Unit 318PH: Understand rainwater system installation and maintenance techniques

# Delivery guide

Unit information

The purpose of this unit is for learners to obtain trade experience in plumbing and heating installations.

The purpose of this unit is for learners to explore rainwater systems within a domestic property and industrial and commercial building and the competences that underpin work on the different systems. Learners will have the opportunity to:

* install and test rainwater systems
* commission rainwater systems
* service and maintain rainwater systems.

This work will be in accordance with the current versions of the appropriate industry standards and regulations; the specification; industry recognised working practices; the working environment and the natural environment.

Learners may be introduced to this unit by asking themselves questions such as:

* How do you install a rainwater system?
* How do you test a rainwater system?
* What steps must you take to design a rainwater system including appliances, components and accessories?
* What steps are part of commissioning appliances, components and accessories on a rainwater system?
* How do you service and maintain appliances, components and accessories on a rainwater system?

Learning outcomes

1. Understand the appropriate industry standards and regulations
2. Understand the organisational procedures for confirming with the relevant people the appropriate actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum negative impact on the installation work to be undertaken
3. Understand the methods and techniques for fitting, fixing and connecting the selected appliances, components and accessories
4. Understand the appropriate testing procedures for confirming the systems’ integrity
5. Understand how to complete relevant documentation in accordance with organisational procedures
6. Understand the methods for determining the type of size of appliances, components and accessories
7. Understand how to interpret diagrams and drawings for the rainwater system to locate site services and system supply
8. Understand how to interpret diagrams and drawings for the rainwater system to identify the planned location of the appliances, components and accessories
9. Understand the visual and manual checks required to confirm that the appliances, components and accessories have been fixed, fitted and connected
10. Understand the methods and techniques for commissioning the rainwater system
11. Understand the methods for determining the type of size of replacement appliances, components and accessories in accordance with industry recognised organisational procedures
12. Understand the methods and techniques for servicing and maintaining appliances, components and accessories
13. Understand the methods and techniques for replacing/repairing the appliances, components and accessories
14. Understand basic fault-finding techniques

Suggested resources

Textbooks

* Maskrey, M. (2019) *The City & Guilds Textbook: Plumbing Book 1 for the Level 3 Apprenticeship (9189), Level 2 Technical Certificate (8202) & Level 2 Diploma (6035) (City & Guilds Textbooks). London: Hodder Education.*

ISBN 978-1-5104-1648-2

* Tanner, P. and Stephen, L. (2019) *The City & Guilds Textbook: Plumbing Book 2 for the Level 3 Apprenticeship (9189), Level 3 Advanced Technical Certificate (8202) & Level 3 Diploma (6035) (City & Guilds Textbooks).* London: Hodder Education.

ISBN 978-1-5104-1646-8

Websites

* [Floplast | Homepage](https://www.floplast.co.uk/)
* [Gutter Crest | Homepage](https://www.guttercrest.co.uk/)
* [Marley Plumbing and Drainage | Homepage](https://www.marleyplumbinganddrainage.com/)
* [Planning Portal | Homepage](https://www.planningportal.co.uk/)

British Standards

* BS EN 12056-2:2002. *Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation.*

Legislation

* *Building Regulations 2010 Approved Document H: Drainage and Waste Disposal*. Newcastle upon Tyne: NBS.

