in the first 36 months with the specialist option undertaken and completed in the final year.

It is recommended that Apprentices undertake a structured programme of study in suitable employment and complete the on-programme training and assessment as part of a high-quality programme. Apprentices can only attempt the separate, mandatory end point assessment once the pre-requisite gateway components have been achieved.

The main objective of the end-point assessment is to provide a high quality cost effective means of measuring apprentices' whole-job competence in the final stage of their apprenticeship.



Summary of Assessment			
Assessment Method	Area Assessed	Assessed By	Grading
Multiple choice test	Knowledge	Independent end-point assessment organisation in an independent assessment centre	Fail Pass Merit Distinction
Design project	Knowledge	Independent end-point assessment organisation in an independent assessment centre	Fail Pass
Practical installation test	Skills	Independent end-point assessment organisation in an independent assessment centre	Fail Pass Merit Distinction
Practical Application test	Skills	Independent end-point assessment organisation in an independent assessment centre	Fail Pass
Professional discussion	Knowledge, Skills and Behaviours	Independent end-point assessment organisation in an independent assessment centre	Fail Pass

Professional Qualifications
Level 3 Plumbing and Domestic Heating Qualification

On-Program Assessment
Completion of Level 3 Plumbing and Domestic Heating Qualification, An Employer Occupational Brief has been developed, to provide additional advice and guidance around the development of the EPA assessment and the on-programme qualification. The employers occupational brief is freely available for download from www.aphc.co.uk/apprenticeships

Assessment Gateway
Completion of the following will provide access to the End Point Assessment, once agreed by employer and training organisation: • Level 3 Plumbing and Domestic Heating Qualification • Level 2 Maths • Level 2 English

End Point Assessment

What is being assessed?

The following areas will be assessed within the end-point assessment.

Health and safety systems
Legislation, codes of practice, relevant regulations, safe working practices, risk assessment, COSHH and method statements, safe working environments and situations (working at heights, excavations etc.), fire protection and emergency procedures.

Plumbing and Heating Science, processes
Scientific principles, heat transfer, units of measurement, mechanical principles, electrical principles, plumbing and heating design principles. Pipework measuring, cutting, bending and jointing techniques. Allied trade skills, plastering, drilling, cutting and making good different building fabrics.

Environmental and energy efficient working practices
Environmental principles - Compliance to environmental legislation and the impact of processes and technologies associated with fire, emergency and security systems. Questions to assess the apprentice on the culture of re-use and recycle, WEEE Regulations (Waste electrical electronic equipment).

Meet work and project plans and meeting customer expectations
Managing time, resource and job planning for economy, business and client convenience and sound business principles. Principles of high quality customer service and the needs of others. Building and maintaining relationships. Communicating in a clear, articulate and appropriate manner.

Plumbing and Heating Systems
Size, select, plan, install, test, commission, decommission, service, maintain, fault find and repair plumbing and heating systems, including; cold water, hot water, central heating, sanitation and rainwater, electrical and heating controls, fuel burning appliances and environmental technologies.

The details of what will be assessed by each method is set out in Appendix 1.

How is it being assessed?

The knowledge element of the end point assessment has two components: Multiple Choice Test and Design project.

Multiple Choice Test (Underpinning Knowledge Assessment) – a global assessment made of 50 questions, multiple-choice, each with one correct answer and three distractors, centrally set and centrally marked. The knowledge areas will be selected from an assessment bank that covers the full knowledge range, as specified in appendix 2 of this Assessment Plan. This examination will have a maximum time of 90 minutes.

Design Project (Applied Knowledge Assessment) – taking 7 hours' duration, in an assessment centre. Building plans are provided to the apprentice with a job specification, manufacturer's information and data, British Standards and regulations. The apprentice is asked to complete a heating, hot water and cold water design capable of meeting the job specification. The apprentice will then produce:

- Design criteria
- Completed fabric heat loss
- Heating pipework sizing
- Hot and cold water sizing
- Final layout plans
- Materials list
- Merchant order

The performance element has two components: the Practical Installation Test and the Practical Application Test.

Practical Installation Test (Underpinning Skills Assessment) – will see Apprentices complete the fabrication of a pipework frame, utilising different materials and pipework components with various jointing techniques. The assessment marking criteria will include overall performance and soundness, quality of manufacture and tolerances of ±2mm. This assessment should be completed within 6 hours.

Practical Application Test (Applied Skills Assessment) – will be carried out in an assessment centre within a secure bay. The apprentice will inspect a pre-installed unvented cylinder, functioning with electrical components and controls. The assessor will make alterations to the system to create faults on various components within the system. The apprentice is then given 2 hours to identify the faults and repair then re-commission the system. Finally, the apprentice will complete a service on the unvented system, according to manufacturer's instructions, this will be undertaken within 1 hour.

Optional Pathways and Behaviours – will be assessed through the Professional Discussion and supported by the production of a work place log book completed by the apprentice during the end point assessment period, with at least 8 weeks to complete, after the gateway.

The log book must be designed and developed by EPAOs so that it aligns with the knowledge and skills of the core options along with the behaviours specified within **Appendix 1 - Assessment Method Identification**. The EPAOs must provide advice and guidance on what constitutes best practice in the compilation of the log book, including the quality of entries and examples of evidence that could be provided etc.

Apprentices will be responsible for the full and varied compilation of evidence that will be required for submission purposes. The log book should record the apprentice's achievements as they progress through the EPA period and should be supplemented with employer testimonies, performance appraisals and timely endorsements of competence from line managers.

The apprentice's log book entries should be typographically correct; errors will impact on award of grade. In addition, evidence contained must be sufficient, authentic and relevant.

On completion, the apprentices finished log book will be sent to the End Point Assessor at least 2 weeks in advance to prepare for the professional discussion. The appointed independent assessor will review the log book and the professional discussion (which will take 30 minutes) will be used to verify and question the apprentice in relation to the log book.

Who will carry out the assessment?
End-point assessments will be carried out by staff from independent end-point assessment organisations on the ESFA's Register of End-Point Assessment Organisations (RoEPAO).

To ensure consistent and reliable judgements are made, independent end-point assessors will be subject to rigorous quality assurance and must take part in regular standardisation activities. The mandatory criteria for independent end-point assessors is set out below.

Occupational expertise of plumbing and domestic heating independent end-point assessors
The requirements set out below relate to all plumbing and domestic heating independent end-point assessors. Independent end-point assessors must:

- Have excellent knowledge and understanding of the apprenticeship standard as set out in the industry set Grading Criteria.
- Hold a recognised workplace assessment qualification, for example an NVQ Level 3 in Plumbing and Domestic Heating. The list of approved qualifications will be published at www.aphc.co.uk/apprenticeship and updated as new, appropriate qualifications are released.
- Relevant occupational expertise and knowledge, at the relevant level of the occupational area(s) they are assessing, which has been gained through 'hands on' experience in the Plumbing and Domestic Heating industry.
- Practice standardised assessment principles set out by the end-point assessment organisation and hold a recognised assessing qualification such as an A1.
- Have sufficient resources to carry out the role of independent end-point assessor i.e. time and budget.
- Continuous professional development for plumbing and domestic heating independent end-point assessors

It is necessary for independent end-point assessors to maintain a record of evidence of their continuous professional development (CPD). This is necessary to ensure currency of skills and understanding of the occupational area(s) being assessed, and can be achieved in a variety of ways. It should be a planned process, reviewed on an annual basis, for example as part of an individual's performance review.

Independent assessors should select CPD methods that are appropriate to meeting their development needs. Within a twelve-month period, an independent end-point assessor will be required to demonstrate they have gained practical experience in the plumbing and domestic heating industry which develops/up-dates their knowledge/skills. The following provides an example of a variety of methods that can be utilised for CPD purposes, a multiple of which need to be experienced/undertaken.

Updating occupational expertise (at least 10 hours per year):

- Internal and external work placements to gain 'hands on' experience
- Work experience and shadowing
- External visits to other organisations
- Updated and new training and qualifications
- Training sessions to update skills, techniques and methods

Keeping up to date with sector developments and new legislation (at least 5 hours per year):

- Relevant sector websites and twitter feeds
- Membership of professional bodies and trade associations
- Papers and documents on legislative change
- Seminars, conferences, workshops, membership of committees/working parties
- Staff development days

Standardising and best practice in assessment (at least 5 hours per year):

- Quarterly standardisation meetings with colleagues (see requirements for standardisation below)
- Sharing best practice through internal meetings, news-letters, email circulars, social media
- Comparison of assessment and verification in other sectors

End Point Final Judgment

Final judgement and marking will be made by the independent assessor, approved through the end-point assessment organisation and meeting the assessor competence requirements laid out within this assessment plan.

