Plumbing and Heating Engineering

# Sample scheme of work

This sample scheme of work covers classroom-based learning for the unit **Plumbing and Heating engineering**. It is based on 642 hours of learning over 214 sessions. It is an example of a possible scheme of work and is based on theory and practical activities within a training centre. However, it can be amended to suit all learning facilities with the necessary adjustments to meet individual students’ needs.

You can use the sample scheme of work as it is, adjust it or extract content to create a scheme of work to suit your delivery needs. It can also be adjusted by adding workshops to support students who have/need additional learning time.

It is important that tutors look for ways to build or embed Behaviours within periods of learning, as well as the Skills and Knowledge required by the qualification.

The scheme of work refers to **PowerPoint presentations,** that are available in this package of resources for tutors to use with students. Any other resources listed provide guidance for the tutor as to others they may produce. Delivery timings are given; however, these can be amended to suit the group.

Plumbing and heating engineering

# Sample scheme of work

**Course/qualification:**

**Tutor’s name:**

**Number of sessions**:214 **Delivery hours**: 642 **Venue**: **Group**:

|  |
| --- |
| Learning Outcomes   * Health and safety (K1.1 – K1.3) * Tools, equipment and materials (K1.4 – K1.5) * Plumbing and heating systems (K1.6 – K1.14) * Measurement (K1.15) * Plumbing and heating science (K1.16 – K1.24) * Pipework technology (K1.25 – K1.29) * Information and data (K1.30 – K1.31) * System installation (K1.32 – K1.34) * System commissioning (K1.35 – K1.39) * System maintenance (K1.40 – K1.43) * System decommissioning (K1.44 – K1.48) |

| Session | Content area | Knowledge outcome | Activities and resources | Skills check |
| --- | --- | --- | --- | --- |
| **1**  3 hours  **PPT available** | **Outcome 1 – Plumbing and heating common knowledge criteria** | K1.1 Key requirements of Codes of Practice (CoP), Building Regulations and the Water Regulations | Activities:  **Unit introduction:** Breakdown of content within the Plumbing and Heating unit.  **Starter Task**: What regulations or codes do you already follow in your personal or work life? Write down three reasons why standards are important for installers.  Be ready to share your thoughts with the group.  **Delivery focus:**  Using PowerPoint **K1.1 Overview of Codes of Practice and their role in industry**, deliver the following content:   * Overview of Codes of Practice and their role in industry. * Introduction to Building Regulations (e.g., Part G, Part H, Part L). * Water Regulations 1999 – key principles and compliance requirements. * Roles and responsibilities in adherence to these standards.   **Knowledge Check example:** Mini Quiz: Multiple choice and short answer questions identifying key regulations and their purposes.  Resources:  PowerPoint: **K1.1 Overview of Codes of Practice and their role in industry**  Mini Quiz  Copies of Building regulation documents  Projector and whiteboard | Q&A  List Regulations group task  Mini quiz knowledge check English skills (reading, writing, technical vocabulary) |
| **2-3**  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.2 Typical hazards and risks associated with plumbing and heating systems | Activities:  Starter task example: Introduce HSE website and show students some of the tools and information contained within the site [www.hse.gov.uk](http://www.hse.gov.uk)  **Delivery focus:**  Health and safety - Typical hazards. Tutor to encourage classroom discussion based on:   * tripping hazards * slipping hazards * inadequate or lack of personal protective equipment * defective (unsafe) equipment * manual handling * working at heights * chemical injuries * inhalation of gases/chemicals * transfer of bacteria, risk prevention strategies and control measures (PPE, isolation procedures). * Use of Safety Data Sheets (SDS) and manufacturer’s instructions. * Tutor to distribute images and scenarios for students to identify typical hazards. * Students to use flip chart paper and board pens to list typical plumbing activity hazards.   **Knowledge Check example**: Risk Scenario Cards: Students match hazards to control measures and justify their reasoning.  Resources:  Safe and unsafe working area images  Safety data sheets  Projector and whiteboard | Q&A  Knowledge check – risk scenarios English skills (reading, writing, technical vocabulary) |
| **3**  3 Hours  **PPT**  **available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.2 Typical hazards and risks associated with plumbing and heating systems | Activities:  Starter task example: Distribute a number of images of materials and ask students to identify which may contain asbestos. Key message is that all could contain asbestos.  Alternative: Ask students if they have seen materials they suspect might contain asbestos.  Delivery focus:  Using PowerPoint K1.2 Asbestos, deliver the following content:  Asbestos:   * types * places you may come across asbestos * how to deal with asbestos.   Knowledge Check example:  Quick quiz, 20 questions based on today's session.  Resources:  PowerPoint: **K1.2 Asbestos**  Projector and whiteboard  Asbestos-containing material images  Knowledge check quiz | Q&A  Knowledge questions English skills (reading, writing, technical vocabulary) |
| **4**  3 Hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.2 Typical hazards and risks associated with plumbing and heating systems | Activities:  Starter task example:  Students are to make a quick list of risks when working with electrical equipment before discussing as a group.  Delivery focus:  Health and safety - Electrocution - Common electrical dangers encountered on construction sites and in private dwellings:   * faulty electrical equipment * signs of damaged or worn electrical cables – power tools and property hard wiring system * trailing cables * proximity of cables to services pipework * buried/hidden cables * inadequate over-current protection devices   Knowledge Check example:  Distribute images of workspaces with electrical faults and dangers – students are to identify the risks and corrective measures required.  Resources:  Examples of defective equipment  Examples of overcurrent devices  Images of poor practice  Projector and whiteboard | Group work task  Scenario based task – identify risks and suggest measures Maths skills (measurement, scale, calculation, costing) |
| **5**  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.2 Typical hazards and risks associated with plumbing and heating systems | Activities:  Starter task example:  Show video of site accidents created through misuse of gases, cylinders etc. such as [MythBusters Air Cylinder Rocket](https://www.youtube.com/watch?v=C4kb-8CjVYg)  Alternative: Ask students where they might encounter compressed gas cylinders in plumbing work.  Delivery focus:  Using PowerPoint K1.2 Safe Use and Transportation of Compressed Gases, deliver the following content:  The various types of gases used in jointing processes:   * propane * MAP gas * butane * oxy acetylene.   Safe transportation and storage of bottled gases and equipment.  The various types of heat-producing equipment and how to check them for safety and assemble:   * hoses * colours used * thread directions * flashback arrestors * dates * control valves * gauges * blowpipes.   Safety:   * bottle location and position * equipment assembly sequence * leak detection procedure * purging procedure * lighting and extinguishing procedure * actions in the event of leakage * transportation.   Knowledge Check example:  Examine the suitability of a risk assessment based on the use of compressed or flammable gases in small groups and discuss suggestions as a class.  Resources:  PowerPoint: K1.2 Safe Use and Transportation of Compressed Gases  Examples of cylinder regulators  Examples of hoses  Examples of flashback arrestors | Q&A  Group work - Examine Risk assessment and feedback English skills (reading, writing, technical vocabulary) |
| **6**  3 Hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.2 Typical hazards and risks associated with plumbing and heating systems | Activities:  Starter task example:  Knowledge recap. Short quiz based on safe transportation and use of cylinders.  Delivery focus:  Health and safety - The dangers of working with heat-producing equipment and how to prevent fires occurring, and the method for fighting small/localised fires that can occur in the workplace.  Use video links such as [(1) How to use a Fire Extinguisher - Workplace Safety Demonstration - Rescue 365 - - YouTube](https://www.youtube.com/watch?v=EUVzpiiL3Ng)  Fighting small/localised fires:   * tackling fires to aid escape * types of extinguishers * selection of extinguisher by fire type * method of use * evacuation procedures.   Breakout to centre and inspect the various fire extinguishers around the site  Knowledge Check example: Distribute a fire safety test for students to complete individually before swapping answers for peer marking and discussion.  Resources:  Knowledge test  Examples of fire extinguisher types | Q&A  Knowledge recap quiz  Fire safety test English skills (reading, writing, technical vocabulary) |
| **7**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.1 Key requirements of Codes of Practice (CoP), Building Regulations and the Water Regulations  K1.2 Typical hazards and risks associated with plumbing and heating systems  S2.1 Interpret risk assessments and related documentation | Activities:  **Starter task example:** Spot the Hazard Image – Students identify visible risks in a provided image of a plumbing/heating installation site.  **Delivery focus:**   * What is a risk assessment? Legal importance and structure (likelihood x severity). * Reviewing real or simulated risk assessment templates. * Related documents: method statements, COSHH sheets, permits to work. * Employer and employee duties in documentation handling.   **Knowledge Check example:** Pair Analysis – In pairs, complete a short risk assessment for a given plumbing task such as the upcoming practical task in session 10-11.  Give students time to complete before reviewing as a group.  Resources:  Examples of hazards images  Examples of risk assessment templates  Examples of Permits to work | Identify hazards task  Produce risk assessment |
| **8**  3 hours  **PPT available** | Outcome 2 Install plumbing and heating systems | S2.2 Prepare a safe working environment to conduct plumbing and heating system installation | Activities:  **Starter task example**  Toolbox Talk Video: Watch a short H&S video; students note good and bad practices.  **Alternative:** Ask students to think about a recent construction site they have seen. What signs or safety measures stood out to them?  **Delivery focus**:  Using PowerPoint **S2.2 Site Setup and Safe Working Practices**,deliver the following:   * Site setup: barriers, signage, ventilation, lighting, housekeeping. * Safe use of tools and equipment (hand/power). * Pre-start checks, isolations, and safe systems of work. * Emergency procedures: fire, first aid, spillages. * Distribute examples of method statements to discuss   **Knowledge Check example**: Mock Setup Task: Students describe (or sketch) how they would prepare a safe work area for a boiler installation. This may be in the form of a simple method statement.  Resources:  PowerPoint: **S2.2 Site Setup and Safe Working Practices**  Examples of method statements  H&S videos – site safety | Q&A – Identify bad practices  Produce simple method statement English skills (reading, writing, technical vocabulary) |
| **9**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.3 Implications of legislation and additional guidance to employers and those working with plumbing and heating systems | Activities:  **Starter task example**: “Who’s Responsible?”: Match different responsibilities to either the employer or employee using pair cards.  **Delivery focus**:  Tutor to discuss the implications of legislation on working practices. Discuss the trade bodies, relevant legislation and guidance along with the role of the HSE.   * Health and Safety at Work Act 1974. * PUWER, PPE, RIDDOR, and other relevant regulations. * Legal consequences of non-compliance (fines, prosecution, insurance impact). * The role of CPD and keeping up to date with guidance (e.g., HSE updates, trade bodies). * Examine guidance on HSE website and examples of how HSE have investigated accidents such as [Fine for company and director after employee dies from fall through roof – HSE Media Centre](https://press.hse.gov.uk/2025/04/30/fine-for-company-and-director-after-employee-dies-from-fall-through-roof/?utm_source=hse.gov.uk&utm_medium=referral&utm_campaign=press-channels-push&utm_id=prosecution&utm_term=roof-fall-death&utm_content=home-page-news&_ga=2.44559142.368857317.1747031400-1223147815.1747031400)   **Knowledge Check example**: Case Study Discussion: Analyse a real-world plumbing accident and identify what legislation was breached and how it could have been prevented.  Resources:  Pair cards  HSE website link [Fine for company and director after employee dies from fall through roof – HSE Media Centre](https://press.hse.gov.uk/2025/04/30/fine-for-company-and-director-after-employee-dies-from-fall-through-roof/?utm_source=hse.gov.uk&utm_medium=referral&utm_campaign=press-channels-push&utm_id=prosecution&utm_term=roof-fall-death&utm_content=home-page-news&_ga=2.44559142.368857317.1747031400-1223147815.1747031400) | Identify responsibilities – pair cards  Analyse an accident task |
| **10**  3 Hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.1, K1.2, K1.3, S2.1, S2.2 | A self study and reflection session has been added here as the formal Health and Safety element of the delivery is completed.  This time may be used for tutors to assess knowledge and understanding of the content covered so far. |  |
| **11**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.4 Tools, equipment and materials used for installation  K1.5 Operation and handling requirements for tools and equipment  S2.2 Select tools, equipment and materials | Activities:  **Starter task example:**  Students are to list as many BSE tools as possible in small groups within a time limit and discuss as a group.  **Delivery focus:**  **Pipework fitting and fixings – Tools and equipment** - Tutor to distribute a range of hand tools from the list below. Students are to work in pairs to write a short example of the use of each tool. On completion tutor will lead a discussion on their uses and give demonstration where possible.   * screwdriver * hammer * chisel * water pump pliers * adjustable wrench * spanner * spirit level * pipe cutter * hand saw * plier * bending tool * soldering equipment * press-fit * tape measure * measuring equipment.   **Knowledge Check example**:  Distribute quiz based on hand tools. On completion swap answer papers for peer marking  Resources:  Examples of tools and equipment  Knowledge check quiz | Q&A  Group exercise – Identify tool uses  Knowledge check quiz English skills (reading, writing, technical vocabulary) |
| **12**  3 Hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.4 Tools, equipment and materials used for installation  K1.5 Operation and handling requirements for tools and equipment  S2.2 Select tools, equipment and materials | Activities:  **Starter task example:**  Introduce students to common power tool manufacturers to help them become aware of brands such as [www.hilti.com](http://www.hilti.com), [Products | RIDGID Tools](https://www.ridgid.eu/gb/en/ridgid-tools)  **Delivery focus:**   * **Pipework fitting and fixings – Power tools and equipment -** Tutor to demonstrate and discuss the range of specialist tools and equipment including. Use directed questions to establish what tools students are aware of and their uses. * power drill * circular saw * jig saw * reciprocating saws * multi tool * press fit gun * portable pipe threading machine * hydraulic machine bender * hydraulic crimping kit * portable pipe freezing kit.   **Knowledge Check example**:  Distribute quiz based on power tools and specialist equipment. On completion swap answer papers for peer marking  Resources:   * Examples of tools and equipment * Knowledge quiz * Manufacturer websites | Q&A  Group exercise – Identify tool uses  Knowledge check quiz English skills (reading, writing, technical vocabulary) |