ISBN 978-1-8594-6599-8

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Understand the appropriate industry standards and regulations relevant to  * decommissioning * installing and testing * commissioning * service and maintenance of rainwater systems | * 1. The information sources required to complete testing and commissioning | * Learners to be able to identify the information sources required to complete testing and commissioning of rainwater systems including: * manufacturer instructions * supplier catalogues * Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal * BS EN 12056-2:2000. Gravity drainage systems inside buildings. |
| 1. Understand the organisational procedures for confirming with the relevant people the appropriate actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum negative impact on the installation work to be undertaken | * 1. What may be communicated to the client through the progress of a job | * Learners to be aware of the information that may be communicated to the client throughout the progress of a job including: * start and finish times * changes to specifications * alternative sources whilst systems are being decommissioned * confirming the location of components * requesting valuable items are removed whilst installation work is undertaken * information regarding delivery orders/deliveries * delays to progress. * Learners to be able to explain suitable communication methods including: * verbal communication * written communication * emails * text messages. |
| * 1. The types of communication that may be required with the site management team | * Learners to be aware of the types of communication that may be required with the site management team including: * architect * quantity surveyor (QS) * buyer/estimator * surveyor * project manager/clerk of works * structural engineer * building services engineer * contracts manager * construction manager. * Learners to be able to explain suitable communication methods such as communicating with the clerk of works via a variation order to communicate changes to the work programme, including by: * verbal communication * written communication * emails * text messages. |
| * 1. The importance of complying with company policies and procedures | * Learners to be able to discuss the importance of complying with company policies and procedures and the consequences of not adhering to them for example, not complying with company health and safety policies could result in disciplinary action. |
| * 1. The impact when materials are not delivered on time against the work programme | * Learners to be able to explain the impact when materials are not delivered on time such as: * delays in completion * effect on the work programme on other trades * delays affecting other deliveries. |
| * 1. The factors that affect working time allocation to work activities | * Learners to be aware of the factors that affect working time allocation to work activities including: * material availability * labour requirements * staff experience * delivery requirements * labour availability * weather * environmental * client deadlines * budget. |
| 1. Understand the methods and techniques for fitting, fixing and connecting the selected appliances, components and accessories in accordance with:  * the plumbing and heating system’s design * the working environment * manufacturers’ instructions | * 1. The factors affecting gutter bracket selection and fixing for buildings | * Learners to be able to explain the factors which affect gutter bracket selection and fixing for buildings structure including: * fascia boards * exposed rafters * no fascia board or exposed rafters * gutter material * rainwater material. |
| * 1. How to install rainwater systems | * Learners to be able to describe the installation requirements and to have the opportunity to practice the installation of the following components: * rainwater pipe (RWP) * offsets * angles * branches * hopper heads * shoes * specialist connectors to the drainage system * brackets. * Gutters including: * running outlets * gutter angles * gutter unions * stop ends * specialist unions between different gutter materials * fascia brackets * rafter brackets * rise and fall brackets. * Learners to know industry standard methods of connecting gravity rainwater system pipework to the outlets and components, how to interpret typical installation drawing showing outlets identified and how to produce a fitting schedule. * Learners to be able to identify different types of building fabric and the precautions to be taken when installing gravity rainwater pipework and components within them and industry clipping distances. |
| 1. Understand the appropriate testing procedures for confirming the systems’ integrity | * 1. The visual inspection of a rainwater system to confirm that it is ready to be soundness tested | * Learners to know the process and reasons for a visual inspection and be able to explain the steps taken during a visual inspection to confirm the rainwater system is ready to be soundness tested including: * checking that all joints have been made correctly and there are no leaks * checking that all pipework is secure and adequately supported * checking the installation conforms to the regulations * checking the gutter and rainwater pipework has been installed with the correct fall * checking that gutters are clear of debris * checking there is no damage to the gutters of rainwater pipework * checking for signs of damp on the building surface. * Learners to be aware that any problems, such as insufficient clipping, should be rectified before testing begins. |
| * 1. A soundness test to industry requirements on rainwater systems pipework and components | * Learners to be able to demonstrate the correct method and to practice how to carry out a soundness test in line with current industry requirements, on gravity rainwater systems pipework and components. Soundness test to include: * visual inspection * notifying * initial fill * wet test * check for leaks * completing documentation and notifying as required. * Learners to be allowed to carry out soundness testing on a range of rainwater systems, including those with metal and plastic pipework. * Learners to be able to explain the requirements for carrying out an air test on internal rainwater pipework as detailed in Building Regulations and British Standards. * Learners to understand that leaks must be rectified and re-tested before a test certificate is issued. |