Independence

Independence and impartiality are achieved through the end-point assessment being undertaken by an independent end-point assessor.

The independent end-point assessor will assess each apprentice's work, including the grade to be awarded, based on evidence produced through the end point assessment methods.

Organisations delivering the independent assessor service, in addition to appearing on the ESFA's RoEPAO and acting on behalf of the industry, will be responsible for management and independent moderation of these services.

Summary of Roles and Responsibilities	
Employer	The employer will support the apprentice throughout their training and conduct regular reviews to monitor their progress throughout their apprenticeship. The employer will determine when the apprentice is ready to be put forward to the end point assessment. The employer may take advice from the training provider, if appropriate.
Apprentice	The apprentice will receive regular reviews with their employer giving regular opportunities to raise any training needs or issues. The apprentice will self-reflect if they are ready to proceed to the end-point assessment.
Training Provider	The training provider as appropriate will jointly provide support to the employer in the training of the apprentice throughout their apprenticeship (on-program), developing the tools required for the apprentice to acquire the skills, knowledge and behaviour for full occupational competency through the end-point assessment.

Independent End-Point Assessment Organisation	The Independent End-Point Assessment Organisation will administer the delivery of the end point assessment test and is solely responsible for determining the overall competence of the apprentice.

Quality Assurance - Internal

The key to success with any training and qualification programme lies in ensuring that the required standards are met consistently and reliably. This can only be achieved through a rigorous quality assurance regime.

For the Plumbing and Domestic Heating Technician Apprenticeship, the End-Point Assessment Organisations will be required to meet the following requirements:

Assessment organisations are registered on the ESFA Register of apprenticeship assessment organisations. Assessment organisations are responsible for ensuring assessments are conducted fairly and that assessments are valid, reliable and consistent. It is essential that assessment organisations:

- Ensure independent end-point assessors are competent both occupationally and in assessment practices
- Ensure assessments are planned, communicated and executed fairly
- Quality assurance of independent end assessments with planned internal quality assurance activity, including both desk based and 'live' quality assurance activity.
  (This must be performed on a risk basis, i.e. new or poorly performing assessors must have every element of every assessment quality assured, but established, high performing assessors can be quality assured on a sampling basis, with at least one assessment activity being subject to either desk based or live internal quality assurance activity on an annual basis)
- Ensure on-demand tests are correctly invigilated.

Ensure standardisation of all assessors, including but not limited to:

- Review of annual adherence to CPD requirements
- Standardisation meetings – at least quarterly but required frequency to depend on internal and external quality assurance outcomes of each assessment organisation
- Assessment and verification training sessions
- Shadowing and cross checking of other assessors
- Address poor performance from assessors to ensure high standards of end assessment
- Obtain and review feedback / satisfaction results from apprentices and employers, taking appropriate actions for improvement
- Address and administer any appeals and grievances fairly and in line with the consistent approach

End-Point Assessment Organisations will be required to operate in accordance with a quality management system, including an internal audit regime, which assures compliance with the requirements outlined above.

Quality Assurance – External

External quality assurance (EQA)

End-point assessment organisations will be subject to external quality assurance to deliver national consistency across the plumbing and domestic heating industry which is overseen by the Plumbing and Domestic Heating Apprenticeship Board.

External quality assurance (EQA) of the end point assessment for plumbing and domestic heating apprenticeship standards

All assessment organisations listed on the Register of End-Point Assessment Organisations (RoEPAO) must follow the external quality assurance process in this plan. The external quality assurance will be overseen by a Plumbing and Domestic Heating Apprenticeship Board and conducted and managed by Association of Plumbing and Heating Contractors (APHC) on a non-profit making basis and independent of commercial or other financial gain. Supporting information on the external quality assurance can be found at www.aphc.co.uk/apprenticeship

Plumbing and Domestic Heating Apprenticeship Board

The board should be reflective of the type of work carried out across the industry to include new-build installation, retro-fit and refurbishment along with service and maintenance activities. The board will also reflect business size within the industry to include small, medium and large employers.

Membership of the board is not subject to membership of any other industry organisation, including Association of Plumbing and Heating Contractors (APHC) and Chartered Institute of Plumbing and Heating Engineers (CIPHE). When a vacancy arises, Plumbing and Domestic Heating employers are invited to apply for a seat on the board. Each vacancy will be advertised in the plumbing and domestic heating trade press to ensure independence of selection.

Applications will be considered, and selection will be based on a desk based review and potential interview, against a person and business specification, covering size of business, scope of business activities, employer's experience, knowledge, qualifications and commitment to ensuring that apprentices consistently achieve the apprenticeship standard.

The industry trade association (APHC) and professional institute (CIPHE) are committed to working together to carry out the selection process in a transparent and neutral manner, giving joint support for the successful applicant. Where a nominee does not immediately secure a place on the board, they will be retained on a list of prospective members for future vacancies.

APHC, CIPHE and Plumbing and Heating Skills Partnership (PHSP) will each have one non-voting seat on the board.

A Board of six employers:

- Represent the views of their business and industry networks
- Are subject to re-election after a period of 2 years (requiring the support of two organisations).

- Re-election is not automatic to give opportunities for other employers to be part of the board
- Work openly, challenge, innovate and drive the industry's apprenticeship commitment to quality
- Contribute their specific experience and expertise
- Actively communicate and engage other employers and partners to achieve high quality apprenticeships

In relation to quality the responsibilities of the Board include:

- A full knowledge and understanding of the:
  - content of the assessment plan
  - external quality assurance arrangements and methodology
  - infrastructure and processes used to manage and operate the external quality assurance
- Agreeing measures to benchmark external quality assurance results set by APHC
- Overseeing external quality assurance results based on the provision of quarterly reports provided by APHC and agreeing corrective action as necessary
- Working collaboratively with assessment organisations, to identify and address matters relating to the external quality assurance process and results
- Reviewing evaluation results to ensure that the Plumbing and Domestic Heating apprenticeship remains fit for purpose and advising on matters of maintenance which may impact on external quality assurance
- Reviewing and addressing complaints against Plumbing and Domestic Heating apprenticeship and external quality assurance results

Plumbing and Domestic Heating Apprenticeship Industry Group

The Industry Group will provide advice and guidance to the board, on matters concerning the delivery of the apprenticeship end point assessment. The Plumbing and Domestic Heating Apprenticeship Industry Group are not a decision-making group and all matters are referred to the board for final ratification and agreement.

The group is made up from representatives of Industry Stakeholders, through a transparent selection process, to include:

- Training Provider (1) (representative)
- Managing Agent (1) (representative)
- College (2)
- Assessing Organisations (3) (representative)
- Awarding Organisations (3) (representative)
- National Association of Plumbing Teachers (NAPT) (1)
- Plumbing and Domestic Heating Board (1)
- APHC (1)
- CIPHE (1)

Membership to the Industry Group for the two years and is not subject to membership of any other industry organisation. When a vacancy arises within the representative groups, organisations operating within that representative grouping are invited to apply for a seat on the industry group. Each vacancy will be advertised in the plumbing and domestic heating trade press to ensure independence of selection.

Applications will be considered, and selection will be based on a desk based review and potential interview, against a business specification, covering scope of business activities and commitment to ensuring that apprentices consistently achieve the apprenticeship standard.

The industry trade association (APHC) and professional institute (CIPHE) are committed to working together to carry out the selection process in a transparent and neutral manner, giving joint support for the successful applicant. Where a nominee does not immediately secure a place on the board, they will be retained on a list of prospective members for future vacancies.

APHC and CIPHE will each have one non-voting seat on the board.

The Industry Group members:

- Represent the views of their business and industry networks
- Work openly, challenge, innovate and drive the industry's apprenticeship commitment to quality
- Contribute their specific experience and expertise
- Provide support and guidance to the Apprenticeship Board

Process for initiating external quality assurance

In order to start the external quality assurance process, the assessment organisation will notify APHC online at www.aphc.co.uk/apprenticeship

External quality assurance visits will be completed, at least annually, on each assessment organisation, and may include more than one visit/activity where an assessment organisation operates in more than one region, or uses multiple assessment centres, each centre receiving a visit at least bi-annually. External quality assurance will comprise a range of activities, examples of which are detailed below and will include on-site visits to assessment organisations.

External quality assurance activities

External quality assurance will focus on four defined areas to ensure compliance, including: consistency of assessment materials, competence and performance of staff, the internal quality assurance checks and the overall planning and reporting of the apprenticeship end point assessment process.