| **13**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.5 Operation and handling requirements for tools and equipment | Activities:  Starter task example:  Present images or real tools with intentional faults (e.g., frayed cords, missing guards). In small groups, students identify hazards and suggest corrective actions.  **Delivery focus:**   * **Pipework fitting and fixings – Power tools -** The use of electricity for powered tools and the specific safety considerations relating to their use and hazards. * Maintenance schedules and processes for escalating or reporting broken, unsafe or faulty equipment. * PAT requirements. * PPE requirements. * Show examples of damaged tools and equipment to look for and PAT labels.   **Task:**  Tutor to distribute a practical task drawing such producing a simple pipe installation and bracket system and fixing to the wall. Students are to create a list of tools and equipment required to produce the exercise. This may be a basic copper pipe installation in clips with simple compression joints and crimped joints to a set dimension.  **Knowledge Check example:**  Matching exercise where students pair tasks with appropriate PPE.  Resources:  Examples of tools and equipment with faults  Practical bracket exercise drawing | Identify faults task  Produce list of tools and equipment for task  Match PPE to task |
| **14-15**  6 hours | Outcome 2 Install plumbing and heating systems | S2.2 Select tools, equipment and materials  S2.5 Use hand and power tools | Activities:  Practical session in which students will use a range of tools and equipment to produce a simple copper & plastic pipe installation in brackets fixed to the wall and jointed using compression and crimped joints.  Tutor to give a demonstration of the use of the example tools for the task.  Students may work in pairs or individually as required to produce the work using the range of tools as required including:   * screwdriver * hammer * chisel * water pump pliers * adjustable wrench * spanner * spirit level * pipe cutter * hand saw * pliers * bending tool * blowtorch.   Materials:   * copper pipework/fittings. * plastic pipework/fittings. * On completion of the task, students are to peer mark each other's work and suggest areas for improvement under tutor guidance.     Resources:  Tools and equipment as listed  Materials list  Plastic and copper pipework and fittings | Produce simple pipework and bracket exercise  Q&A English skills (reading, writing, technical vocabulary) |
| **16**  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.25 Understand characteristics of different types of pipework  K1.26 Types of pipework | Activities:  **Starter task example:**  Look at wholesaler websites such as [www.wolseley.co.uk](http://www.wolseley.co.uk), [www.screwfix.com](http://www.screwfix.com), etc., to make students aware of the industry's common wholesalers and the types and range of materials and equipment they offer.  **Alternative:** Students (in pairs), to list as many types of pipe materials as they can in 2 minutes.  **Delivery focus:**  Using PowerPoint **K1.25** **Characteristics of different types of pipework**, deliver the following content:   * prefabricated components * modularised components * onsite installation * copper * R220 soft coils * R250 half hard lengths * R290 hard lengths * plastic pipework * polyethylene (MDPE) * cross-linked polyethylene (PEX) * polybutylene * PVC-u * polypropylene * MUPVC * ABS * lead * Tutor-led discussion and identification of copper, plastic, and steel pipe samples. Use PowerPoint presentation to discuss tolerances and limitations of each material. * Distribute a range of pipe materials and use presentation to show their uses and typical installation images. * Tutor presentation on copper, plastic, and steel pipe types. Students handle pipe samples and match to uses. * prefabricated components * modularised components * onsite installation. * Tutor to discuss the advantages and disadvantages of each material and common uses.   **Knowledge Check example:**  Class Q&A on where and why certain pipe types are used.  Group Q&A on the suitability of materials for specific systems.  Short MCQ test: Pipework and materials  Resources:  PowerPoint: **K1.25 Characteristics of different types of pipework**  Range of pipe materials and fittings  MCQ test | Q&A  Pipework and materials MCQ English skills (reading, writing, technical vocabulary) |
| **17**  3 Hours | Outcome 2 Install plumbing and heating systems | S2.4 Mark out requirements  S2.7 Cut pipes | Activities:  Starter task example:   * Match tools to pipe cutting types (drag and drop or flashcards).   Delivery focus:  Practical session - pipe skills including:   * measure, marking and cutting of a range of pipe materials. * Students should be able to measure end-to-end, centre-to-end and centre-to-centre whilst creating straight cuts. * Demonstration of safe marking and cutting on copper and plastic pipes.   Tutor demonstration of marking and cutting, including:   * measuring tape * marker * Cutting tools:   + pipe cutter   + hacksaw   + tube cutter   Students practice on copper and plastic pipes.  Knowledge Check example:  Peer review of marked and cut sample.  Resources:  Measuring tape  Marker  Cutting tools Pipe cutter  Hacksaw  Tube cutter | Measure E-E Measure C-E Measure C-C  Produce straight cuts Maths skills (measurement, scale, calculation, costing) |
| **18**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.27 Jointing methods  K1.28 Types of fitting  K1.25 Characteristics of types of pipework  K1.26 Types of pipework | Activities:  Starter task example:   * Prompt: “What are the risks and challenges when working with old lead pipework?” * Class discussion to elicit key considerations: health risks, regulations, material compatibility.   Delivery focus:  Introduction to Lead and Copper Pipework – Tutor to examine and discuss a range of fitting types with class.   * Legal and safety considerations when working with lead * Approved transition fittings * WRAS and water hygiene standards * Demonstration – Solder Ring & End Feed * Step-by-step demo of both techniques * Safety focus: flux, heat application, clean joints * Discuss key differences and inspection points * Tutor to demonstrate Solder Ring & End Feed fitting use, Step-by-step demo of both techniques, Safety focus: flux, heat application, clean joints, Discuss key differences and inspection points * Practical task: students to install Solder Ring & End Feed fittings to pipework * Tutor to demonstrate the use of Compression Joints (Type A & B) * Visual explanation of construction * Tool requirements and pressure suitability * Common installation errors * Practical task: students to install Compression Joint both Type A and Type B fittings * Tutor to Demonstrate – Push-Fit & Press-Fittings and allow students to install and practice   Knowledge Check example:   * Exit Ticket Quiz * 5-question assessment covering: * Identification of joint types * Appropriate applications * Basic procedural steps * Advantages and disadvantages   Resources:  Copper pipe, fittings for each method  Blowtorches, flux, solder  Compression tools  Push-fit and press-fit tools  Safety equipment (gloves, goggles, mats)  Quiz handouts or digital quiz platform | Q&A  Demonstrate basic practical cuts and joints  Knowledge check quiz Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| **19-20**  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.27 Jointing methods  S2.4 Mark out requirements  S2.7 Cut pipes  S2.8 Connect materials using jointing methods | Activities:  Starter task example:  Recap task – Q&A based on previous practical session and the cutting of different materials  Delivery focus:   * Practical session – Copper pipe jointing following on from previous session to allow students to develop their skills based on Copper pipe jointing including Soldering, compression and push fit pipe jointing. * Tutor to recap and demonstrate the techniques involved in jointing pipework before setting short tasks for students to produce individually or as small group. * Tutor to set suitable practical tasks based on copper pipe jointing and a range of jointing types including a drawing for students to work from. This will include dimensions and pipe sizes.   Knowledge Check example:   * Toolbox talk – students are to give safety requirements relating to the task * Peer marking of set tasks to a given measurement with feedback given by peers.   Resources:  Measuring tape  Marker  Cutting tools  Pipe cutter  Hacksaw  Tube cutter  Soldering equipment  PPE | Produce cuts on pipework  Solder and joint pipework Maths skills (measurement, scale, calculation, costing) |
| **21**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.27 Jointing methods  K1.28 Types of fitting | Activities:  Starter task example:  Component Match-Up - Students match labelled pipework samples with their corresponding jointing methods (e.g., MDPE with proprietary fittings, PVC with solvent weld).  Delivery focus:  Introduction to Plastic Pipe Types and Applications – Tutor to demonstrate and examine plastic fitting types and discuss.   * Plastic pressure pipe vs. plastic sanitary/condensate pipe * Key differences in materials: MDPE, PVC, ABS * Compatibility with metal systems (e.g., copper to MDPE) * Distribute a range of fitting types to discuss * Tutor demonstration on the following: * Plastic Pressure Pipe Jointing * Push-fit * Compression * Proprietary joints (e.g., transition fittings for copper/MDPE) * Focus on pipe prep, correct insertion depth, and seal integrity * Practical task - Students build short test rigs using all three pressure pipe methods * Tutor to demonstrate the use of: Ring seal joints (push-fit style) * Compression fittings * Solvent weld (permanent bond) * Safety and preparation: deburring, priming, solvent use * Sanitary Plastic Jointing * Show correct procedures for all three types * Emphasise differences between permanent and demountable systems   Practical: Sanitary Jointing Exercise   * Students create short runs using all three joint types * Perform basic leak tests (visual inspection or water check)   Knowledge Check example:  Multiple-choice and short-answer questions  Resources:  Plastic pipe samples (MDPE, PVC, ABS)  Push-fit, compression, solvent weld fittings  Transition (proprietary) fittings for copper/MDPE  Pipe cutters, inserts, chamfering tools, solvent cement  PPE (gloves, goggles)  Quiz sheets | Q&A  Produce joints and cuts on plastic pipework  MCQ knowledge check Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| **22-23**  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.27 Jointing methods  S2.4 Mark out requirements  S2.7 Cut pipes  S2.8 Connect materials using jointing methods | Activities:  Starter task example:  Recap task – Q&A based on previous practical session and the cutting of different materials  Delivery focus:   * Practical session following on from previous session to allow students to develop their skills based on Plastic pressure pipe and Plastic sanitary pipe jointing. * Tutor to recap and demonstrate the techniques involved in jointing pipework before setting short tasks for students to produce individually or as small group. * Tutor to set suitable practical tasks based on plastic pipe jointing and a range of jointing types including a drawing for students to work from. This will include dimensions and pipe sizes.   Knowledge Check example:   * Toolbox talk – students are to give safety requirements relating to the task * Peer marking of set tasks to a given measurement with feedback given by peers.   Resources:  Measuring tape  Marker  Cutting tools  Pipe cutter  Hacksaw  Tube cutter  PPE | Q&A  Produce joints and cuts on plastic pipework  Toolbox talk  Peer marking Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| **24**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.29 Types of support, fittings and fixings | Activities:  Starter task example:  Image Match Activity: Students work in pairs to match images of supports and fixings to their names and discuss possible uses (e.g., internal/external, heavy/light-duty).  Delivery focus:   * Supports, fittings and fixings - Tutor to distribute, share and discuss a range of modern and traditional brackets and clip systems and fixings. * Saddle clips, Munson rings, plastic clips, waste/soil clips, nail-in clips, rainwater/gutter clips * Screws, wall plugs, nails, cavity fixings, anchor bolts, appliance fixing kits * Demonstrate correct selection and installation techniques using boards simulating different wall surfaces (block, timber, plasterboard, exterior cladding). Emphasise load-bearing capacity, spacing, and system compatibility.   Practical task:   * Short practical task for students to use a range of fixings. Students will have the opportunity to continue with this in following sessions * Students rotate through hands-on stations * Install waste pipe to a solid wall using saddle clips, screws, and plugs * Fix pipework in a stud wall using cavity fixings and plastic clips * Secure gutter/downpipe using rainwater clips and suitable external fixings   Knowledge Check example:  Quick question chain: Students must answer a question relating to the question before nominating the next peer to answer the following tutor question.  Resources:  Supports: clips, Munson rings, brackets  Fixings: plugs, screws, cavity fixings, anchor bolts  Pipework: copper, plastic, waste, rainwater  Simulated wall panels (block, plasterboard, timber)  Tools: drills, screwdrivers, PPE  Visual aids and quiz handouts/digital tools | Matching task  Q&A  Fixing task  Quick quiz English skills (reading, writing, technical vocabulary) |
| **25-26**  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | S2.4 Mark out requirements  K1.29 Types of support, fittings and fixings  S2.9 Install clips/brackets to different types of building fabric | Activities:  Starter task example:  Recap task – Q&A based on previous practical session and the cutting of different materials.  Delivery focus:   * Practical session to allow students to develop their practical skills based on previous session. * Students are to work in pairs or as directed by tutor to install a range of brackets, clips and materials into a range of surface types. * Work to set dimensions and specification as directed by tutor.   Knowledge Check example:  Peer marking of set tasks to a given measurement with feedback given by peers.  Resources:  Measuring tape  Marker  Cutting tools  Pipe cutter  Hacksaw  Tube cutter  PPE | Q&A  Install clips, brackets and fixings  Peer marking exercise English skills (reading, writing, technical vocabulary) |
| **27**  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.30 Plumbing and heating drawing symbols and markings  K1.31 Types of documentation  S2.21 Interpret information provided | Activities:  Starter task example:  Start session by asking students to list 5 documents they may come across in the workplace, work in pairs or small groups.  Delivery focus:  Using PowerPoint K1.30 Drawing Types and Drawing Symbols, deliver the following content:   * Working drawings and symbols: Introduce a range of drawing examples, such as Installation, as fitted and schematics to examine as a class. * Discuss the role of the drawings and information found within the drawing such as titles, revision and scale. * Tutor to use PPT Presentation to help deliver information on the symbols found on a range of drawing types.   Knowledge Check example:  Set a range of questions based on the different symbols found within the drawings for students to attempt before discussing as a class.  Resources:  Range of drawing types  PowerPoint: K1.30 Drawing Types and Drawing Symbols | List documents  Knowledge questions English skills (reading, writing, technical vocabulary) |