| 1. Understand how to complete relevant documentation in accordance with organisational procedures | * 1. The types of information to be provided on commissioning, installation and maintenance records | * Learners to be aware of the information contained on commissioning, installation and maintenance records for example, installation date, type of system installed, name of engineer, parts maintained. * Learners to be provided with examples of commissioning, installation and maintenance records. * Learners to know the additional information that should be contained within a maintenance record for rainwater systems. * Learners to be able to give the appropriate advice on the safe use of a gravity rainwater system to the customer and to understand that component manufacturer’s instructions should be left and explained to the customer on handover. |
| 1. Understand the methods for determining the type of size of appliances, components and accessories in accordance with industry recognised organisational procedures | * 1. The factors which affect the selection of rainwater systems for dwellings | * Learners to know the factors that affect the selection of rainwater systems for dwellings including: * customer needs (what profile and colour) * size of household * type of property * building layout and features * affordability/cost * current legislation (applicable to rainwater systems) * rainfall intensity for the location * environmental considerations * roof area * roof pitch (angle) * running outlet position * gutter fall * changes of direction in the gutter run. |
| * 1. The information sources required to size and select rainwater systems and components | * Learners to be able to identify the information sources required to size and select rainwater systems and components including: * manufacturer technical instructions * supplier catalogues * Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal * BS EN 12056-2:2000. Gravity drainage systems inside buildings * specifications * pre-determined data * building plans and drawings. * Learners to know that verbal and written information is also required from the customer in relation to gutter profiles and preferred colour. |
| * 1. How to calculate rainwater system requirements used in dwellings | * Learners to be able to demonstrate how to calculate requirements for rainwater systems and components and to have time to practice on a range of properties including: * gutters * rainwater pipe. * Learners to understand how the requirements for outlets, gutter and rainwater pipes impact on their positioning. * Learners to know how to calculate effective roof area, taking into consideration the pitch of the roof to correctly size guttering components. |
| * 1. How to select rainwater components in accordance with calculations from predetermined data | * Learners to know how to select rainwater components in accordance with calculations from pre-determined design data from: * suppliers * manufacturer product guides * internet sources * merchants. * Learners to use different sources of information to calculate system components using pre-determined data to focus on the procedures for calculating: * outlet size * gutter size * rainwater pipe size. |
| 1. Understand how to interpret diagrams and drawings for the rainwater system to locate site services and system supply | | * Learners to be able to interpret diagrams and drawings for the rainwater system to develop a comprehensive materials list and to locate site services and system supply including: * service plan * building plan * site plan * installation diagram. * Learners to be given examples and an explanation of the key information contained, such as drawing scales, key information, common symbols and orientation information. * Learners to be introduced to the use of scale drawings, to understand the formula to determine full scale measurements from the drawings and to look at the contents of drawings, plans and specifications. * Learners to know the process of using specifications when carrying out design calculations. * Learners to know how to prepare line drawings to present design calculations, how to prepare a quotation from design information and calculations and to understand the method of presenting and producing a tender. |
| 1. Understand how to interpret diagrams and drawings for the rainwater system to identify the planned location of the appliances, components and accessories | * 1. Interpret information to complete a detailed materials list | * Learners to be aware of how to interpret information from a range of sources including diagrams and drawings to complete a detailed material list. * Learners to know that material lists should include quantities/colours/grades/sizes of: * pipework * consumables * fittings * components * appliances * gutter. * Learners to know that, when ordering from a plumber’s merchant, product codes should also be included. |
| * 1. Present calculations and information in a suitable format for quotation and tender | * Learners to be aware of the methods to present calculations and information in various formats. * Learners to know that scale drawings are produced to show the customer the proposed final installation. * Learners to know that technology and bespoke computer programmes, 3D drawings and artist impressions can be produced showing what the installation will look like when completed. * Learners to know that spreadsheets can be used to present design calculations. Functions can also be added to automatically calculate data. * Learners to know that Word documents and spreadsheets can be used to produce quotes, material lists and write job specifications to supplement drawings. |