Ensuring consistency of assessment materials

- Design of the assessment materials
- Consistent application and internal quality assurance of assessment materials during end point assessments

Competence of staff – EQA activity will check

- Vocational competence of assessment and internal verification staff
- That assessment and internal quality assurance staff have been trained on end point assessment for the plumbing and domestic heating standard
- That Continuous Professional Development of both vocational and assessment competence is occurring to the prescribed standard

Internal quality assurance – EQA activity will check

- Independent assessment organisations have implemented internal quality assurance procedures as set out in the assessment plan

Reporting and management of information – EQA activity will check

- Timely and accurate registration of the apprentice and notification of results
- Accuracy of internal data against registrations in the APHC Management system
- Full, accurate and legible records

Sampling size and frequency

An assessment organisation's sample size will vary due to many considerations. Each assessment 'centre' (i.e. if an assessment organisation provides remote centres or operates multiple teams of assessors) will be sampled bi-annually.

The baseline sample for the first external quality assurance visit will be 10%. At the end of each EQA visit the assessment organisation's performance will be graded (e.g. excellent, adequate, poor) and future EQA activity levels will be planned accordingly.

Assessment organisations receiving excellent EQA results can expect future samples to be less than 10% and assessment organisations receiving poor EQA results can expect increased frequency of activity and size of EQA sample.

At each EQA visit the sample required will include, Apprentices who are currently in the assessment window and those who have completed their end point assessment since the previous full external quality assurance visit

It is expected that EQA activity will typically occur every six months, but this frequency may be adjusted in accordance with the volume of apprentices completing end point assessment and the past performance of the end-point assessment organisation.

Prior to an external quality assurance visit, end-point assessment organisations will be contacted to provide and confirm relevant information regarding apprentices. From this information a sample will be selected and names of apprentices for whom evidence and activity are to be quality assured will be notified to the end-point assessment organisation prior to the visit.

Typically, an external quality assurance visit will involve:

- Meetings between the external quality assurance personnel and apprentices, assessors and internal quality assurance staff.
- A desk review of assessment documentation, covering each assessment activity and usually covering a range of results from distinction through to fail, validating the internal quality assurance activity.
- Review of records relating to the planning of internal quality assurance and feedback from end point assessments.
- Review of records relating to the multiple-choice test administration.
- Review of records relating to appeals and grievances.
- Review of competence and CPD for assessment and internal quality assurance staff.
- Review end-point assessment organisations' evidence of satisfaction measures for apprentices and employers

External quality assurance activity will normally include an opportunity to review at least two components of the end point assessment. All forms of assessment will be sampled over time during the course of external quality assurance visits.

Competence of External Quality Assurance Auditor (EQA Auditor)

EQA Auditors will be a current employer or an employer representative.

Undertaking an EQA on behalf of the Plumbing and Domestic Heating Apprenticeship Board is not subject to membership of any other industry organisation, including APHC and CIPHE. When a vacancy arises, Plumbing and Domestic Heating employers or their representatives are invited to apply. Each vacancy will be advertised in the plumbing and domestic heating trade press to ensure independence of selection.

Applications will be considered, and selection will be based on a review of a submitted CV and interview, against;

- a person specification, including qualifications, holding at least an NVQ Level 3 in Plumbing and Domestic Heating, or recognised equivalent. Experience of selecting, installing, commissioning, Servicing and maintaining the range of systems and work activities demonstrated within the Plumbing and Domestic Heating Technician Apprenticeship Specification
- Willing to undertake further CPD, including,
    - internal training which would cover conducting an audit, understanding the apprenticeship, the end point assessment and commitment to ensuring that apprentices consistently achieve the apprenticeship standard.
    - Standardisation meetings to be held at least annually

The industry trade association (APHC) and professional institute (CIPHE) are committed to working together to carry out the selection process in a transparent and neutral manner, giving joint support for the successful applicant.

Reporting and recommendations

Typically, a verbal summary will be given at the end of an external quality assurance visit. Within five working days after the visit a draft report will be supplied to the independent end-point assessment organisation, including recommendations, actions and a provisional risk grading. The end-point assessment organisation will be given a further five working days to provide any feedback, as necessary, after which the final edition of the report, including final grade, will be sent to them.

Subsequent external quality assurance activity will be appropriate to the findings, recommendations and actions and may include interim EQA activity prior to the next full visit.

The EQA reports will not be made publicly available, but redacted elements may be shared, in whole or in part, with the employers on the Plumbing and Domestic Heating Apprenticeship Board to inform evaluations and improvements. Identifying information will be removed so that board members cannot identify the end-point assessment organisation or individual apprentice.

End Point Grading

If an Apprentice fails any component of the End Point Assessment, the Apprentice will receive an overall grade of Fail. This is regardless of other grades achieved within other assessment components.

The final overall End Point Assessment grade for Apprentices receiving at least a pass in each assessment component is show in the table below.

End Point Assessment Final Grade	Multiple Choice Test	I Practical Installation Test	Design Project	Practical Application Test	Professional Discussion
Pass	Pass	Pass	Pass	Pass	Pass
Pass	Merit	Pass	Pass	Pass	Pass
Pass	Pass	Merit	Pass	Pass	Pass
Merit	Distinction	Pass	Pass	Pass	Pass
Merit	Pass	Distinction	Pass	Pass	Pass
Merit	Merit	Merit	Pass	Pass	Pass
Merit	Distinction	Merit	Pass	Pass	Pass
Merit	Merit	Distinction	Pass	Pass	Pass
Distinction	Distinction	Distinction	Pass	Pass	Pass

Re-sits and re-takes

Apprentices who pass the EPA cannot re-sit or re-take any component of the End Point Assessment, simply to achieve a higher grade.

Where an apprentice fails any component of the End Point Assessment they are permitted to re-sit the assessment component within 14 days.

Should an apprentice fail the assessment component re-sit then further training is deemed necessary. In this case a re-take can be arranged with the agreement of the employer, but not less than 12 weeks after the previous end point assessment component attempt.

An apprentice having to undertake a re-sit or re-take must have their final grading capped to a Pass, unless the independent end-point assessment organisation confirms there are extenuating circumstances.

Grading Descriptors

Multiple Choice Test (Underpinning Knowledge Assessment)

Fail – up to and including 49%, knowledge does not meet minimum criteria

Pass – 50%, up to and including 74%, knowledge meets minimum criteria

Merit –75% up to and including 89%, good knowledge demonstrated

Distinction –90% up to and including100%, outstanding knowledge demonstrated

Practical Installation Test (Underpinning Skills Assessment)

Fail – 6 or more errors in the selection of materials, development of the pipework frame to include operating safely, measuring, marking, (planning) bending, cutting, jointing, bracketing (installing) and water tightness (testing) across the pipework and cabling materials. Not taking responsibility for the work environment and the health and safety of others. Cannot describe opportunities where the each of the behaviours listed within the apprenticeship standard have been demonstrated.

Pass – up to and including 5 errors in the selection of materials, development of the pipework frame to include operating safely, measuring, marking, (planning) bending, cutting, jointing, bracketing (installing) and water tightness (testing) across the pipework and cabling materials. Taking responsibility for the work environment and the health and safety of others.

Demonstrated each of the behaviours mapped against this assessment method in Appendix 1, as described below

Dependable and responsible - Demonstrates the ability to take on responsibility for delivery of the assessment task, turning up at the required time, with the correct clothing and personal equipment, expected to undertake the task

Quality focus – Demonstrates work carried out to the required standards, within the timescales and quality standards identified above.

Work with others - the ability to work with others to maintain the progress completion of the assessment task

Sustainable working - Undertakes work in the most efficient sequences, selects and uses materials and techniques which minimise environmental impact

Merit – up to and including 3 errors in the selection of pipework materials, development of the pipework frame to include operating safely, measuring, marking, (planning) bending, cutting, jointing, bracketing (installing) and water tightness (testing) across the pipework and cabling materials. Taking responsibility for the work environment and the health and safety of others.

Demonstrated each of the behaviours mapped against this assessment method in Appendix 1, as described below

Dependable and responsible - Demonstrates the ability to take on responsibility for delivery of the assessment task, turning up at the required time, with the correct clothing and personal equipment, expected to undertake the task

Quality focus – Demonstrates work carried out to the required standards, within the timescales and quality standards identified above.