| **28**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.30 Plumbing and heating drawing symbols and markings  K1.31 Types of documentation  S2.21 Interpret information provided | Activities:  Starter task example:  Knowledge recap – students to state one thing each they can remember from the previous session.  Delivery focus:   * Working drawings and symbols - Distribute drawing paper and scale rulers. Set task for students to identify a small pipework installation in the workshop / centre and represent it using a scale drawing as directed by tutor. * Give students time to produce and ensure they include the relevant drawing symbols.   Knowledge Check example:  Peer marking review. Students to peer review others' drawings and provide feedback on how they could improve in a tutor-led session.  Resources:  Examples of working drawings  Drawing paper  Scale rulers  Tape measures |  |
| **29**  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.31 Types of documentation | Activities:  Starter task example:  Introduce students to useful and relevant website such as [www.theengineeringmindset.com](http://www.theengineeringmindset.com) and YouTube channels such as [(2) The B1M - YouTube](https://www.youtube.com/@TheB1M)  Alternative: Ask students if they have ever had to complete or follow a risk assessment or method statement. Have a brief class discussion to establish prior experience.  Delivery focus:  Using PowerPoint K1.31 Risk assessments and method statements, deliver the following content:   * Risk assessments and method statements – Tutor to discuss the importance of RAMS and how they impact planning of the work program. * Tutor to use PowerPoint presentation to deliver processes involved in producing Risk assessments and method statements. * Tutor to distribute a number of examples, some strong and some weak. Students are to examine as small groups and then feedback into group discussion to summarise findings. * Tutor to discuss how a Risk assessment is produced and follow worked example as a class.   Knowledge Check example:   * Students to produce a simple method statement for a proposed activity following the risk assessment provided by the tutor. * On completion teams to swap and peer mark before discussing as a group.   Resources:  PowerPoint: K1.31 Risk assessments and method statements  Examples of RAMS | Identify good and bad practice in RAMS  Produce simple method statement |
| 30  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.31 Types of documentation | Activities:  Starter task example:  Start session by asking students to list 5 trade operations that may be present in a new build home and one task each trade may carry out. Discuss as a group.  Alternative: Ask students to name three tools or documents they would use when planning work tasks, and why planning is critical to the success of a plumbing project.  Delivery focus:  Using PowerPoint K1.31 Work programmes including Gantt charts and Critical path planning, deliver the following content:   * Tutor to discuss the purpose and use of work programmes within a construction project using PowerPoint presentation. * Distribute and examine a range of programmes including Gannt charts. * Discuss the term ‘Critical path’ and examine this within an example of a programme. * Discuss the terms ‘productive’ and ‘non-productive’ in relation to work planning. * Introduce the term ‘BIM’ and discuss how this is used to monitor work programs.   Knowledge Check example:   * Set task for students to produce a simple work programme which includes a small number of trades such as installing a new bathroom. Allow students time to complete and discuss the outcome in the next session.   Resources:  PowerPoint: K1.31 Work programmes including Gantt charts and Critical path planning  Examples of work programmes / Gantt Charts | Q&A  Produce simple work programme Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| **31**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.31 Types of documentation | Activities:  Starter task example:  Look at BIM software and examples of BIM such as [(3) What Is BIM (Building Information Modelling)? - YouTube](https://www.youtube.com/watch?v=suNadRnHy-U)  Delivery focus:   * Work programmes continued – Students are to complete the work from previous session where they were producing a work programme / Gannt chart for a small project. * Tutor to show pre worked example of a solution to the programme and discuss and a class. * Introduce the term ‘Specification’ and ask students to identify the term. * Show examples of specifications from P&H projects and examine the content and scope of these as a group.   Knowledge Check example:  Set task for students to produce a simple specification including materials and workmanship for the bathroom project in previous session. Students to produce a suitable materials and workmanship specification as directed by tutor. On completion use peer marking and tutor led discussion to review work.  Resources:  Examples of Job Specifications | Produce simple specification English skills (reading, writing, technical vocabulary) |
| **32**  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.31 Types of documentation | Activities:  Starter task example:   * Group task – match the statements to the document. Share cards with statements based on Invoices, quotes and estimates. Students try to identify the statement with the document. This can be repeated at end of session to see how learning has taken place.   Delivery focus:   * Quotes, estimates and invoices – Tutor to deliver content using examples of each document and the role of each in the project. * Tutor to distribute examples of each and discuss the content including how and when they are used. * Set task for students to identify good and bad practice on examples and discuss in group discussion.   Knowledge Check example:   * Set task for students to produce a simple estimate and quote for a small job such as the replacement of a WC. This can be done individually or in pairs as required. On completion carry out peer marking and group feedback.   Resources:  Examples of quotes, estimates and invoices | Q&A   Group task  Identify good and bad practice  Produce simple estimate and quote Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 33  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.31 Types of documentation | Activities:  Starter task example:  Introduce a new organisation relevant to the industry such as CIPHE by showing students the website and the role [Consumer advice | Professionalism | CIPHE](https://www.ciphe.org.uk/about/code-of-professional-standards/)  Delivery focus:   * Maintenance records, commissioning records and delivery notes – Tutor to deliver content using examples of each of the documents. * Discuss their roles within the project and the information contained within each. * Distribute examples for students to examine and discuss their importance including when they should be used, where they should be kept and the importance of the customer during handover. * Discuss how delivery notes should be checked against actual quantities for accuracy.   Knowledge Check example:  Quick quiz – 15 question MCQ based on today’s session. On completion discuss answers in tutor led discussion.  Resources:  Examples of Delivery notes, maintenance records and commissioning records  Quick quiz | Q&A  Quick quiz English skills (reading, writing, technical vocabulary) |
| 34-35  6 hours | Outcome 2 Install plumbing and heating systems | S2.3 Measure site requirements and materials | Activities:  Starter task example:  Recap by asking students to state items of information found in a site drawing before nominating a peer to do the same.  Delivery focus:   * Measure site requirements and materials – In this session tutor will deliver information regarding the process of quantifying materials from installation drawings by ‘taking off’ from a site drawing. * Tutor to discuss the impact of poor estimation and how quantifying materials accurately can lead to efficiency for contractor and client. * Distribute copies of a site drawing and a simple job specification to each learner. Give each learner a scale ruler. * Tutor to demonstrate the use of scale in measuring a given section of pipework in a worked example with class. * Breakout to workshop to demonstrate the use of measuring devices to measure space. * Students to identify other sections of pipe or materials in drawing using the specified scale as directed by tutor. * Discuss how the specification is then used to identify the specific material standard and type along with the drawing so that quotations can be produced. * Tutor to set task for students in small groups. Students are to be given a fresh drawing and specification and complete a take off. They are then to produce a materials list. * Allow students access to plumbing catalogues or online resources to then complete a price list and quotation for the project.   Knowledge Check example:  Peer marking and discussion of the project led by tutor. Discuss and compare the quotations and take offs and how teams could have improve their accuracy.  Resources:  Examples of site drawings  Examples of specification  Scale rulers | Q&A  Take off materials  Produce quote Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 36  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.30, K1.31, S2.21, S2.3 | A self study and reflection session has been added here as the formal Information and data element of the delivery is completed.  This time may be used for tutors to assess knowledge and understanding of the content covered so far, offer feedback or for students to complete their own reflection or deeper study. |  |
| 37  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.32 Bending techniques  S2.6 Prefabricate bends by bending to shape | Activities:  Starter task example:  Classroom discussion – what is the benefit of forming a bend rather than using a fitting?  Delivery focus:  Using PowerPoint K1.32 Bending techniques 90 degree bends, deliver the following content:   * Tutor to explain the processes involved including the practical process of using both spring and machines to bend, the use of angle finders and the measurements and marks to be made to ensure bends can be completed from centre to end accurately. * Tutor to demonstrate the process and allow students to pull a spring bend or machine bend as required.   Knowledge Check example:  Knowledge check – questions on the bending process, safety and the marking of pipework to form accurate bends.  Resources:  PowerPoint: K1.32 Bending techniques 90 degree bends  Copper pipe  Spring benders  Angle finder  Tape measure  Machine bender | Form a spring or machine bend  Knowledge test English skills (reading, writing, technical vocabulary) |
| 38  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.32 Bending techniques  S2.6 Prefabricate bends by bending to shape | Activities:  Starter task example:  Students to state a fact remembered from previous session before nominating a peer to do the same.  Delivery focus:   * Practical session forming 90 degree bends in copper pipework – Students will have the opportunity to progress from the previous session. * Tutor to distribute practical task guide and set task for students to produce 90 degree bends to a set dimension. * On completion measure for accuracy and discuss how bends can be improved.   Knowledge Check example:  Peer marking of completed work – produce 90 degree bends  Resources:  Copper pipe  Spring benders  Angle finder  Tape measure  Machine bender | Produce 90 degree bends |
| 39  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.32 Bending techniques  S2.6 Prefabricate bends by bending to shape | Activities:  Starter task example:  Introduce manufacturers websites relating to bending tools and equipment to make students aware of available equipment.  Alternative: Ask students what might happen if a copper pipe bend is made too sharply without the correct tool.  Delivery focus:  Using PowerPoint K1.32 Copper pipe bending, offsets and passovers, deliver the following content:   * Tutor to explain the processes involved including the practical process used to produce the bends, the use of angle finders and the measurements and marks to be made to ensure bends can be completed with correct travel and offset. * Discuss the angles such as 30 degree and 45 degree and the calculation to work out travel such as 1.414 x offset for 45 degree. * Tutor to demonstrate the process and allow students to attempt a small offset or Passover.   Knowledge Check example:  Knowledge check – questions on the bending process, safety and the marking of pipework to form accurate bends  Resources:  PowerPoint: K1.32 Copper pipe bending, offsets and passovers  Copper pipe  Spring benders  Angle finder  Tape measure  Machine bender | Form an offset or passover  Knowledge test English skills (reading, writing, technical vocabulary) |
| 40  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.32 Bending techniques  S2.6 Prefabricate bends by bending to shape | Activities:  Starter task example:  Students to state a fact remembered from previous session before nominating a peer to do the same  Delivery focus:   * Practical session forming offsets and passovers in copper pipework – Students will have the opportunity to progress from the previous session. * Tutor to distribute practical task guide and set task for students to produce bends to a set dimension. * On completion measure for accuracy and discuss how bends can be improved.   Knowledge Check example:  Peer marking of completed work – Produce offsets and passovers  Resources:  Copper pipe  Spring benders  Angle finder  Tape measure  Machine bender | Produce offsets and passovers |
| 41  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.32 Bending techniques  S2.6 Prefabricate bends by bending to shape  S2.10 Install pipework relevant to type of system | Activities:  Starter task example:  Recap session – students to list types of fitting suitable for use with Plastic pressure pipe. Discuss as group.  Delivery focus:   * Cabling and forming of plastic pipework – Tutor to demonstrate the techniques used to bend plastic pressure pipework. * Distribute pipework examples, clips and supports for use with plastic pressure pipe. * Show students the protective plates available for use when notching joists and discuss maximum clipping distances. * Discuss the dimensions and diameters of holes in joists.   Knowledge Check example:  Set task for students to mark suitable areas for drilling and notching on a given joist. Students to drill, notch and cable the plastic pipework into the given joist.  Resources:  Plastic pressure pipe  Tape measures  Timber for joist  Clips and plates  Drills | Q&A – plastic pressure pipe recap   Install plastic pipe in joists  Drill and notch in suitable zones English skills (reading, writing, technical vocabulary) |