| 1. Understand the visual and manual checks required to confirm that the appliances, components and accessories have been fixed, fitted and connected in accordance with:  * the plumbing and heating system's design * the working environment * organisational procedures | * 1. The visual inspection of a rainwater system to confirm that it is ready to be soundness tested | * Learners to know the reasons for a visual inspection prior to the gravity rainwater system receiving water. * Learners to be able to explain the steps taken during a visual inspection to confirm the rainwater system is ready to be soundness tested by: * checking that all joints have been made correctly and there is no leakage * checking that all pipework is secure and adequately supported * checking the installation conforms to the regulations * checking the gutter and rainwater pipework has been installed with the correct fall * checking that gutters are clear of debris * checking there is no damage to the gutters of rainwater pipework * checking for signs of damp on the building surface. * Learners to have an overview of the correct support and joint alignment. * Learners to know that any problems, such as insufficient clipping of pipes, should be rectified before testing begins. * Learners to know the procedure to follow if they identify installation faults on gravity rainwater systems whilst carrying out a visual inspection. |
| 1. Understand the methods and techniques for commissioning the rainwater system in accordance with:  * the plumbing and heating system’s design * the working environment * organisational procedures | * 1. The operational checks required during commissioning | * Learners to be able to describe the operational checks required during commissioning of rainwater systems including: * correct fall * correct size * correct support * no spill over * no leaks. |
| * 1. The commissioning procedures for rainwater systems | * Learners to be aware of the commissioning procedure for rainwater systems including: * visual inspection * soundness test * operational checks * complete commissioning documentation * handover procedure. |
| * 1. The range of information that would be detailed on commissioning documentation | * Learners to be aware of the range of information that would be detailed on commissioning documentation, such as test pressures, durations, test dates. * Learners to be provided with examples of documentation for them to complete. |
| * 1. The actions that must be taken when commissioning reveals defects | * Learners to be able to identify the actions that must be taken where installations do not meet expectations of specifications or when inspection and testing reveals defects in gravity rainwater systems including: * dealing with systems that do not meet correct installation requirements * remedial work associated with defective gutter and pipework bracketing * remedial work associated with leakage from systems. * Learners to be provided with practical examples and to be asked to come up with solutions to rectify the defects. |
| * 1. The procedure for handing over to the end-user | * Learners to be aware that, once the system has been tested and commissioned, it can be handed over to the customer including an overview of system maintenance requirements, durations and an explanation of what to do in the event of an emergency. |
| 1. Understand the methods for determining the type of size of replacement appliances, components and accessories in accordance with industry recognised organisational procedures | | * Learners to understand the methods for determining the type of size of replacement appliances, components and accessories using design data, pre-installed systems and manufacturer information. * Learners to be provided with examples and asked to determine the type of size of replacement appliances, components and accessories. |
| 1. Understand the methods and techniques for servicing and maintaining appliances, components and accessories in accordance with:  * the plumbing and heating system’s design * the working environment * manufacturers’ instructions. | | * Learners to understand the methods and techniques for servicing and maintaining components and accessories. * Learners to be given the opportunity to carry out routine checks on gravity rainwater systems as part of a periodic maintenance programme including: * leakage from systems * blockages from systems * improper support to PVC-u gutter systems. |
| 1. Understand the methods and techniques for replacing/repairing the appliances, components and accessories in accordance with:  * the plumbing and heating system's design * the working environment * manufacturers' instructions. | | * Learners to understand the methods and techniques for replacing/repairing the components and accessories in rainwater systems. * Learners to know the commissioning and testing procedures. * Learners to be given the opportunity to replace components on gravity rainwater systems including: * pipe (RWP) * offsets * angles * shoes * brackets. * Learners to be given the opportunity to replace gutters including: * running outlets * gutter unions * stop ends * brackets. |
| 1. Understand basic fault-finding techniques | * 1. The repair and rectification procedures to deal with a range of faults | * Learners to know how to carry out routine checks on gravity rainwater systems as part of a periodic maintenance programme. * Learners to know the fault diagnosis and rectification procedure as follows: * diagnose * notify client * decommission * rectify * re-commission * handover. * Learners to be able to explain the procedures for dealing with defects in gravity rainwater systems as follows: * leakage from systems * blockages in systems * improper support to PVC-u gutter systems. * Learners to know the types of instruments and measuring devices used in fault diagnosis techniques, the method of checking system components for correct operation and the methods of repairing faults in cold water system components. |
| * 1. The methods of obtaining information on system faults | * Learners to be aware of how information on system faults can be obtained in the following ways: * the customer (end-user) – they will be able to give you an overview of the fault, what is happening, when it happens * carrying out a visual inspection to identify faults on the system * service history – information relating to the system/component faults may be detailed on a maintenance record with remedial actions to be completed * manufacturer instructions contain a maintenance section, which will detail common system/component faults * manufacturer technical instructions will detail replacement part numbers. * Learners to be familiar with system faults including: * leaks * blockages/debris * inadequate or broken support * broken gutter/rainwater pipe (RWP) * incomplete systems * incorrect fall * lack of provision for expansion and contraction. |