Work with others - the ability to work with others to maintain the progress completion of the assessment task

Sustainable working - Undertakes work in the most efficient sequences, selects and uses materials and techniques which minimise environmental impact

Distinction – no more than one error in the selection of materials, development of the pipework frame to include operating safely, measuring, marking, (planning) bending, cutting, jointing, bracketing (installing) and water tightness (testing) across the pipework and cabling materials. Taking responsibility for the work environment and the health and safety of others.

Demonstrated each of the behaviours mapped against this assessment method in Appendix 1, as described below

Dependable and responsible - Demonstrates the ability to take on responsibility for delivery of the assessment task, turning up at the required time, with the correct clothing and personal equipment, expected to undertake the task

Quality focus – Demonstrates work carried out to the required standards, within the timescales and quality standards identified above.

Work with others - the ability to work with others to maintain the progress completion of the assessment task

Sustainable working - Undertakes work in the most efficient sequences, selects and uses materials and techniques which minimise environmental impact

Design Projects (Applied Knowledge Assessment)

Fail – Design solution does not meet minimum design criteria, established in meeting customer's needs (customer service), is not in accordance with health and safety legislation and Water Supply (Water Fittings) Regulations 1999, the correct heat loss, pipe sizing and design calculations are not correctly carried out or applied (selection of hot water, cold water, central heating and above ground sanitary pipework systems). Materials take off and drawings incomplete or not finished to BS standards and Building Regulations, with drawing and merchant order incomplete or inaccurate (Communication).

Pass – Design solution meets minimum design criteria, established in meeting customer's needs (customer service), in accordance with health and safety legislation and Water Supply (Water Fittings) Regulations 1999, correct heat loss, pipe sizing and design calculations applied but may demonstrate minor errors in maths (selection of hot water, cold water, central heating and above ground sanitary pipework systems). Materials take off and drawings finished to BS standards and Building Regulations, with drawing and merchant order produced accurately (Communication).

Practical Application Test (Applied Skills Assessment)

Fail – Not operating safely or adhering to health and safety legislation, codes of practice and applying safe working practices, incorrect Fault identification or incorrect repair. Service and maintenance, de-commissioning and commissioning not carried out to manufacturer's instructions. Unsafe working practices demonstrated. Not producing a work programme. Not taking responsibility for the work environment and the health and safety of others.

Pass – Fault correctly identified and correctly repaired. Service carried out to manufacturer's instructions. Safe working practices demonstrated and taking responsibility for the work environment and the health and safety of others.

Professional Discussion (Optional Pathways and Behaviour's)

Fail – cannot demonstrate an understanding of the principles of selection, installation, testing, commissioning and service and maintenance techniques within the optional pathway. Cannot describe examples of selecting, installing, testing, commissioning, service and maintaining technologies within the chosen pathway.

Cannot describe opportunities where the each of the behaviours listed within the apprenticeship standard have been demonstrated.

Pass – can demonstrate an understanding of the principles of selection, installation, testing, commissioning and service and maintenance techniques within the optional pathway. Can describe examples of selecting, installing, testing, commissioning, service and maintaining technologies within the chosen pathway.

Working with the logbook that has been developed to support the end point assessment, can describe opportunities where the each of the behaviours listed within the apprenticeship standard have been demonstrated.

Implementation

Affordability

The costs and practicality of assessment have been key considerations in the development of this approach, not least because of the number of smaller businesses who employ apprentices in these two roles. Cost effectiveness has been increased in several ways, including the removal of the current duplication in the assessment of knowledge

The pragmatic combination of assessment methods ensures breadth, validity and reliability to satisfy the assessment requirements whilst minimising additional, non-value adding assessment costs.

The removal of the current requirements for the collection of unnecessary evidence throughout the duration of the apprenticeship, by focusing on summative assessment.

Consultation with awarding organisations and training providers has confirmed that the costs of this approach will be no more than the current arrangements, and could be significantly less.

Their view is that less time will have to be spent on assessment, but that the time spent on assessment will be more value adding to the apprentice and the employer. They also recognise that they may need to have more experienced staff involved in the process.

The cost of the End Point Assessment (EPA) will be no more than 20% of the overall apprenticeship. The funding band is awaiting confirmation.

Professional Body Recognition

- Apprentices achieving the end-point assessment will be eligible and may, if they wish, apply for Engineering Technician registration with a relevant Professional Body, such as

- Chartered Institute of Plumbing and Heating Engineering (CIPHE)
- Chartered Institute of Building Services Engineers (CIBSE)

Consistency

Benchmarking the end point assessment against the professional bodies' requirements for Engineering Technician (EngTech) registration. The internal and external quality assurance processes mean that the assessment outcomes will be consistent and reliable, allowing a fair and proper comparison between apprentices employed in different types and sizes of organisations.

Volumes

- Based on previous apprenticeship patterns it is expected that there will be around 2,500 Plumbing and Domestic Heating Technician apprentices each year undertaking the EPA
- There is currently a network of more than 360 providers delivering P & DH apprenticeships throughout England for employers to choose from

Appendix 1

Assessment Method Identification

The table below provides an overview of which knowledge, skills and behaviours are being assessed by 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
MCT Multiple Choice Test (Underpinning Knowledge Assessment)
DP Design Project (Applied Knowledge Assessment)
PIT Practical Installation Test (Underpinning Skills Assessment)
PAT Practical Application Test (Applied Skills Assessment)
PD Professional Discussion

Core Knowledge		IEA				
The Installer will understand:		MCT	DP	PIT	PAT	PD
Health and safety	Understand health and safety legislation, codes of practice and safe working practices	✓	✓	✓	✓	
Core plumbing systems	Understand selection, planning, installation, testing, commissioning and de-commissioning, service, maintenance, fault diagnosis and repair techniques on cold water, hot water, central heating, above ground drainage and rainwater systems	✓	✓	✓	✓	
Electrical components and control systems	Understand installation and testing techniques for electrical components and control systems on plumbing and domestic heating systems	✓	✓		✓	
Plumbing science and processes	Understand scientific plumbing, domestic heating and mechanical principles	✓	✓	✓	✓	
Principles of environmental technology systems	Understand the principles of domestic mechanical environmental technology systems	✓	✓			
Principles of fossil fuels	Understand the principles of fuel combustion, ventilation and fluing arrangements within a domestic environment	✓	✓			✓
Customer service	Understand the principles of high quality customer service and establishing the needs of others (colleagues, customers and other stakeholders). Respect the working environment including customer's properties	✓	✓		✓	
Communication	Understand different communication methods, how to communicate in a clear, articulate and appropriate manner and how to adapt communication style to suit different situations	✓	✓	✓	✓	

Core Skills		IEA				
The Installer will:		MCT	DP	PIT	PAT	PD
Safe working	Operate in a safe working manner by adhering to health and safety legislation, codes of practice and applying safe working practices			✓	✓	
Core plumbing system techniques	Apply selection, planning, installation, testing, commissioning and de-commissioning, service, maintenance, fault diagnosis and repair techniques on cold water, hot water, central heating, above ground drainage and rainwater systems			✓	✓	
Electrical components and control systems techniques	Apply installation and testing techniques for electrical components and control systems on plumbing and domestic heating systems			✓	✓	
Supervisory skills	Take responsibility for own work and safety and welfare of others Oversee and organise the programme of work and work environment Carry out work and manage resources in an environmentally friendly manner			✓	✓	

Option Knowledge and Skills		IEA				
The Installer will:		MCT	DP	PIT	PAT	PD
Option 1 (Fossil Fuel – Natural Gas)	Understand the principles of selection, installation, testing, commissioning and service and maintenance techniques on domestic downstream natural gas pipework systems and appliances					✓
	Select, install, test, commission, service and maintain domestic downstream natural gas pipework systems and appliances					✓
Option 2 (Fossil Fuel - Oil)	Understand the principles of selection, installation, testing, commissioning and service and maintenance techniques on domestic oil storage, pipework and appliances					✓
	Select, install, test, commission, service and maintain domestic oil storage, pipework and appliances					✓

Option 3 (Fossil Fuel – Solid Fuel)	Understand the principles of selection, installation, testing, commissioning and service and maintenance techniques on domestic solid mineral fuel, wood burning and biomass appliances					✓
	Select, install, test, commission, service and maintain domestic solid mineral fuel, wood burning and biomass appliances					✓
Option 4 (Environmental Technologies)	Understand the principles of selection, installation, testing, commissioning and service and maintenance techniques on solar thermal, heat pumps and water recycling systems					✓
	Select, install, test, commission, service and maintain solar thermal, heat pumps and water recycling systems					✓

Behaviours		IEA				
The Installer will demonstrate:		MCT	DP	PIT	PAT	PD
Honesty and Integrity	Develop trust with customers and colleagues by undertaking responsibilities in an ethical and empathetic manner					✓
Dependable and responsible	Show conscientiousness through being punctual, reliable and professional. Take responsibility for own judgements and actions. Aware of the limits of their own competence			✓		✓
Enthusiasm and positive attitude	Demonstrate drive and energy in fulfilling requirements of role					✓
Quality focus	Be quality focussed in work and in personal standards			✓		✓
Willingness to learn	Identify own development needs and take action to meet those needs. Keep up-to-date with best practice. Maintain and enhance competence					✓
Work with others	Work effectively and collaborate with colleagues, other trades, clients, suppliers and the public			✓		✓
Sustainable working	Give consideration to appropriate use of resources and own actions taking into account the impact on environmental, social and economic factors			✓		✓

Appendix 2

The EPA test specification outlines specific areas of knowledge that should be tested and is provided to assessing organisations for the development of the Multiple Choice Test.