| 42  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.34 Impact of installation activities | Activities:  Starter task example:  Students to complete quick quiz – joist notching and drilling locations. Spend 5-10 minutes on recap quiz.  Alternative: Ask students if they can think of any time when an installation or building service activity affected their home or school.  Delivery focus:  Using PowerPoint **K1.34 Potential impacts of installation activities on customers**,deliver the following content:   * isolation of services * preparation of temporary services – providing water during temporary loss * completing work out of hours or when unoccupied – cost related disability (no sanitation services).   Impact:   * no water * temporary loss of water * delayed arrival of resource or materials.   Knowledge Check example:  Scenario based activity – students are given an example of a project where disruption occurs and in small teams suggest activities and responses to resolve. Discuss as tutor led discussion.  Resources:  PowerPoint: K1.34 Potential impacts of installation activities on customers  Scenario activity | Recap quiz   Scenario activity English skills (reading, writing, technical vocabulary) |
| 43  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.33 Connection techniques  S2.10 Install pipework relevant to type of system | Activities:  Starter task example:  Quick quiz – Identify a range of fitting types using a worksheet or range of fittings in class. Discuss the answers as a group.  Delivery focus:  Connection techniques – Revisiting the jointing and connection methods used in plumbing and introducing the terms ‘First fix’ and ‘Second fix’ and discuss the processes.  Solder and solder ring should be lead-free.  Copper pipe:   * solder ring and end feed (lead free) * compression (type A and B) * push-fit * press-fit.   Plastic pressure pipe:   * push fit * compression * proprietary * copper and MDPE.   Plastic jointing (sanitary):   * ring seal * compression * solvent.   Practical – Allow students to practice making connections to appliances and equipment such as Pumps, blending valves, WHB, WC, Shower valves etc using a range of connection types listed above.  Resources:  Range of fitting types  Examples of components and equipment to make connections to  Tools and equipment | Identify fittings quiz  Make connections practical task English skills (reading, writing, technical vocabulary) |
| 44-45  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.33 Connection techniques  S2.10 Install pipework relevant to type of system  S2.11 Install heating appliances | Activities:  Starter task example:  Toolbox talk – nominate learner(s) to discuss the safety requirements for use of a particular tool or process.  Delivery focus:  Install heating appliances and Make connections – continuing from previous session, this session allows students to practice making second fix connections and connecting to equipment and appliances, particularly boilers.   * Tutor to demonstrate the process of hanging a boiler using boiler jig. * Distribute manufacturers instructions for students to examine and discuss. * Demonstrate the template use and the marking of fixings. * Show process of fixing, levelling and hanging the boiler securely. * Demonstrate and discuss the connections to the boiler and the types of fitting and seals required. * Tutor to introduce Practical task example: * In pairs of small groups, students are to use a template and boiler jig to mount and fix a boiler to the wall. * Set task for students to then make connections from the boiler into a short piece of pipe in a clip. * On completion discuss each installation and groups to make suggestions on how each installation could be improved.   Resources:  Boiler installation manuals  Boiler jigs  Tools and equipment  Templates  Fixings | Practical installation of boiler |
| 46  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | S2.15 Install thermal insulation materials  K1.19 Types of insulation materials | Activities:  Starter task example:  Classroom discussion – How does heat transfer? Tutor led discussion.  Alternative: Ask students what types of insulation materials they’re familiar with in buildings.  Delivery focus:  Using PowerPoint K1.19 Install thermal insulation materials, deliver the following content:  Thermal insulation materials:   * polyisocyanurate foam * PVC foam * polyethylene foam.   Practical task example:  Give practical demonstration of how basic joints are cut and then allow students to practice this on the previously installed boiler jig pipework from previous sessions using relevant insulation type.  Resources:  PowerPoint: K1.19 Install thermal insulation materials  Examples of pipe insulation  Hacksaws  Tape measures  Insulation jointing tape | Q&A   Practical installation task English skills (reading, writing, technical vocabulary) |
| 47  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.15 Metric and imperial dimensions  K1.21 Scientific principles and concepts of heating engineering | Activities:  Starter task example:   * Introduction to new topic – Scientific principles, discuss the content included in the next phase of delivery. * Starter task - Students to offer examples of measurements that might be used within the workplace.   Delivery focus:   * Deliver the range of SI Units used within industry: * metre (length) m * kilogram (mass) kg * second (time) s * Kelvin (temperature) * Pascals * bar.   Knowledge Check example:   * Distribute short knowledge check paper and allow students to complete individually before discussing answers in tutor led feedback session.   Resources:  Knowledge check test | Q&A  Knowledge test English skills (reading, writing, technical vocabulary) |
| 48  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | Activities:  Starter task example:  Recap, students to state one fact each relating to SI units and derived SI units from previous session.  Delivery focus:   * Tutor to facilitate a group discussion on how to compare other materials to air and how they react or respond, e.g. NG would rise and LPG would sink. * Tutor to review students’ response in notes and their discussions. * In pairs, students to identify a scenario where a gas leak would present different hazards depending on its individual SG. * Tutor to analyse the outcome of students discussing scenario in pairs. * As a class, students to explain how to calculate density and apply this to solid materials and the interaction with water, e.g. float or sink?   Knowledge Check example:  MCQ knowledge check – students to complete individually before peer marking.  Resources:  MCQ knowledge test questions | Q&A  Group scenario task  Knowledge test English skills (reading, writing, technical vocabulary) |
| 49  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | **Activities:**  **Starter task example:**  Introduce students to oils through short video such as[(10) Petroleum refining processes explained simply - YouTube](https://www.youtube.com/watch?v=vD0kbdIS6kE)  **Delivery focus:**  **Application of liquids**:  Tutor to discuss the properties and applications of:  • water  • refrigerants  • anti-freeze/glycol mixes  • fuel oils  • lubricants/greases.   * Discuss the ‘weights’ of oils and how this is measured. * Short Group task – students spend 30 - 40 minutes using ILT equipment to research the types of Refrigerants used in AC and refrigeration and the uses of anti freeze glycol mixtures before feeding back in tutor led discussion.   **Knowledge Check example:**  Students to feedback their findings in small groups for tutor led peer discussion.  **Resources:**  ILT equipment | Q&A     Research task and feedback English skills (reading, writing, technical vocabulary) |
| 50-51  6 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | **Activities:**  **Starter task example:**  Long memory recall – spend 5 minutes discussing ‘WRAS’ and its purpose.  **Alternative:** Students to name three types of liquids commonly used in building services and their purpose.  **Delivery focus:**  Using PowerPoint **K1.16 Application and properties of liquids,** deliver the following:   * water * boiling/freezing point * relationship Celsius and Kelvin * change of state and molecular changes * volume and pressure increases * density at differing temperatures * to steam/super-heated steam * capillarity * acidity/alkalinity (pH value) * water hardness * soft * temporary hard * permanently hard. * The types of water, properties and chemical states. * Water quality (including pH) and treatments. * Use activities such and PH testing of water samples, show examples of pipework and components which have been effected by scaling, show students how the volume of a heated glass of water increases and show video such as [(10) Boiling, Atmospheric Pressure, and Vapor Pressure - YouTube](https://www.youtube.com/watch?v=Ag4lLUXKuSM)   **Knowledge Check example:**   * Distribute a suitable knowledge test for students to complete individually. On completion, swap papers for tutor led peer marking discussion. * Set short homework task for students to find a Building Services company based in their area and examples of their projects.   **Resources:**  PowerPoint: **K1.16 Application and properties of liquids**  Water vessels and heat source  Temperature thermometers  PH measuring equipment  YouTube videos  Pipework with effects of limescale | Q&A  Test water PH  Knowledge test English skills (reading, writing, technical vocabulary) |
| 52  3 Hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | **Activities:**  **Starter task example:**  Ask students what gases they commonly hear about in plumbing or HVAC systems.  **Delivery focus:**  Using PowerPoint **K1.16 Gases and their properties** deliver the following content:   * natural gas, LPG * air and steam * pressure * volume * temperature of gases found within the industry * carbon dioxide * refrigerant gases.   Watch video to highlight the effect on steam and pressure [Mythbusters Water Heater Explosion (youtube.com)](https://www.youtube.com/watch?v=9bU-I2ZiML0)  Discuss the uses and properties of natural gas, carbon dioxide, air, steam and refrigerant gases.  **Knowledge Check example:**  Tutor to distribute a knowledge check MCQ test for students to complete individually before discussing answers as a class.  **Resources:**  PowerPoint: **K1.16 Gases and their properties**  Video Link - [Mythbusters Water Heater Explosion (youtube.com)](https://www.youtube.com/watch?v=9bU-I2ZiML0)  MCQ Knowledge check | Homework task   MCQ test |
| 53  3 Hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | **Activities:**  **Starter task example:**  Recap of long term knowledge – Q&A session based on fittings.  **Alternative:** Ask students which materials they may have seen in plumbing systems that look worn, damaged or rusted, and the causes behind the erosion.  **Delivery focus:**  Using PowerPoint **K1.16 Corrosion and reasons for breakdown**, deliver the following content:   * atmospheric corrosion * oxidisation of metals * UV damage to plastics * heat damage to plastics * erosion corrosion.   **Knowledge Check example:**  Distribute Worksheet based on Corrosion for students to complete as homework to be discussed in next session.  **Resources:**  PowerPoint: **K1.16 Corrosion and reasons for breakdown**  Examples of materials that have broken down through corrosion.  Worksheet | Q&A  Worksheet task English skills (reading, writing, technical vocabulary) |
| 54  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.20 Electrolyte qualities of materials and the periodic table | Activity:  Starter task example:  Ask students to explain why do some metal joints or fittings corrode faster than others, even when in the same system.  Delivery focus:  Using PowerPoint K1.20 Electrolytic corrosion and the electromotive series, deliver the following:   * Materials * Anode * Cathode * Electrolyte * Distribute a number of corroded materials for students to discuss and examine. * Demonstrate electrolytic reaction with a multi meter and two dissimilar metals within water, use a number of different metals to show how reaction is greater between some materials. * Distribute sacrificial anodes to examine along with Denso tape and inhibitor labels so that students can examine.   Knowledge Check example:  Rearrange cards into the correct order relating to the electromotive series.  Resources:  PowerPoint: K1.20 Electrolytic corrosion and the electromotive series  Examples of corroded metallic components  Multimeter  Water in a vessel  Knowledge check cards | Homework task   Rearrange cards in order |
| 55  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.16 Scientific principles and concepts to plumbing engineering | Activity:  Starter task example:  Quick recap – offer one fact each from previous session.  Delivery focus:  Tutor to deliver knowledge of:   * Strength * Tensile strength * Compressive strength * Elasticity * Malleability * Conductivity * Use a range of physical materials with the required properties to help explain the properties.   Knowledge Check example:  Research task – set task for students in small groups to produce a short description of one of the properties each per group. Allow 1 hour before groups re assemble and feedback their findings in group discussion.  Resources:  Examples of materials with relevant properties  ILT equipment | Q&A   Research task and feedback English skills (reading, writing, technical vocabulary) |
| 56  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.17 Relationship between flow and pressure | Activity:  Starter task example:  Introduce useful website for Science revision [GCSE Science - BBC Bitesize](https://www.bbc.co.uk/bitesize/subjects/zrkw2hv)  Delivery focus:  **Relationship between flow and pressure for both liquids and gases** to include:   * Boyle’s law * Charles’s law * Show video [(11) The ABC's of gas: Avogadro, Boyle, Charles - Brian Bennett - YouTube](https://www.youtube.com/watch?v=BY9VGS2eXas&t=73s)   Knowledge Check example:  Set scenario based knowledge check with open questions. Students may complete in class or as homework as required.  Resources:  Video link [(11) The ABC's of gas: Avogadro, Boyle, Charles - Brian Bennett - YouTube](https://www.youtube.com/watch?v=BY9VGS2eXas&t=73s) | Scenario based question paper |
| 57  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.18 Relationship between mass/volume and specific heat capacity  K1.21 Scientific principles and concepts of heating engineering | Activity:  Starter task example:  Recap of previous session including discussing answers to homework/knowledge task.  Delivery focus:  Tutor to deliver content on Specific Heat capacity, including:   * Heat capacity - calculate the quantity of heat energy required to raise the temperature of a substance and the amount of power required to heat a substance. * Use examples throughout session to help work through the calculations as a class.   Knowledge Check example:  Heat capacity calculation examples – give students examples to complete either in small groups or individually as required before discussing answers as a class.  Resources:  Calculation task sheet | Homework task  Worked calculations  Calculation task |
| 58  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.18 Relationship between mass/volume and specific heat capacity | Activity:  Starter task example:  Discuss what would happen if a gas such as LPG was to escape from a cylinder on a barge. Discuss as a class.  Alternative: Ask students the following question:  If you have 2kg of copper and it takes up 0.00025m³ of space, what is its density?  Delivery focus:  Using PowerPoint **K1.18 How to calculate density**, deliver the following:   * Mass/volume - calculate the density of solids, liquids and gases. * The density of water changes with the water’s temperature. * Explain the terms ‘SG’ and ‘RD’ giving the numbers relevant to various materials including Air as 1, Water as 1 and examples relative to this such as Natural gas at 0.6. * Discuss the volume of a cistern at 1m3 at various temperatures.   Knowledge Check example:  MCQ knowledge test  Resources:  PowerPoint: K1.18 How to calculate density  MCQ knowledge test | Q&A  MCQ knowledge test English skills (reading, writing, technical vocabulary) |
| 59  3 hours  **PPT available (use for this and session 60)** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.21 Scientific principles and concepts of heating engineering | Activity:  Starter task example:  Knowledge recall – state the measurements used in industry for pressure including the SI Unit and discuss the conversions.  Delivery focus:  Using PowerPoint **K1.21 Force, pressure, and flow characteristics**, deliver the following:   * force calculations * pressure head * pressure calculations * static pressure * dynamic pressure * draught * forced draught   Use worked examples as a class to calculate force and pressure.  Knowledge Check example:  Calculating force and pressure using a set of given problems and scenarios. Students to complete as small groups or individually as tutor requires.  Resources:  PowerPoint: K1.21 Force, pressure, and flow characteristics  Knowledge test – calculations | Knowledge recall Q&A   Worked calculation tasks  Scenario tasks English skills (reading, writing, technical vocabulary) |
| 60  3 hours  **PPT available (same as session 59)** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.21 Scientific principles and concepts of heating engineering | Activity:  Starter task example:  Quick task – calculate static head in given examples.  Delivery focus:  Using PowerPoint **K1.21 Force, pressure, and flow characteristics**, deliver the following:   * effects of increasing/reducing pressure * effects of increasing/reducing pipe size * changes of direction, bends and tees * pipe size * pipe reductions * roughness of material surface * constrictions, such as valves * expansion in systems.   Discuss the term ‘equivalent length’ and look at resistance tables for fittings.  Where applicable investigate the video [(11) pipe resistance - YouTube](https://www.youtube.com/results?search_query=pipe+resistance)  Knowledge Check example:  Worksheet task – calculate the equivalent lengths and explain which circuits would have the most resistance (bends, fittings, length etc)  Resources:  PowerPoint: **K1.21 Force, pressure, and flow characteristics**  Equivalent length tables  Worksheet task | Calculate static head  Calculate equivalent length  Worksheet tasks Maths skills (measurement, scale, calculation, costing) |
| 61  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.21 Scientific principles and concepts of heating engineering | Activity:  Starter task example:  Discuss work experience opportunities and arrangements with students.  Delivery focus:  Tutor to deliver content on Heat transfer, including:   * conduction * convection * radiation * heat loss * Discuss the principles of each heat transfer method. * Students to give examples of each within the Plumbing and Heating industry. * Explain the concept of the K, R and U values and allow students to try and calculate a simple K or R value.   Knowledge Check example:  MCQ knowledge quiz for students to complete individually or in small teams as directed by tutor.  Resources:  MCQ knowledge quiz | Give examples of heat transfer  Calculate simple R and K values  Complete knowledge quiz Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 62  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.22 Heating systems and the combustion process | Activity:  Starter task example:  Introduce students to ‘Gas Safe’ using the HSE website. Discuss their role in industry [Gas Safe Register - HSE](https://www.hse.gov.uk/gas/domestic/newschemecontract.htm)  Alternative: Ask students what three things are required for combustion to take place.  Delivery focus:  Using PowerPoint K1.22 Combustion and incomplete combustion in fuels, deliver the following content:   * gas * oil * solid fuel * the causes and signs of incomplete combustion * complete combustion * combustion triangle * Where possible use a combustion analyser to show products of combustion being created and examine the contents. * Show examples of appliances showing signs of incomplete combustion. * Discuss the equation for complete combustion of natural gas.   Knowledge Check example:  Open question sheets based on today’s session. Students to complete and then discuss answers in tutor led discussion.  Resources:  PowerPoint: **K1.22 Combustion and incomplete combustion in fuels**  Combustion analyser  Appliances  Open question paper | Q&A  Open question paper English skills (reading, writing, technical vocabulary) |
| 63-64  6 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.23 Flues/Chimneys in relation to gas and the combustion process | Activity:  Starter task example:  Students to produce a short description of what they think a ‘chimney’ or ‘flue’ does and how it operates. Students offer explanation in classroom discussion.  Delivery focus:  Using PowerPoint **K1.23 Flue systems and combustion**, deliver the following content:   * The types of flue, sizes and the correct and safe operation in line with industry requirements. * Basic inspection requirements of flue systems. * Operating principles: remove combustion products, draw in combustion air. * Components: primary flue, draught diverter, secondary flue, terminal. * Flues/chimneys: open flued, room sealed, flueless. * Show examples of a range of flues attached to appliances and distribute flue fittings to examine materials and construction. * Demonstrate Flue draught using smoke pellets. * Look at positions of flues and terminals using guides such as IGEM documents.   Knowledge Check example:  Student research task. Set task for students to research a type of flue arrangement in small groups. Students have 1 ½ hours to produce a short feedback session. On completion all groups feed back into tutor led presentation.  Resources:  PowerPoint: **K1.23 Flue systems and combustion**  Examples of flues and components  Smoke pellets  IGEM documents  ILT equipment | Q&A   Research and feedback task English skills (reading, writing, technical vocabulary) |
| 65-66  6 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.24 Ventilation in relation to gas and the combustion process | Activity:  Starter task example:  Examine the IGEM Website and introduce students to their role in industry [IGEM | The Institution of Gas Engineers and Managers (IGEM)](https://www.igem.org.uk/)  Alternative: Ask students what happens when there isn’t enough oxygen supplied to a gas appliance.  Delivery focus:  Using PowerPoint **K1.24 Gas combustion and ventilation requirements**, deliver the following:   * Types of ventilation: natural, mechanical. * Installation practices: adequately sized, continuous size, sleeved, permanently open, fly screen removed, correctly positioned. * Explain the basic calculations required to calculate ventilation opening sizes and flow rates. * Set worked examples to work through in class as a group. * Show students examples of vents in situ and in class. * Look at IGEM guidance documents relevant to ventilation.   Knowledge Check example:  MCQ knowledge test. Distribute test and set time for learner to complete. On completion swap papers for tutor led peer marking and classroom discussion.  Resources:  PowerPoint: K1.24 Gas combustion and ventilation requirements  IGEM documents  Tape measures  Examples of grilles  MCQ test | Calculate ventilation sizes  MCQ test Maths skills (measurement, scale, calculation, costing) |
| 67  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.15 – K1.24 | A self study and reflection session has been added here as the formal Information and data element of the delivery is completed.  This time may be used for tutors to assess knowledge and understanding of the content covered so far, offer feedback or for students to complete their own reflection or deeper study. |  |
| 68  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 Sources and distribution of water | Activity:  Starter task example:  Introduce next topic in scheme – Plumbing and Heating systems and discuss what will be covered in coming weeks.  Delivery focus:  Tutor to deliver the following content:   * Surface sources: Lakes, reservoirs, rivers, streams. * Underground sources: deep and shallow wells, artesian wells, bore-holes, springs. * Supply and water treatment: mains, private. * Discuss the terms ‘Potable’ and ‘Wholesome’ in relation to water supplies.   Knowledge Check example:  Distribute knowledge quiz based on the session for students to complete.  Resources:  Website link [WRAS Approvals](https://www.wrasapprovals.co.uk/)  Knowledge quiz | Q&A  Knowledge quiz English skills (reading, writing, technical vocabulary) |
| 69  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 Sources and distribution of water | Activity:  Starter task example:  Recall task – Students recall H&S facts from earlier in course and spend 5 minutes discussing as a group.  Delivery focus:  Tutor to discuss fluid categories anddeliver information on the following content:   * The role of the Water Regulations * Fluid categories1–5 * preventing waste, undue consumption, misuse or contamination. * Look at the regulations [The Water Supply (Water Fittings) Regulations 1999](https://www.legislation.gov.uk/uksi/1999/1148/contents/made) and highlight the content. * Encourage students to download a free download from the website link. * Offer examples of waste, undue consumption, misuse or contamination within industry. * Examine categories 1-5 and give examples of each.   Knowledge Check example:  Card matching – students pair cards with Fluid categories and water sources / Examples of breaches and what it contravenes.  Resources:  Matching pair cards  Handouts for Fluid categories and Water regulations  Link to water regulations [The Water Supply (Water Fittings) Regulations 1999](https://www.legislation.gov.uk/uksi/1999/1148/contents/made) | Q&A  Matching pairs task English skills (reading, writing, technical vocabulary) |
| 70  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 Sources and distribution of water | Activity:  Starter task example:  Introduce students to the following website: [WRAS Approvals](https://www.wrasapprovals.co.uk/)  Delivery focus:  Tutor to deliver the following content:   * connection methods to the main * communication pipe detail * service pipe detail * main external stop valve location and meter housings * installation requirements * methods of entry of the service pipework to a property * Distribute examples of relevant components such as water meter, external stop valves, ferules, MDPE etc   Knowledge Check example:  Students to produce a detailed sketch of the mains water supply to a building including dimensions, valves, components and labels. On completion swap with peer for peer marking and discussion.  Resources:  Paper, pencils and rulers for drawing  Components such as water meter, external stop valves, ferules, MDPE etc. | Produce sketch of service to a property |
| 71-72  6 hours  **2 PPTs available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Knowledge recap from previous session – ask students to state one fact each from last session before nominating a peer to do the same.  Delivery focus:  Using PowerPoints **K1.7 Direct Cold Water Systems** and **K1.7 Indirect Cold Water Systems**, deliver the following content:   * direct cold-water systems * Indirect cold-water system * System layout * Positions of components including valves and cisterns * Types of valves to be used in each position * Advantages and disadvantages of each type of system * Students are to make detailed sketch of each system including component positions.   Knowledge Check example:  MCQ knowledge check based on session content. On completion tutor to discuss answers for peer or self marking.  Resources:  PowerPoint: K1.7 Direct Cold Water Systems  PowerPoint: K1.7 Indirect Cold Water Systems  Drawing paper, rulers and pencils  MCQ knowledge test paper | Produce sketch of system  MCQ knowledge test English skills (reading, writing, technical vocabulary) |
| 73-74  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Paired task – state 2 advantages and two disadvantages for both Direct and Indirect CW systems and discuss as a class.  Delivery focus:  Tutor to deliver the following content:   * Boosted system principles * Direct boosting * Indirect boosting * Drinking water headers * Break cisterns * Use of accumulators / buffer vessels * High and low level switches * Operation of delayed action float valves * Limitations of systems and restrictions on direct boosting * Tutor to show system set up in workshop or centre where possible. * Use videos such as [(13) SCALA1 - A better pressure boosting system - YouTube](https://www.youtube.com/watch?v=sqgVa71GyaY) * Students may produce sketch of Boosted systems with components   Knowledge Check example:  Complete knowledge check open paper individually before tutor led discussion of answers.  Resources:  Video link [(13) SCALA1 - A better pressure boosting system - YouTube](https://www.youtube.com/watch?v=sqgVa71GyaY)  Drawing paper, pencils and rulers  Open question paper | State advantages and disadvantages  Drawing task  Open question paper |
| 75-76  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Work experience update – discuss and update on latest work experience progress.  Delivery focus:  Tutor to deliver content relevant to cisterns including:   * Location * Support * ‘Bylaw 30’ Kit * Float operated valves * Materials * Connection locations * Clearance * Temperature * Tutor to show examples of cisterns in location and un connected. * Demonstrate how to connect to a cistern including cutting holes and making connection with suitable fittings. * Allow students opportunity to make connections using tank connectors and FOVs etc. * Discuss the temperatures for storage and measure if possible using thermometer on live cistern. * Check measurements from air gap and FOV on installed cistern and discuss.   Knowledge Check example:  Complete worksheet with MCQ and open tasks on relevant worksheet either individually or as small groups.  Resources:  Examples of cisterns  Examples of ‘Bylaw 30’ components  Tank connection fittings  Float operated valves  Thermometers  Tape measures  Drill and hole cutter  Worksheet | Cut holes in cistern  Make connection to cistern  Complete worksheet tasks Maths skills (measurement, scale, calculation, costing) |
| 77  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Introduce website of the day – show useful links to plumbing related content for students to use during study  Delivery focus:  **Cold water components - boosted system components Including:**   * Delayed action FOV * Buffer vessel and accumulators * Low and high level float switches * Pressure transducer * Pressure switches * Tutor to distribute a range of components as listed and examine their operation, use and location as a group. * List and discuss the purpose of each and students to make notes and take part in discussions. * Show how the electrical components create continuity through the switch using a multimeter   Knowledge Check example:  Match component description to component name in matching card task.  Resources:  Examples of listed components  Test equipment such as multimeter  Matching titles and role cards | Q&A  Matching title and role card task English skills (reading, writing, technical vocabulary) |
| 78  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Quick list task – ask students to list as many appliances as they can fitted in a dwelling requiring water and waste.  Delivery focus:  Tutor to explain the use, location, installation requirements and operation of appliances, including:   * Wash hand basins * Baths * Washing machines * Dishwashers * Water fed fridges * Bidet * Showers * Tutor to use manufacturers instructions and distribute copies for students to examine such as requirements for connection of washing machine. * Discuss the basic requirements for backflow prevention on these appliances. * Show examples of installed appliances and how these are connected to water and waste.   Knowledge Check example:  MCQ knowledge check test to be completed individually before tutor led discussion of answers.  Resources:  PowerPoint presentation  Examples of connected appliances  Knowledge test | List appliances  Q&A  Knowledge test English skills (reading, writing, technical vocabulary) |