Health and Safety Systems **Core Knowledge Area – Health and Safety**				
Learning outcome:	**Q in Ass't**	Assessment criteria	**Min Q in Bank**	Notes
Know Health and safety legislation that applies to the building services industry	**1**	1. Identify health & safety legislation in protecting the workforce and members of the public	**3**	
		2. Define responsibilities of members of the construction team	**3**	
		3. Describe the legal status of health and safety guidance materials	**3**	
		4. State the control measures of inspectors	**2**	
Understand hazardous situations working in the building services industry	**1**	1. Identify types of site hazards that may be encountered while at work or my members of the public	**4**	
		2. Define strategies used to prevent accidents during work activities	**2**	
		3. Identify classes of hazardous substances as outlined in legislation	**2**	
		4. Describe how to deal with commonly encountered substances	**1**	
		5. Identify common building materials and services components that may contain asbestos	**2**	
		6. Identify types of asbestos that may be encountered in the workplace	**2**	
		7. State procedures that must be used to safely work with asbestos cement based materials	**2**	
Apply personal protection measures	**0**	1. State the purpose of personal protective equipment (PPE)	**0**	covered in practical installation test
		2. Use personal protective equipment (PPE)	**0**	covered in practical installation test
		3. Define procedures for manual handling	**0**	covered in practical installation test
		4. Carry out correct manual handling	**0**	covered in practical installation test
		5. Use mechanical lifting aids	**0**	covered in practical installation test

Understand how to respond to accidents	**1**	1. State requirements for first aid provision in the workplace	**2**	
		2. Describe actions that should be taken when an accident or emergency is discovered	**2**	
		3. Identify procedures for dealing with minor injuries	**2**	
		4. Identify procedures for dealing with major injuries	**2**	
		5. State recording procedures for accidents and near misses at work	**2**	
Apply procedures for electrical safety	**0**	1. Identify common electrical dangers encountered on construction sites and in private dwellings	**0**	covered in practical application test
		1. State methods of safe supply for electrical tools and equipment on site	**0**	covered in practical application test
		2. State the procedure that should be applied for tools and equipment that fail safety checks	**0**	covered in practical application test
		3. Identify safe isolation procedure when replacing attachments to power tools	**0**	covered in practical application test
		4. Conduct a visual inspection of a power tool for safe condition before use	**0**	covered in practical application test
		5. Use temporary continuity bonding when working on pipework components	**0**	covered in practical application test
Understand how to work safely with heat producing equipment	**1**	1. Identify several types of gases used in pipe and sheet jointing processes	**4**	
		2. Describe how bottled gases and equipment should be safely transported and stored	**4**	
		3. Identify several types of heat producing equipment and how to check them for safety	**2**	
		4. Describe how gas heating equipment is safely assembled and used	**2**	
		5. Identify the three elements of the fire triangle and how combustion takes place	**3**	
		6. Identify the dangers of working with heat producing equipment and how to prevent fires occurring	**2**	
		7. Describe the method for fighting small localised fires that can occur in the workplace	**3**	

Safely use access equipment	**1**	1. Identify situations where it may be necessary to work at height	**2**	
		2. State how to select appropriate access equipment to permit work at heights	**2**	
		3. Define safety checks to be carried out on access equipment	**2**	
		4. Use access equipment	**2**	
Understand working safely in excavations and confined spaces	**1**	1. Identify situations where it may be necessary to work in excavations and confined spaces	**2**	
		2. Identify safe working in excavations and confined spaces	**3**	
		3. State dangers associated with excavations and confined spaces	**2**	
		4. State safety measures when working in excavations and confined spaces	**2**	

Questions in Assessment	**6**
Questions in bank	**75**

Common Processes and Techniques **Core Knowledge Area – Plumbing Science and Processes**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Use hand and power tools in domestic plumbing and heating work	**1**	1. Identify the purpose of hand tools and power tools	**3**	
		2. Use and maintain hand and power tools	**3**	
Know types of domestic plumbing and heating pipework and their jointing principles	**1**	1. Identify pipework materials and sizes used in dwellings	**5**	
		2. State methods of jointing new hot and cold-water pipe to existing lead pipework	**6**	
		3. Identify fitting types used in dwellings	**6**	
		4. Describe methods of jointing pipework used in dwellings	**3**	
		5. Describe methods of bending pipework used in dwellings	**2**	
Understand site preparation techniques for plumbing and heating work	**0**	1. State work methods for preparing and protecting the building for installation work	**0**	covered in practical application test
		2. Identify the pre-existing damage checks to the building fabric or customer property before the work commences	**0**	covered in practical application test
		3. Describe the methods of safe storing of tools, equipment	**0**	covered in practical application test
		4. Identify sources of information for carrying out preparatory work	**0**	covered in practical application test

Use clips and brackets to support domestic plumbing and heating pipework and components	**1**	1. Describe how to measure and mark out for fixings to pipework and plumbing and heating components	**3**	
		2. Identify types of fixing devices	**3**	
		3. Identify clip and bracket types	**3**	
		4. Select and fix clips and brackets appropriate to the system pipework and the industry recommended spacing	**3**	
Install domestic plumbing and heating pipework	**0**	1. Identify pipework installation requirements	**0**	covered in practical installation test
		2. Select pipework materials and fittings from instructions	**0**	covered in practical installation test
		3. Measure, mark and cut pipework materials for installation	**0**	covered in practical installation test
		4. Fabricate pipework bends to clear obstacles	**0**	covered in practical installation test
		5. Select, position and fix pipework materials to specifications	**0**	covered in practical installation test
		6. Joint pipework to specifications	**0**	covered in practical installation test

Questions in Assessment	**3**
Questions in bank	**40**

Scientific Principles **Core Knowledge Area – Plumbing Science and Processes**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Understand units of measurement used in the plumbing and heating industry	**1**	1. Identify internationally recognised (SI) units of measurement	**3**	
		2. State the use of SI derived units	**2**	
		3. Describe the use of conversion tables for non-SI units	**2**	
Understand properties of materials	**1**	1. Compare relative densities of common materials	**4**	
		2. Identify properties and applications of solid materials	**2**	
		3. Explain reasons why solid materials breakdown	**2**	
		4. Outline methods of preventing corrosion	**2**	
		5. Identify applications of liquids and gasses	**2**	
		6. Describe basic properties of liquids	**2**	
		7. Describe basic properties of gases	**2**	

Understand the relationship between energy, heat and power	**2**	1. Identify the relationship between the Celsius and Kelvin temperature scales	**2**	
		2. Describe the principles associated with a change of state	**2**	
		3. Identify the terms latent and sensible heat as they apply to liquids and gases	**2**	
		4. Define methods of heat transfer	**4**	
		5. Distinguish how units of energy and heat are related and derived	**2**	
		6. Carry out heat, energy and power calculations	**2**	
Understand principles of force and pressure and their application in the plumbing and heating industry	**2**	1. State how units of force and pressure as derived from SI units	**2**	
		2. Identify pressure and flow rate units of measurements	**2**	
		3. Describe the application of pressure and flow rate measurements	**2**	
		4. Carry out simple force and pressure calculations	**2**	
		5. Explain the relationship between velocity, pressure and flow rate in systems	**2**	
		6. Identify how restrictions in the pipework effects the flow of liquids and gases	**4**	
		7. Describe the principles of a siphon	**2**	
Understand mechanical principles in the plumbing and heating industry	**1**	2. Outline principles of simple machines	**3**	
		3. Outline principles of basic mechanics	**3**	
Understand principles of electricity in the plumbing and heating industry	**1**	1. Identify basic principles of electron flow theory	**2**	
		2. Describe the purpose and application of simple units of electrical measurement	**4**	
		3. Carry out simple electrical calculations	**3**	
		4. Identify the requirements for earthing of electrical circuits	**2**	