| 79  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Introduce WRAS guidance books and ask students to find pages relevant to water meters.    Delivery focus:  Tutor to distribute examples of water meters and discuss their operation and installation requirements.   * Look at manufacturers instructions and discuss the need for suitable valves. * Discuss the need for earth continuity and earth connections. * Discuss the location of drain off valves. * Examine installed meters and discuss any issues.   Knowledge Check example:  Produce a detailed sketch of a water meter installation for a given scenario. Swap sketches for tutor led peer marking.  Resources:  Examples of water meters  Examples of earth connections  Stop taps  Drain valves  WRAS books  Drawing paper, pencils and rulers | WRAS book task  Q&A  Produce water meter installation sketch English skills (reading, writing, technical vocabulary) |
| 80  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Trade magazines and publications introduction. Introduce students to Plumbing and heating trade magazines.  Delivery focus:  Tutor to deliver content on taps and valves, including:   * Taps: Concussive, non-concussive, mixer, pillar and monobloc * Valves: Stop cocks, service valves, gate valves, non-return and check valves, drain off valves, blending valves * Distribute a range of taps and show students working internals. * Tutor to demonstrate the process of installing a tap to a wash hand basin with use of relevant tools.   Knowledge Check example:  Tap and valve identification and use task – students to match taps to type and/or specific uses.  Resources:  Examples of taps and valves  Spanners and tools to disassemble and install components. | Tap and valve matching task |
| 81  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Toolbox talk – Tutor to start by introducing a relevant topic to conduct a toolbox talk as a class before practical session commences.  Delivery focus:  Practical session – Students to position and secure taps to wash hand basins and sinks.   * Tutor to identify wash hand basins, sinks and relevant outlets to allow students in pairs the opportunity to fit the taps in position. * Recap the processes for tap types before monitoring the students and advising as they carry out the task. * On completion and when tutor has inspected then the students should remove the tap so that the pairs can swap to another example.   Knowledge and skill check example:  Install taps at wash hand basins and sinks.  Resources:  Suitable tool kits per appliance  Examples of suitable taps  Relevant PPE | Install taps to appliances |
| 82  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Work experience quick discussion – update on plans and potential opportunities.  Delivery focus:  Tutor to deliver information regarding showers and their connections:   * Electric shower * Mixer shower * Tutor to discuss the difference between the types including the cold water connection differences. * Discuss the need for backflow protection and how the cold water is connected to each type including relevant sizes for supply. * Show examples of showers and discuss centre measurements and the use of adjustable connection on electric showers. * Demonstrate the positioning of a shower and the process of making connections.   Knowledge Check example:  Knowledge test – 10 question quiz based on today’s session including advantages, connection centres, connection materials, making watertight seals and positions.  Resources:  Examples of showers and components  Tape measure  Level  Fixings  Knowledge test | Q&A     Knowledge quiz English skills (reading, writing, technical vocabulary) |
| 83-84  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Long term recall task – Students are to recall one fact each regarding the Scientific principles content before nominating a peer to do the same.  Delivery focus:  Practical session – Install showers in position and make connections.   * Tutor to recap on previous session and discuss the plans for the practical session. * Identify the areas for the installation of the range of showers. * Students are to gather materials and install an electric shower and a mixer shower in pairs or as directed by tutor. * On completion of each shower, students are to remove ready for next groups etc. * Tutor to give feedback on skills and techniques. * Tutor may wish to connect to a live source for testing.   Knowledge and skills check example:  Install showers in position as directed by tutor.  Resources:  PPE  Toolboxes for each pair/group  Jointing materials  Showers  Fittings | Q&A     Install showers English skills (reading, writing, technical vocabulary) |
| 85  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  5 minute discussion regarding types of contractor – Difference between a sole trader and a limited company  Delivery focus:  Cold water components – Water treatment equipment.   * Introduce water treatment types such as softeners and filters. * Discuss the need for these components and the effect of hard and soft water areas. * Discuss water quality and the advantages of filtration systems. * Introduce water treatment products and commercial products such as [Water treatment products | Grundfos](https://product-selection.grundfos.com/uk/categories/water-treatment-products?tab=categories) * [⁣BRITA integrated water filter tap | BRITA®](https://www.brita.co.uk/water-filter-system/water-filter-tap-solutions/integrated-water-filter-tap) * [Screwfix - How to install a BWT water softener](https://www.youtube.com/watch?v=My70NRG9JqQ) * Demonstrate the examples of water softeners and filters and examine as a group. * [How to fit a water softener | How a water softener works](https://www.youtube.com/watch?v=YbOmUzxi3PA) * Tutor to demonstrate the installation of a softener or filter under a sink with the emphasis on tight installation spaces.   Knowledge Check example:  Quick quiz – 10 knowledge questions based on water filters and softeners with tutor led discussion of answers on completion.  Resources:  Examples of water treatment equipment  Video links  Tools for demonstration of installation  Quick quiz | Q&A   Quick quiz English skills (reading, writing, technical vocabulary) |
| 86-87  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Starting point discussion – Students state what they know regarding topic – tutor creates Spider diagram which can be referenced throughout session.  Delivery focus:  Tutor to deliver content of WC and flushing cisterns including:   * WC types * WC connections * Close coupled * Back to wall pans * Enclosed cisterns * Cistern frames * Flushing cisterns * Float operated valves * Tutor to discuss the types, installation requirements, advantages, clearances, connection types and fixing of content. * Demonstrate how to connect a close coupled pan and cistern. * Discuss and examine the flush types of modern and traditional cisterns and the use of siphons and float operated valves. * Set practical task for students to connect a WC pan and close coupled cistern using correct equipment in pairs. * Students may also be tasked with mounting a traditional WC via flush pipe to cistern.   Knowledge Check example:  Quick quiz – students to answer 10 question quiz based on today’s session after completion of practical session.  Resources:  Examples of WC’s and cistern types  Flush pipes  FOV  Siphons  Tools for WC connection  PPE | Q&A         Connect and install WC and cisterns   Quick quiz English skills (reading, writing, technical vocabulary) |
| 88  3 hours  **PPT Available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Recap quiz – quick 5 minute quiz based on fluid categories from previous sessions. Students identify fluid categories from given examples.  Delivery focus:  Using PowerPoint K1.7 Backflow Prevention (Non-mechanical), deliver the following content:   * What is backflow? * What is back pressure? * What is back siphonage? * Types of non-mechanical backflow prevention. * AA, AB, AD, AG, AUK1, AUK2, AUK3, and DC pipe interrupter. * Tutor to show physical examples of each type and discuss measurements.   Knowledge Check example:  MCQ Knowledge test – 15 question knowledge test based on today’s session with peer marking and tutor-led discussion.  Resources:  PowerPoint: K1.7 Backflow Prevention (Non-mechanical)  Examples of non-mechanical backflow prevention  Knowledge quiz | Recap quiz    MCQ Knowledge test English skills (reading, writing, technical vocabulary) |
| 89  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Careers discussion led by tutor. Spend 10 minutes discussing careers options within BSE including apprenticeship opportunities.  Delivery focus:  Tutor to deliver content on mechanical backflow prevention including:   * Mechanical types: BA, CA, DB, EA/EB, EC/ED, HA, HUK1 and HC. * Tutor to distribute backflow prevention devices and discuss their operation and use. * Tutor to show examples of devices fitted in centre and discuss which items are selected relative to water categories.   Knowledge Check example:  Matching card task – students are to match the BFP device image cards to the written description or water category.  Resources:  Back flow prevention devices  Description and image matching cards | Q&A        Matching cards task English skills (reading, writing, technical vocabulary) |
| 90-91  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 Sources and distribution of water  K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Delivery focus:  End of topic consolidation – This session as been added to allow tutors to focus on recap of the Cold Water topic to date.   * Tutors may wish to use time for: * Knowledge tests and recap * Site visits * Practical training and reinforcement * External visits from stakeholders * Student led research and assignment work |  |
| 92-93  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:  Introduction to Hot water content within Outcome 1 and Q&A / discussion regards any previous knowledge of DHW systems.  Delivery focus:  Tutor to deliver content on hot water systems including:   * Introduction to the principles of hot water systems * Vented hot water systems * Principles of open vent pipe * Principles of cold feed and expansion pipe * Purpose and role of storage cistern * Direct cylinders * Immersion heater * Building regulations document G3 basic requirements in schedule 2 * Tutor to discuss the roles of each part of the open vented direct system. * Students to produce sketches of system layouts and label. * Tutor to show real working systems and use task to identify the components.   Knowledge Check example:  Produce sketch of a Direct open vented hot water system with labels.  Complete a short open question paper regarding the roles of system parts.  Resources:  Working DHW systems  Drawing paper, pencils and rulers  Open question paper | Q&A        Sketch system layout  Identify system component parts  Open question paper English skills (reading, writing, technical vocabulary) |
| 94-95  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:  Direct cylinder task – label a direct cylinder image including connections and discuss as a group led by tutor.  Delivery focus:  Tutor to deliver content on Indirect open vented hot water systems, including:   * Indirect hot water cylinders * Basic single coil cylinders * Twin coil cylinders * Primary circuits and basic control * Cylinder thermostats and position * Connection positions * Tutor to discuss layouts, connections, basic controls and positions. * Tutor to show students real working systems and examine dimensions and pipe connections.   Knowledge Check example:  Students to produce system sketches and label before peer marking and tutor led discussion.  Resources:  Examples of indirect cylinders  Cylinder thermostats | Label the direct cylinder   Q&A   Produce sketch English skills (reading, writing, technical vocabulary) |
| 96  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:  Website of the day – introduce students to a relevant website relating to the topic such as www.engineeringtoolbox.com  Delivery focus:  Using PowerPoint K1.7 K1.11 Unvented Hot Water Principles, deliver the following content:  Requirements of Approved document G3 schedule 2   * Principles of water under pressure. * The comparison of components between vented and unvented. * How expansion is managed without the cistern. * Tutor to show images of system layout and discuss how temperature is controlled without open vent. * Discuss the role of T&P valve in comparison to an open vent. * Examine live systems and show component parts for students to try and identify.   Knowledge Check example:  Students are to complete a 10 question knowledge test based on today’s content before peer marking and discussion.  Resources:  PowerPoint: K1.7 K1.11 Unvented Hot Water Principles  Examples of UVHW systems  Knowledge test | Identify components      Complete 10 question MCQ test |
| 97  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Pros and cons – vented vs Unvented: Students may organise a pile of pros and cons under two piles (Vented and Unvented) to represent the pros and cons of each system type.  Delivery focus:  Tutor to deliver content on unvented hot water systems – functional controls, covering the following content:   * Functional controls, their roles and positions * Service valve * Line strainer * Pressure Reducing Valves (PRV) * Check valves * Expansion vessel * Expansion relief valves * Tundish * Provision of balanced cold and hot supply * Tutor to discuss the controls fitted to the mains supply and the cylinder in the correct order. * Students may draw a diagram of the system layout * Examine working systems to see these components in place and distribute examples to discuss in class including composite valves.   Knowledge Check example:  Students are to produce a detailed diagram of an UVHW system and components.  Resources:  Pros and Cons cards  PowerPoint presentation  Examples of working systems  UVHW functional components  Drawing paper, pencils and rulers | Identify Pro’s and Con’s      Q&A  Identify components  Produce diagram English skills (reading, writing, technical vocabulary) |
| 98  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:  Quick recap session – Tutor to use direct questioning to check recall of content from earlier in term such as H&S within BSE  Delivery focus:  Using PowerPoint K1.7 K1.8 UVHW Safety Controls, deliver the following content:   * Safety controls for UVHW systems * Control thermostat * Energy cut-out (ECO) * Temperature and pressure relief valve * Discharge pipework (D1 & D2) * Tutor to discuss the temperature and pressure ranges that these components are required to operate. * Examine these controls installed within a working system. * Tutor to discuss the basic requirements for discharge pipework including termination, materials, diameter and length.   Knowledge Check example:  Students are to complete a written explanation of the function of each safety control along with their relative setpoints.  Resources:  PowerPoint: K1.7 K1.8 UVHW Safety Controls  Examples of safety controls | Q&A     Written explanation English skills (reading, writing, technical vocabulary) |