Questions in Assessment	**8**
Questions in bank	**70**

Planning and Supervision **Core Knowledge Area – Customer Service** **Core Knowledge Area – Communication**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Know the role of the construction team within the plumbing and heating industry	**1**	1. Identify key roles of the site man't team	**4**	
		2. Identify key roles of the site operatives	**4**	
		3. Identify common site visitors	**2**	
Understand information sources in the building services industry	**0**	1. Interpret workplace information	**0**	covered in design project
		2. State the importance of complying with company policies and procedures	**0**	covered in design project
Know how to communicate with others	**1**	1. Identify methods for effective communication with individual's needs	**2**	
		2. Identify suitable communication methods	**2**	
		3. Identify appropriate actions to deal with conflicting parties	**2**	
		4. Explain the effects of poor communication with individuals	**2**	
Understand responsibilities of relevant people in the building services industry	**1**	1. Identify diverse types of client	**2**	
		2. Identify what may be communicated to the client through the progress of a job	**2**	
		3. Define duties and methods for supervising staff	**2**	

Produce a work programme for tasks in the plumbing and heating industry	**1**	1. Identify types of projects	**2**	
		2. State factors to consider when planning activities to job specifications	**2**	
		3. Describe the impact when materials are not delivered on time against the work programme	**2**	
		4. Identify factors which affect working time allocation to work activities	**2**	
		5. Produce simple work programmes	**0**	covered in design project
		a. Planning work with other trades	**0**	covered in design project
		b. Material deliveries	**0**	covered in design project
		c. Simple work programmes	**0**	covered in design project
		d. Simple bar (progress) charts	**0**	covered in design project
Produce risk assessments and method statements for the plumbing and heating industry	**1**	1. Identify different hazards	**4**	
		2. Identify levels of risk	**4**	
		3. Produce a risk assessment for a task	**0**	covered in practical application test
		4. Produce a method statement for a task	**0**	covered in practical application test

Questions in Assessment	**5**
Questions in bank	**40**

Cold Water Services **Core Knowledge Area – Core Plumbing Systems**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Understand cold water supply route to dwellings	**1**	1. State the key stages in the rainwater cycle	**2**	
		2. Identify the various sources of water and the typical properties of water from those sources	**2**	
		3. Describe the two main types of water supply to dwellings and how these are regulated	**3**	
		4. Identify fluid categories of water and uses of water supplied to dwellings	**5**	
		5. Describe the mains water treatment process and typical mains water distribution system from treatment works to property	**3**	
		6. Identify mains water service to the property and isolation points	**3**	
		7. Define the requirements to provide water whilst preventing waste, undue consumption, misuse or contamination	**2**	
Install cold water systems	**2**	1. Identify types and layout features of cold water systems	**4**	
		2. State advantages and disadvantages of cold water systems	**4**	
		3. Identify types and typical pipe sizes used in cold water systems within dwellings	**0**	covered in design project
		4. Describe working principles of cold water systems, positioning fixing, connection and operation of components	**4**	
		5. Describe layout and installation requirements for protected plastic storage cisterns	**3**	
		6. Describe insulation requirements, system frost protection and prevention of undue warming of cold water systems	**2**	
		7. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in design project
		8. Identify sources of information required when undertaking work on cold water systems	**4**	
		9. Explain backflow risk and required methods of prevention	**4**	
		10. Install cold water systems	**0**	covered in practical installation test

Decommission chilly water systems	**0**	1. Explain procedures for decommissioning systems	**0**	covered in practical installation test
		2. Carry out decommissioning procedures	**0**	covered in practical installation test
Size and select chilly water systems and components for dwellings	**0**	1. Explain factors which affect the selection of cold water systems for dwellings	**0**	covered in design project
		2. Identify information sources required to size and select cold water systems and components	**0**	covered in design project
		3. Identify recommended design temperatures within cold water systems	**0**	covered in design project
		4. Calculate cold water system requirements used in dwellings	**0**	covered in design project
		5. Select cold water components in accordance with calculations from predetermined data	**0**	covered in design project
		6. Interpret information to complete a detailed materials list	**0**	covered in design project
		7. Present calculations and information in a suitable format for quotation and tender	**0**	covered in design project
Perform a soundness test and commission cold water systems and components	**1**	1. Identify information sources required to complete testing and commissioning	**2**	
		2. Describe how to fill and vent CWS	**2**	
		3. Describe a visual inspection of a cold-water system to confirm that it is ready to be soundness tested	**2**	
		4. Describe a soundness test to industry requirements on cold water systems pipework and components	**2**	
		5. State the flushing requirements including the use of system additives for new and existing cold-water systems	**2**	
		6. Carry out a soundness test	**0**	covered in practical application test
		7. Describe operational checks required during commissioning	**0**	covered in practical application test
		8. Identify the range of information that would be detailed on commissioning documentation	**0**	covered in practical application test
		9. Identify actions that must be taken when commissioning reveals defects	**0**	covered in practical application test
		10. Describe the procedure for handing over to the end user	**0**	covered in practical application test
		11. Carry out commissioning procedures	**0**	covered in practical application test

Perform fault diagnosis and rectification procedures on cold water systems	**0**	1. Describe methods of obtaining information on system faults	**0**	covered in practical application test
		2. Carry out diagnostic checks for faults	**0**	covered in practical application test
		3. Carry out repair and rectification procedures to deal with a range of faults	**0**	covered in practical application test
Carry out service and maintenance of cold water systems	**1**	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	**2**	
		2. Describe routine checks required on cold water system components and pipework as part of a periodic maintenance programme	**2**	
		3. Identify types of information to be provided on a maintenance record for CWS	**2**	
		4. Identify requirements for Legionella and bacterial growth control measures	**4**	
		5. Carry out routine checks of CWS	**0**	covered in practical application test

Questions in Assessment	**5**
Questions in bank	**65**

Hot Water Services **Core Knowledge Area – Core Plumbing Systems**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Install hot water systems	**1**	1. Identify types and layout features of hot water systems	**4**	
		2. State advantages and disadvantages of hot water systems	**4**	
		3. Identify types and typical pipe sizes used in hot water systems within dwellings	**4**	
		4. Describe working principles of hot water systems, positioning fixing, connection and operation of components	**4**	
		5. Describe insulation requirements and system frost protection	**2**	
		6. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in practical installation test
		7. Explain expansion and contraction in hot water systems and negative effects	**2**	
		8. Identify location and function of unvented system components	**0**	covered in design project
		9. Describe secondary circulation and how trace heating can be used	**2**	
		10. Identify sources of information required when undertaking work on hot water systems	**0**	covered in design project
		11. Explain backflow risk and required methods of prevention	**3**	
		12. Install hot water systems	**0**	covered in design project
Decommission hot water systems	**0**	1. Explain procedures for decommissioning systems	**0**	covered in practical application test
		2. Carry out decommissioning procedures	**0**	covered in practical application test

Size and select hot water systems and components for dwellings	**0**	1. Explain factors which affect the selection of hot water systems for dwellings	**0**	covered in design project
		2. Identify information sources required to size and select hot water systems and components	**0**	covered in design project
		3. Identify recommended design temperatures within hot water systems	**0**	covered in design project
		4. Calculate hot water system requirements used in dwellings	**0**	covered in design project
		5. Select hot water components in accordance with calculations from predetermined data	**0**	covered in design project
		6. Interpret information to complete a detailed materials list	**0**	covered in design project
		7. Present calculations and information in a suitable format for quotation and tender	**0**	covered in design project
Perform a soundness test and commission hot water systems and components	**1**	1. Identify information sources required to complete testing and commissioning	**2**	
		2. Describe how to fill and vent hot water systems	**2**	
		3. Describe a visual inspection of a hot water system to confirm that it is ready to be soundness tested	**2**	
		4. Describe a soundness test to industry requirements on hot water systems pipework and components	**2**	
		5. State the flushing requirements including the use of system additives for new and existing hot water systems	**2**	
		6. Carry out a soundness test	**0**	covered in practical application test
		7. Describe operational checks required during commissioning	**0**	covered in practical application test
		8. Identify the range of information that would be detailed on commissioning documentation	**0**	covered in practical application test
		9. Identify actions that must be taken when commissioning reveals defects	**0**	covered in practical application test
		10. Describe the procedure for handing over to the end user	**0**	covered in practical application test
		11. Carry out commissioning procedures for hot water systems	**0**	covered in practical application test
Perform fault diagnosis and rectification procedures on hot water systems	**0**	1. Describe methods of obtaining information on system faults	**0**	covered in practical application test
		2. Carry out diagnostic checks for a range of faults	**0**	covered in practical application test
		3. Carry out repair and rectification procedures to deal with a range of faults	**0**	covered in practical application test