| 99  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:  Recap – Tutor led discussion and Q&A regarding the purpose of the D1 and D2 pipework.  Delivery focus:  Tutor to cover Hot water systems – Unvented hot water discharge pipework and secondary returns, including the following content:   * D1 pipework dimensions * D2 pipework dimensions * Tundish types * Termination location * Calculation of D2 diameter * Purpose of secondary circuits * Temperature requirements of distribution pipework * Secondary circulation * Secondary pumps * Show images of acceptable and unacceptable termination locations. * Compare working systems to document G3 requirements regarding D1 and D2 lengths. * Explain the methods of calculating D2 pipework diameters. * Allow students time to work through worked examples of D2 calculation. * Discuss the purpose, location and connection of secondary circuits and the use of corrosion resistant circulators.   Knowledge Check example:  Knowledge test including open and MCQ questions based on today’s content. On completion swap papers for peer marking and tutor led discussion.  Resources:  Examples of installed discharge pipework  Knowledge test questions | Q&A    Complete D2 pipework calculations   Knowledge test English skills (reading, writing, technical vocabulary) |
| 100  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:  Quick recap quiz – use online quiz software to play quick quiz relating to content covered so far on Hot water. Spend 10 minutes on recap quiz.  Delivery focus:  Tutor to deliver the following content on Hot water systems – instantaneous water heaters, including:   * Single point water heaters * Under sink water heaters * Multipoint water heaters * Combination boiler * Vented taps * Examine manufacturers information such as [Instantaneous Electric | Heatrae Sadia](https://www.heatraesadia.com/products/cylinders-and-hot-water/instantaneous-electric) * Discuss the difference between inlet control and outlet control. * Examine a range of heaters in position.   Knowledge Check example:   * Knowledge check – identify the types of heater against their best use. Students match the heater image against a description or scenario. * Homework task – investigate how your hot water is generated at home.   Resources:  Online quiz such as Kahoot  Examples or instantaneous heaters  Knowledge check matching task | Quick online quiz           Matching heater to scenario task English skills (reading, writing, technical vocabulary) |
| 101 - 102  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:  Discuss outcome of homework task – how is your hot water generated at home.  Delivery focus:  Hot water systems – Thermostatic mixing valves   * Tutor to show and examine types of TMV and show the components included such as filters, check valves and service valves. * Discuss their location either as system temperature control or at point of use. * Tutor to discuss the temperature setpoints in accordance with legislation and guidance. * Tutor to demonstrate the installation at a wash hand basin. * Tutor to set Practical task for students to install TMV’s at a wash hand basin or simulated outlet including hot and cold pipework and connection to wash hand basin. * Tutor to monitor progress of students and offer advice on skills practice. * On completion tutor to lead with peer examination of work and discussion regards good and bad practice.   Knowledge and skills check example:  Install pipework and TMV at wash hand basin.  Resources:  Examples of TMV’s  Area for installation  Tools and materials including service valves, check valves and hand tools  PPE | Homework task             Practical installation |
| 103  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:   * Guest speaker such as employer or manufacturer to discuss employment opportunities.   Delivery:  Tutor to deliver content on Hot water systems – alternate sources of hot water, including:   * Solar thermal hot water system principles * Basic system layout * Collector types * Pump station * Twin coil cylinder * Thermal stores * Tutor to use working examples and installed systems to explain system layouts and component positions. * Students to identify the parts of a working system and discuss as a group. * Investigate a thermal store unit and students identify the connections.   Knowledge check example:   * Knowledge test – MCQ and open question paper based on the session content.   Resources:  Examples of working or installed systems  System components  MCQ knowledge test | Q&A        Identify components and connections   Knowledge test English skills (reading, writing, technical vocabulary) |
| 104  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:   * Tutor summary of progress and content covered to date with Q&A on Hot water content covered.   Delivery:  Summary of content for Hot water systems – Recap and knowledge check:   * Tutor to set a knowledge assessment for content covered relating to hot water systems. * Examples may be Mock exam paper, open questions , scenario based questions or written assignment task. * Tutor to gather work produced for marking and feedback in next session.   Knowledge check example:   * Progress assessment to cover content on Hot water systems to date. Tutor to feedback in next session. | Q&A    Progress assessment – Hot water English skills (reading, writing, technical vocabulary) |
| 105  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems | Activity:  Starter task example:   * Feedback on progress assessment. * Introduction to new content – Heating systems   Delivery:  Introduction to Heating systems - Wet central heating:   * Tutor to ask students to work in pairs to create a mind-map examining what terms and knowledge they may already have regards the provision of heating within a dwelling or building and discuss as a group. * Tutor to introduce the principle of wet central heating and the use of water to transfer heat to emitters. * Use diagrams and sketches to introduce a basic one pipe circuit and discuss the principles and drawbacks. * Discuss pipe sizes and reduction in diameter. * Students to produce their own sketch and label. * Students to consider how the issue of circuit cooling could be overcome which leads into the next stage – 2 pipe systems. * Discuss the terms LTHW and how an open vent is used to keep the system below 100’c.   Knowledge check example:   * Short knowledge MCQ test based on today’s session * Homework task – research task – find out about 2 pipe system ready for next session.   Resources:  Drawing paper  Pencils  rulers | Q&A – Mind map   Knowledge test English skills (reading, writing, technical vocabulary) |
| 106  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Students to feedback the information they discovered in homework task from previous session   Delivery:  Using PowerPoint K1.7 K1.8 Open Vented Heating Systems, deliver the following content:  Roles of open vent pipe, cold feed and expansion pipe and F&E cistern   * Open vent pipe requirements such as height and diameter * Two pipe system layouts * Role of the circulator * Advantages of 2 pipe vs 1 pipe systems * Tutor to show students examples of system layouts in centre for students to identify * Students to produce sketch of two pipe open vented system with labels   Knowledge check example:   * Tutor to use quiz software such as Kahoot to check students understanding of content from the session   Resources:  PowerPoint: K1.7 K1.8 Open Vented Heating Systems  Paper, pencils and rulers  Examples of 2 pipe systems  Knowledge quiz online | Homework task           Produce sketch   Online knowledge quiz English skills (reading, writing, technical vocabulary) |
| 107  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Quick recap – students to state one fact from previous session before nominating a peer to do the same   Delivery:  Tutor to deliver content on Heating systems – Sealed heating systems, including:   * Sealed heating system overview * Need for expansion vessel and safety controls * Method of filling the system – filling loops * Discuss the system layout and mains cold water connection * Distribute filling loop examples and discuss the requirement for disconnection after filling * Discuss the advantages of sealed vs open vented and the removal of the need for open vent and F&E Cistern * Discuss the term LPHW, MTHW and the relationship between temperature and pressure * Show students an example of a working system and set a task for students to identify the different pipes and components   Knowledge check example:   * Students to sketch a diagram of the system and label components. Students to swap for peer marking and feedback   Resources:  Examples of sealed heating system  Filling loop  Drawing paper, pencils and rulers | Q&A recap    Identify components   Produce diagram  Peer feedback English skills (reading, writing, technical vocabulary) |
| 108  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Introduce students to the term ‘Sundial plan, by sharing the following link [Honeywell\_H\_Controls\_Wiring\_Guide.pdf](https://www.wolseley.co.uk/wcsstore/ExtendedSitesCatalogAssetStore/images/products/AssetPush/DTP_AssetPushHighRes/std.lang.all/ui/de/Honeywell_H_Controls_Wiring_Guide.pdf)   Delivery:  Tutor to discuss Heating systems, System layouts, and the S Plan system, covering the following content:   * The need for heating and hot water control * The operation of 2 port valves * System configuration * The controls required for operation * Tutor to use images and examples of S plans such as Honeywell wiring boards to demonstrate the system in operation. * Discuss the need and principles for the controls and how the system is controlled for temperature and time. * Students to produce a diagram sketch of the system   Knowledge check example:   * Students to produce a step by step explanation of how the S Plan system operates and how control is achieved before discussing in tutor led discussion   Resources:  Examples of 2 port valves  Working s plan systems  Drawing paper, pencils and rulers | Produce sketch of system layout    Produce step by step operation guide |
| 109 -110  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Recap of previous session to cover S plan systems – Q&A or peer to peer questions   Delivery:  Tutor to deliver content on Heating systems – Heating circuit detail, including:   * The typical pipe sizes used in central heating systems. * The importance of pump positioning. * Positive and negative pressures created by pump. * The zoning and control requirements of central heating systems in accordance with statutory legislation. * Tutor to refer to the S Plan system from previous session to introduce the principle of zoning and discuss the legislation referring to maximum areas. * Discuss the typical pipe sizes and examine systems in centre to compare. * Examine pump position diagrams and discuss impact of pump position. * Work through given examples of pump positions to determine pressure in system examples. * Students to produce diagram of S plan system but this time identify pipe sizes and positive and negative pressures within the system.   Knowledge check example:   * Knowledge assessment open questions to cover content from the session.   Resources:  Working system examples  System diagrams and schematics  Open question assessment paper | Q&A    Worked examples – pump positions  Produce detailed drawing    Open question assessment English skills (reading, writing, technical vocabulary) |
| 111-112  6 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Work related activity – tutor to spend 5-10 mins leading activity where students identify what makes someone employable.   Delivery:  Using PowerPoint K1.7 K1.8 Fully Pumped Heating Systems\_ S, Y, W Plan, deliver the following content:   * Fully pumped, 3 x two port valves (S plan+) * Fully pumped, 3 port valve (mid position/diverting) (Y/W plans (PDHWS)) * Arrangements of zones * Control principles * Operation of 3 port diverting and mid position valves. * Tutor to discuss schematic layouts and diagrams. * Examine working or installed systems for students to try and identify the components and pipes. * Students to sketch the system layouts and label. * Students to produce written step by step control methodology of the system operation.   Knowledge check example:   * Complete the incomplete diagrams showing correct system layout for S, S+, Y and W plans before swapping for tutor led peer marking ad feedback   Resources:  PowerPoint: K1.7 K1.8 Fully Pumped Heating Systems\_ S, Y, W Plan  Schematic diagrams  Drawing paper pencils and rulers  Examples of working systems  Incomplete drawings | Q&A   Produce system diagrams  Identify components  Complete the incomplete layout diagrams English skills (reading, writing, technical vocabulary) |
| 113-114  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Long term recall Q&A – Recall of knowledge from Hot water content – Each learner to state one fact based on hot water systems before nominating a peer.   Delivery:  Tutor to deliver content on Heating systems – Large system layouts and control, including:   * Constant temperature systems * Variable temperature systems * Multiple boiler installations * Low loss headers * Tutor to discuss the need for larger systems and identify the difference between CT and VT including 3 port valve position in relation to pump. * Look at 3 port mixing and diverting valves and identify the difference in ports. * Students to label the ports (a, b, ab) of mixing and diverting valves. * Examine multiple boiler / modular boiler installation and discuss the advantages vs single large boiler. * Discuss the position of AAV’s and drain off valves on header installations.   Knowledge check example:  Knowledge test based on session content including MCQ, open questions and diagram based questions.  Resources:  Schematics of CT and VT installations  Examples of 3 port mixing and diverting valves  Examples of headers and installed systems  Knowledge test | Q&A    Knowledge test            Identify valve ports English skills (reading, writing, technical vocabulary) |
| 115  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Introduction to AI software for study. Tutor to introduce quick examples of AI software and lead 10 minute discussion regarding its use within study and work.   Delivery:  Tutor to deliver content on Heating systems – Microbore systems, including:   * Microbore pipe sizes * Manifolds * Pipework distribution * Tutor to distribute examples of microbore pipe and fittings. * Examine manifolds and discuss the maximum number of emitters allowable per manifold including pipe lengths. * Examine installed systems and discuss layout.   Knowledge check example:   * Students to produce sketch of microbore system layout for a given scenario set by tutor.   Resources:  Examples of microbore pipework and fittings  Examples of manifolds  Working systems  Drawing paper, pencils and rulers | Q&A        Produce system diagram English skills (reading, writing, technical vocabulary) |
| 116  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Start by watching video relating to Plumbing industry such as [Should You Become a Plumber / Gas Engineer / Apprenticeship v Fast Track Plumbing](https://www.youtube.com/watch?v=sx538iI6rys) and discuss as a group   Delivery:  Tutor to deliver content on Heating systems – Underfloor heating systems, including:   * Principles of underfloor heating systems * Advantages of heat distribution * Temperatures * Installation processes * Control of temperature and zones * Materials * Tutor to deliver information using PowerPoint and videos where required such as [How Does Underfloor Heating Work? – Wunda](https://www.wundagroup.com/journal/2022/03/07/how-does-underfloor-heating-work/?utm_campaign=PMX&utm_source=google&utm_medium=cpc&gad_source=2&gad_campaignid=20424275684&gclid=Cj0KCQjw0qTCBhCmARIsAAj8C4boZA8MJcwmIG6lLNSEMaCrL5HK-fgedLQh8ZdwZraBS8T6WmhI1K4aAv_JEALw_wcB), [(23) Plumbing - How Does Underfloor Heating Work - YouTube](https://www.youtube.com/watch?v=2OzImGhXRtI), [(23) How to Lay Underfloor Heating in a Screed - YouTube](https://www.youtube.com/watch?v=tkKWQ-MFy3w) * Tutor to show examples of installed systems including the trays and different systems for varied floors. * Distribute plastic pipework types to examine and examine manifolds. * Discuss the methods of room control and temperature distribution. * Tutor to give demonstration of connecting pipework to manifolds.   Knowledge check example:   * MCQ test based on session content completed in small groups or pairs before tutor led discussion of answers as a group.   Resources:  Examples of UFH pipework  UFH Manifolds  Installation tools for jointing to manifold  MCQ knowledge test | MCQ knowledge test English skills (reading, writing, technical vocabulary) |