Carry out service and maintenance of hot water systems	**1**	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	**4**	
		2. Describe routine checks required on hot water components and pipework as part of a periodic maintenance programme	**3**	
		3. Identify types of information to be provided on a maintenance record for hot water systems	**4**	
		4. Identify requirements for Legionella and bacterial growth control measures	**4**	
		5. Carry out service and maintenance of systems	**0**	covered in practical application test

Questions in Assessment	**3**
Questions in bank	**50**

Central Heating Systems **Core Knowledge Area – Core Plumbing Systems**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Install central heating systems	**1**	1. Identify types and layout features of heating systems	**4**	
		2. State advantages and disadvantages types and layout features of heating systems	**4**	
		3. Identify typical pipe sizes used in central heating systems types within dwellings	**4**	
		4. Describe working principles of central heating systems types, positioning fixing, connection and operation of components	**4**	
		5. Explain the importance of pump positioning	**3**	
		6. Identify operating principles for system control	**3**	
		7. Define zoning and control requirements of central heating systems in accordance with statutory legislation	**3**	
		8. Describe insulation requirements and system frost protection	**2**	
		9. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in practical installation test
		10. Explain expansion and contraction in central heating systems and negative effects	**2**	
		11. Identify sources of information required when undertaking work on central heating systems	**0**	covered in design project
		12. Describe procedures for filling and venting system types	**2**	
		13. State the operating principles of heat producing appliances	**3**	
		14. Install central heating systems	**0**	covered in practical installation test
Decommission central heating systems	**0**	1. Explain procedures for decommissioning systems	**0**	covered in practical application test
		2. Carry out decommissioning procedures	**0**	covered in practical application test

Size and select central heating systems and components for dwellings	**0**	1. Explain factors which affect the selection of central heating systems for dwellings	**0**	covered in design project
		2. Identify information sources required to size and select central heating systems and components	**0**	covered in design project
		3. Describe the principles of heat loss and gain and how this affects heating requirements	**0**	covered in design project
		4. Calculate central heating system requirements used in dwellings	**0**	covered in design project
		5. Select central heating system components in accordance with calculations from predetermined data	**0**	covered in design project
		6. Interpret information to complete a detailed materials list	**0**	covered in design project
		7. Present calculations and information in a suitable format for quotation and tender	**0**	covered in design project
Perform soundness test and commission central heating systems and components	**1**	1. Identify information sources required to complete testing and commissioning	**2**	
		2. Describe how to fill and vent central heating systems	**2**	
		3. Describe a visual inspection of a central heating system to confirm that it is ready to be soundness tested	**2**	
		4. Describe a soundness test to industry requirements on central heating system pipework and components	**2**	
		5. State the flushing requirements including the use of system additives for new and existing central heating systems	**2**	
		6. Carry out a soundness test	**0**	covered in practical application test
		7. Describe operational checks required during commissioning	**0**	covered in practical application test
		8. Identify the range of information that would be detailed on commissioning documentation	**0**	covered in practical application test
		9. Identify actions that must be taken when commissioning reveals defects	**0**	covered in practical application test
		10. Describe the procedure for handing over to the end user	**0**	covered in practical application test
		11. Carry out commissioning procedures for central heating systems	**0**	covered in practical application test

Perform fault diagnosis and rectification procedures on central heating systems	**0**	1. Describe methods of obtaining information on system faults	**0**	covered in practical application test
		2. Carry out diagnostic checks for a range of faults	**0**	covered in practical application test
		3. Carry out repair and rectification procedures to deal with a range of faults	**0**	covered in practical application test
Carry out service and maintenance of central heating systems	**1**	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	**2**	
		2. Describe routine checks required on central heating components and pipework as part of a periodic maintenance programme	**2**	
		3. Identify types of information to be provided on a maintenance record for central heating systems	**2**	
		4. Carry out service and maintenance of systems and controls	**0**	covered in practical application test

Questions in Assessment	**3**
Questions in bank	**50**

Rainwater Systems **Core Knowledge Area – Core Plumbing Systems**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Install rainwater and gutter system installation and layout requirements	**1**	1. Identify types and layout features of rainwater and gutter systems	**2**	
		2. State advantages and disadvantages of rainwater and gutter systems	**3**	
		3. Identify typical sizes and materials used in rainwater and gutter systems	**0**	covered in practical installation test
		4. Describe working principles of rainwater and gutter systems, positioning fixing, connection and operation of components	**2**	
		5. Explain expansion and contraction in rainwater and gutter systems and negative effects	**2**	
		6. Explain factors affecting gutter bracket selection and fixing for buildings	**2**	
		7. Identify sources of information required when undertaking work on rainwater and gutter systems	**2**	
		8. Explain working principles of rainwater recycling systems	**2**	
		9. Install rainwater and gutter systems and components	**0**	covered in practical installation test

Decommission rainwater and gutter systems and components	**0**	1. Explain procedures for decommissioning systems	**0**	covered in practical application test
		2. Carry out decommissioning procedures	**0**	covered in practical application test
Size and select rainwater and gutter systems and components for dwellings	**0**	1. Explain factors which affect the selection of rainwater and gutter systems for dwellings	**0**	covered in design project
		2. Identify information sources required to size and select rainwater, gutter systems and components	**0**	covered in design project
		3. Calculate rainwater and gutter systems requirements for dwellings	**0**	covered in design project
		4. Select rainwater and gutter systems components in accordance with calculations from predetermined data	**0**	covered in design project
		5. Interpret information to complete a detailed materials list	**0**	covered in design project
		6. Present calculations and information in a suitable format for quotation and tender	**0**	covered in design project
Perform a soundness test and commission rainwater, gutter systems and components	**1**	1. Describe a visual inspection of a rainwater, gutter system to confirm that it is ready to be soundness tested	**2**	
		2. Describe a soundness test to industry requirements on rainwater, gutter systems pipework and components	**2**	
		3. Describe operational checks required during commissioning	**2**	
		4. Identify actions that must be taken when commissioning reveals defects	**0**	covered in practical application test
		5. Describe the procedure for handing over to the end user	**0**	covered in practical application test
		6. Carry out soundness testing and commissioning procedures	**0**	covered in practical application test
Perform fault diagnosis and rectification procedures on rainwater and gutter systems	**1**	1. Describe methods of obtaining information on system faults	**0**	covered in practical application test
		2. Carry out diagnostic checks for a range of faults	**2**	
		3. Carry out repair and rectification procedures to deal with a range of faults	**2**	

Questions in Assessment	**3**
Questions in bank	**25**

Sanitation Systems **Core Knowledge Area – Core Plumbing Systems**				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Install sanitary appliances and pipework systems	**1**	1. Identify types and layout features of sanitary appliances pipework systems	**4**	
		2. State advantages and disadvantages of sanitary appliances pipework systems	**4**	
		3. Identify typical pipe sizes and maximum distances permitted in sanitary appliances pipework systems within dwellings	**0**	covered in practical installation test
		4. Describe working principles of sanitary appliances pipework systems, positioning fixing, connection and operation of components	**2**	
		5. Identify the positioning and fixing of pipework within the building fabric	**0**	covered in practical installation test
		6. Explain expansion and contraction in sanitary appliances pipework systems and negative effects	**2**	
		7. Identify sources of information required when undertaking work on sanitary appliances pipework systems	**2**	
		8. Identify different types of sanitary appliances and components used in dwellings	**2**	
		9. Identify factors that lead to trap seal loss in sanitary pipework systems	**2**	
		10. Outline the suitability of below ground drainage systems to receive waste water	**2**	
		11. Installation requirements of sanitary facilities and equipment in dwellings for the disabled including wet rooms	**0**	covered in practical installation test
		12. Identify jointing methods used in sanitary appliances pipework systems	**0**	covered in practical installation test
		13. Explain working principles of greywater recycling systems	**2**	
		14. Install sanitary appliances, pipework systems and components	**0**	covered in practical installation test
Decommission sanitary appliances, pipework system and components	**0**	1. Explain procedures for decommissioning systems	**0**	covered in practical application test
		2. Carry out decommissioning procedures	**0**	covered in practical application test

Size and select sanitary appliances pipework system and components for dwellings	**0**	1. Explain factors which affect the selection of sanitary appliances pipework systems for dwellings	**0**	covered in design project
		2. Identify information sources required to size and select sanitary appliances pipework system	**0**	covered in design project
		3. Calculate sanitary appliances pipework system requirements for dwellings	**0**	covered in design project
		4. Select sanitary system components in accordance with calculations from predetermined data	**0**	covered in design project
		5. Interpret information to complete a detailed materials list	**0**	covered in design project
		1. Present calculations and information in a suitable format for quotation and tender	**0**	covered in design project
Perform a soundness test and commission sanitary appliances, pipework systems and components	**1**	1. Describe a visual inspection of sanitary appliances, pipework systems to confirm that it is ready to be soundness tested	**1**	
		2. Describe a soundness test to industry requirements on sanitary appliances, pipework systems and components	**2**	
		3. Describe operational checks required during commissioning	**2**	
		4. Identify actions that must be taken when commissioning reveals defects	**2**	
		5. Describe the procedure for handing over to the end user	**0**	covered in practical application test
		6. Carry out soundness testing and commissioning procedures	**0**	covered in practical application test
Perform fault diagnosis and rectification procedures for sanitary appliances and pipework systems	**0**	1. Describe methods of obtaining information on system faults	**0**	covered in practical application test
		2. Carry out diagnostic checks for a range of faults	**0**	covered in practical application test
		3. Carry out repair and rectification procedures to deal with a range of faults	**0**	covered in practical application test

Carry out service and maintenance of sanitary appliances and pipework systems	**1**	1. Identify how to use manufacturer instructions and job maintenance schedules to establish the periodic servicing requirements of system components	**2**	
		2. Describe routine checks required on sanitary appliances and pipework systems as part of a periodic maintenance programme	**2**	
		3. Identify types of information to be provided on a maintenance record for sanitary appliances and pipework	**2**	
		4. Carry out routine checks of sanitary appliances and pipework systems	**0**	covered in practical application test

Questions in Assessment	**3**
Questions in bank	**35**

Environmental Technology Systems **Core Knowledge Area –** Principles of environmental technology systems				
Learning outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Know the basic operating principles of micro-renewable energy and water conservation technologies.	**1**	1. Describe the basic operating principles of heat producing micro-renewable energy technologies	**3**	
		2. Describe the basic operating principles of heat-led micro-combined heat and power	**3**	
		3. Describe the basic operating principles of water conservation technologies	**2**	
Understand requirements to install micro-renewable energy and water conservation systems to existing systems	**1**	1. Explain the suitability of building location and features when installing micro-renewable energy and water conservation systems	**3**	
		2. Identify regulations affecting installation of micro-renewable energy and water conservation systems	**2**	
		3. Describe what would be typically classified as 'permitted development' under town and country planning regulations in relation to the deployment of technologies	**2**	
		4. State which parts of the regulations apply in relation to the installation of environmental technologies	**2**	
		5. State typical advantages and disadvantages associated with environmental technologies	**3**	

Questions in Assessment	**2**
Questions in bank	**20**

Domestic Fuel Systems **Core Knowledge Area –** Principles of Fossil Fuels				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Understand factors affecting fuel selection.	**2**	1. Identify the types of fuels used in appliances	**4**	
		2. Describe the factors which affect the selection of fuels	**4**	
		3. State sources of information for fuel supply installation	**4**	
		4. Define the regulatory type bodies which govern the installation of various fuel types	**4**	
		5. Specify the storage requirements for fuels	**4**	
		6. Compare factors which could affect storage requirements for fuels	**4**	
Know combustion processes of fuel supply systems.	**2**	1. Describe the combustion process	**4**	
		2. Identify the main constituents of complete and incomplete combustion	**3**	
		3. Identify causes of incomplete combustion	**4**	
		4. Identify signs of incomplete combustion	**4**	
		5. Describe the symptoms of co poisoning	**4**	
		6. Describe the purpose of co detectors	**3**	
		7. Explain the requirements for ventilation	**4**	
		8. Identify the different types of ventilation	**3**	
		9. Explain installation practices for ventilation	**3**	

Know principles of chimney/flue systems.	**2**	1. Explain the operating principles of chimney/flue systems	**2**	
		2. Identify types of chimney/flue systems	**2**	
		3. Identify the components within chimney/flue systems	**3**	
		4. Explain the effects of layout on chimney/flue systems	**3**	
		5. State the layout and features of chimney and flue construction	**3**	
		6. Reference termination requirements for chimney/flue systems from relevant documents	**3**	
		7. List basic inspection and testing procedures for chimney/flue systems	**3**	

Questions in Assessment	**6**
Questions in bank	**75**

Electrical Work on Plumbing and Domestic Heating Systems **Core Knowledge Area –** Electrical components and control systems				
Learning Outcome	**Q in Ass't**	Assessment criteria	**Q in Bank**	Notes
Perform pre-installation activity prior to undertaking electrical work on plumbing and domestic heating systems	**1**	1. State the limitations of your responsibility when carrying out work on electrical supplies and/or circuits for the control of plumbing and domestic heating systems	**4**	
		2. Identify the applications, advantages and limitations of electrical supplies	**4**	
		3. Identify the applications, advantages and limitations of different electrical equipment, cables/wiring and components in relation to the working environment	**3**	
		4. State the appropriate industry standards and regulations relevant to carrying out work on electrical supplies and/or circuits for the control of plumbing and domestic heating systems	**3**	
		5. State how to verify that job information and documentation is current and relevant and that the plant, instruments, access equipment and tools are fit for purpose	**2**	
		6. Produce a risk assessment and method statement for the work to be carried out, in accordance with:	**0**	covered in practical application test
		7. a) the plumbing and domestic heating system's design	**0**	covered in practical application test
		8. b) the conditions of the working environment	**0**	covered in practical application test
		9. c) organisational procedures	**0**	covered in practical application test
		10. Apply and use personal protective equipment (PPE)	**0**	covered in practical application test
		11. Confirm the status of the electrical supply	**0**	covered in practical application test
		12. Confirm, as necessary, that the electrical supply is suitable for the plumbing and domestic heating systems	**0**	covered in practical application test
		13. Select, as required, electrical equipment, cables/wiring and components and confirm that they are:	**0**	covered in practical application test
		a) of the right type and size	**0**	covered in practical application test
		b) fit for purpose in accordance with the plumbing and domestic heating system's design	**0**	covered in practical application test

Apply industry standard safe isolation procedures	**1**	1. Identify the correct means of electrical isolation prior to commencing work	**2**	
		2. Carry out the safe-isolation of electrical equipment and components associated with the electrical supply of the plumbing and domestic heating system	**2**	
Carry out the safe installation, testing and decommissioning of electrical systems	**0**	1. Carry out work on electrical equipment, cables/wiring and components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with the requirements of:	**0**	covered in practical application test
		2. industry recognised methods and procedures	**0**	covered in practical application test
		3. manufacturers' instructions	**0**	covered in practical application test
		4. Identify that the electrical equipment, cables/wiring and components are in accordance with the requirements of the plumbing and domestic heating system.	**0**	covered in practical application test
		5. Check that the electrical equipment, cables/wiring and components are of proper construction in accordance with the requirements of the plumbing and domestic heating system.	**0**	covered in practical application test
		6. Undertake functional testing of the electrical equipment and components associated with the electrical supply and control of the plumbing and domestic heating system in accordance with:	**0**	covered in practical application test
		a. industry recognised methods and procedures	**0**	covered in practical application test
		b. manufacturers' instructions	**0**	covered in practical application test
Carry out the identification of faults and safe repair of electrical work	**1**	1. Identify and rectify electrical faults and deficiencies on plumbing and domestic heating systems in accordance with		
		a. industry recognised methods and procedures	**2**	
		b. manufacturers' instructions	**3**	

Questions in Assessment	**3**
Questions in bank	**25**

Unit Summary

Units	Questions in bank	Questions in assessment
001 - Health and Safety Systems	**75**	**6**
002 - Common Processes and Techniques	**40**	**3**
003 - Scientific Prinicples	**70**	**8**
004 - Planning and Supervision	**40**	**5**
005 - Cold Water Services	**65**	**5**
006 - Hot Water Services	**50**	**3**
007 - Central Heating Systems	**50**	**3**
008 - Rainwater Systems	**25**	**3**
009 - Sanitation Systems	**35**	**3**
010 - Environmental Technology Systems	**20**	**2**
011 - Domestic Fuel Systems	**75**	**6**
012 - Electrical Work on Plumbing and Domestic Heating Systems	**25**	**3**