| 117  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:   * Recap from previous session – Q&A based on UFH delivery.   Delivery:  Using PowerPoint K1.7 K1.8 K1.11 Boilers, deliver the following content:   * Heat only boiler * System boiler * Combination boiler * Principles of each * Installation methods * System suitability * Advantages and disadvantages of each type * Tutor to show examples of working systems and set tasks for students to identify layouts and components * Students to discuss advantages and disadvantages of each type * Tutor to show examples of manufacturers websites to look at ranges such as [Boilers | Worcester Bosch](https://www.worcester-bosch.co.uk/products/boilers)   Knowledge check example:   * Knowledge check using statements referring to each boiler type allowing students to identify boiler type or scenarios in which students can select a suitable boiler   Resources:  PowerPoint: K1.7 K1.8 K1.11 Boilers  Examples of fitted boilers and systems  Manufacturers instructions  Knowledge check scenarios | Q&A      Identify boilers and components     Scenario based knowledge check English skills (reading, writing, technical vocabulary) |
| 118  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:   * Mind map activity – how can heat be generated without gas – students work in small groups to create ideas before feeding back into class led by tutor   Delivery:  Using PowerPoint K1.7 K1.8 K1.11 Air Source Heat Pumps & Electric Boilers, deliver the following content:   * Air source heat pumps * Electric boilers * Basic principles of refrigerant cycle * System layouts * Limitations and advantages of both * Tutor to highlight the principles of basic refrigeration cycle and how heat is generated * Examine examples of heat pump units and discuss the heat exchange process [Air Source Heat Pumps explained - YouTube](https://www.youtube.com/watch?v=vOFyigsT5PY&t=3s) * Discuss temperatures and how the systems are coupled * Examine an example of an electric boiler and discuss its operation and control [[Futurebuild 2025] Combi Boilers - Electric Combi Boilers Company](https://www.youtube.com/watch?v=hIMm2LZdWr8)   Knowledge check example:  Online quiz for students to complete either in small teams or individually such as Kahoot based on today’s content.  Resources:  PowerPoint: K1.7 K1.8 K1.11 Air Source Heat Pumps & Electric Boilers  Examples of ASHP and Electric boilers to examine  Online quiz | Group work and feedback session          Online quiz English skills (reading, writing, technical vocabulary) |
| 119  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * List advantages and limitations for the heat generation sources covered to date including Combination boiler, System boiler, Traditional boiler, ASHP and Electric boiler in small groups before tutor led discussion.   Delivery:  Tutor to deliver content on Heating systems – District heating and heat interface units, including:   * District heating systems * Heat Interface Units (HIU) * Distribution system * Heat generation * Pipework sizes and installation methods * Tutor to discuss examples of operational systems within the UK and discuss the advantages and limitations financially, environmentally and in function. * Look at examples using videos such as: * [What is District Heating](https://www.youtube.com/watch?v=40nC_OB5s3E) * [Kozanlar HIU-Heat Interface Units](https://www.youtube.com/watch?v=jkJpsQXVy7o&t=41s)   Knowledge check example:   * Students to create a brief overview of system operation in a written short assignment including advantages and limitations   Resources: | List advantages and limitations in groups            Written work task |
| 120  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Guest speaker from manufacturer such as appliance or electric heaters to discuss their product.   Delivery:  Tutor to deliver content on Heating systems – Warm air heating and storage heaters, including:   * Use of warm air heating systems * Electric storage heaters * Advantages and limitations of each * Tutor to deliver information relating to the principles of each system. * Discuss the distribution of air and ductwork location. * Make students aware of the off peak electrical demand and the control of temperature and use video links where applicable [How To Use Electric Storage Heaters - British Gas](https://www.youtube.com/watch?v=UeB3Xf_qKvA)   Knowledge check example:   * Fact match task – students match fact cards to either warm air heaters or storage heating solutions.   Resources:  Fact match cards | Fact match task |
| 121-122  6 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  S2.19 Position and secure components in plumbing system  S2.13 Install components to heating appliances | Activity:  Starter task example:   * Knowledge recap – Heating system layouts – Students to sketch a simple 2 pipe heating system before comparing and peer feedback.   Delivery:  Using PowerPoint K1.7 K1.8 Circulating Pumps, deliver the following content:   * Pump principles * Types of circulator * Impeller design * Pump orientation * Pump positions within the system * Tutor to distribute examples of pumps which can be split down into component parts to expose impeller and motor components * Look at manufacturers instructions and discuss pump orientation [MAGNA3 Installation and Operating Instructions—Page 2](https://magazines.grundfos.com/Grundfos/SU/UK/magna3-installation-and-operating-instructions/?page=2) * Examine a range of manufacturers to become aware of different designs * Show examples of pumps in position in centre and discuss the effect of positive and negative pressure within the system * Tutor to demonstrate the installation process by removing and replacing a pump in position. * Set tsk for students in pairs to install a small pump on a decommissioned system   Knowledge and skills check example:   * Pump assessment paper including MCQ, orientation scenarios and connections * Students to install a pump in pairs   Resources:  PowerPoint: K1.7 K1.8 Circulating Pumps  Examples of circulating pumps  Manufacturers instructions  Tools relevant to pump installation  Knowledge assessment paper | Sketch 2 pipe system  Q&A      Install pump  Knowledge assessment paper English skills (reading, writing, technical vocabulary) |
| 123  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Recap Q&A - State one fact from previous session before nominating a peer to do the same   Delivery:  Tutor to deliver content on Heating systems – System components, including:   * Expansion vessels * Buffer vessels * Anti gravity valves * Pressure gauges * Pressure relief valves * Magnetic filters * Drain valves * Corrosion filters * Expansion joints and expansion within the system * Tutor to distribute examples of the components and examine components within an installed system. * Look at manufacturers websites and literature. * Students to identify locations within system diagrams where components should be located.   Knowledge check example:   * Match the component description to the image or component.   Resources:  Examples of components  Examples of installed systems  Manufacturers literature  Matching description task cards or worksheet | Q&A            Identify component positions    Match the description task English skills (reading, writing, technical vocabulary) |
| 124  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Long term recall task – Students to state examples of how heat is transferred using plumbing and heating examples.   Delivery:  Tutor to deliver content on Heating systems – Heat emitters, including:   * Bespoke heat emitters * panel radiators * column radiators * low surface temperature radiators * fan convectors * plinth heaters * towel warmers * Dressing of radiators * Heat distribution * Valves * Connection types (TBOE, BOE) * How to hang a radiator including measurements and levelling. * Tutor to show examples of each type and discuss their suitability against a range of properties and scenarios. * Discuss surface temperatures and safety. * Discuss and demonstrate the process of dressing a radiator with air vent, plugs and valves. * Discuss the heat distribution or various types and the connections including TBOE and BOE.   Knowledge check example:   * MCQ Knowledge test based on today’s sessions   Resources:  Examples of heat emitter types  Radiator valves  Tape measure and level  Radiator and brackets  MCQ assessment | Q&A                MCQ test English skills (reading, writing, technical vocabulary) |
| 125 - 126  6 hours | Outcome 2 Install plumbing and heating systems | S2.19 Position and secure components in plumbing system  S2.12 Install heat emitting devices  S2.16 Install seals for heat emitting devices | Activity:  Starter task example:   * Toolbox talk – use of hand tools delivered by a selected learner   Delivery:  Practical session – Radiator installation   * Tutor to recap the process of hanging a radiator to a set height and position. * Tutor to give specific dimensions to students for the position and guidance on the connection types. * Students are to dress a radiator and install on a surface. * Students are to connect pipework to valves as directed by tutor.   Knowledge and skills check example:   * Install radiator and give peer review of others work.   Resources:  Hand tools  PPE  Radiators  Radiator valves  Jointing materials  Tape measures  Spirit levels | Toolbox talk Q&A      Install radiators and pipework English skills (reading, writing, technical vocabulary) |
| 127  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Tutor led discussion – Opportunities for work experience and employer engagement.   Delivery:  Heating systems – Protection of heating systems including:   * Insulation * Frost protection * Water treatment * Inhibitor * Flushing agents * Sludge remover * Cleansers * Tutor to distribute a range of insulation types. Discuss requirements for insulation of heating and hot water systems in line with British Standards. * Examine frost thermostats and discuss temperatures for protection. * Show an example of chemical system protectors and examine manufacturers websites to look at ranges and use videos to examine protection techniques [Videos - Fernox UK](https://fernox.com/videos/).   Knowledge check example:   * Use multiple choice knowledge test or online quiz such as Kahoot to check knowledge from session.   Resources:  Examples of insulation materials  Examples of frost thermostats  Chemical inhibitors and treatments | MCQ test or online quiz English skills (reading, writing, technical vocabulary) |
| 128-129  6 hours  **2 PPTs available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.10 Types of control systems required for plumbing systems  K1.14 Safety devices  applicable to heating  systems | Activity:  Starter task example:  Delivery:  Using PowerPoints K1.7 K1.8 K1.10 K1.14 Control Components (Parts 1 & 2), deliver the following content over two sessions:   * radiator valves – thermostatic and manual valves * thermo-mechanical cylinder control valves * programmer * timer * thermostats * programmable room stat * optimizer * weather compensation * optimum start * night set back * frost stat * wiring centre * cylinder stat * automatic by-pass * pump control unit * smart controls * solenoid valves * overheat thermostats * control thermostats * Tutor to discuss temperatures involved for thermostat and overheat thermostats to operate. * Tutor to show examples of control components and discuss how they effect the system operation. * Discuss location of controls for efficient operation and the basic principle of control relating to open and closed loop control. * Examine manufacturers websites to look at range of controls. * Use Building regulation Document L and BS7593 to discuss the Zoning requirements for heating systems. * Set task for students to produce short 10 minute presentation in small groups based on a given control component this will be delivered in next session.   Knowledge check example:   * Produce 10 minute presentation for next session in small groups   Resources:  PowerPoint: K1.7 K1.8 K1.10 K1.14 Control Components (Part 1)  PowerPoint: K1.7 K1.8 K1.10 K1.14 Control Components (Part 2)  ILT equipment  Examples of control components |  |
| 130  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.10 Types of control systems required for plumbing systems | Activity:  Delivery:  Student group presentations – Controls for heating systems   * Each small group to present a 10 minute presentation based on an element of control systems as directed by tutor. * Students to give feedback on each presentation and tutor to lead and advise technically where required. * On completion Tutor to feedback regards technical content and quality of presentation   Resources:  ILT equipment  Projector | Deliver short presentation |
| 131  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems | Activity:  Starter task example:   * Long term recall task – students to state facts related to pressure before nominating a peer to do the same.   Delivery:  Heating systems – Procedures for filling and venting the heating system including:   * Sealed systems * Open vented systems * AAV * Manual air vents * Filling loops * F&E cisterns * Step by step procedure for filling and venting * Tutor to show students the procedure for filling and venting both system types * Look at specific appliances such as combination boilers with integral filling loops * Allow students to take part in process * Discuss AAV and manual vents * Identify where air locks could occur in open systems * Discuss pressure for filling sealed systems   Knowledge check example:   * Students to produce a step by step method statement for filling a heating system and removing air.   Resources:  Examples of systems to demonstrate filling and venting  AAVs | State facts regarding pressure     Produce step by step guide to filling and venting systems |
| 132-133  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | 2.13 Install  components to  heating appliances  2.14 Install controls  into a range of  heating systems | Activity:  Starter task example:   * Toolbox talk session – Spend 10 minutes discussing a suitable element of safety relating to the session. Nominate a learner to state safety aspects.   Delivery:  Practical session – Install controls and components to heating systems - This session allows students to practice their installation skills in a practical environment.  Install controls and components into existing systems or pipework arrangements such as:   * Diverter valves * Safety controls * Automatic air vents * Circulating pumps * radiator valves – thermostatic and manual valves * thermo-mechanical cylinder control valves * programmer * timer * thermostats * programmable room stat * optimizer * weather compensation * optimum start * night set back * frost stat * wiring centre * cylinder stat * automatic by-pass * pump control unit * smart controls * solenoid valves * Students are to work in small groups or pairs as directed by tutor and work to given specifications by tutor. * Once each task is complete students may strip back down before swapping task with another peer group.   Knowledge and skills check example:   * Install components and controls in a controlled environment.   Resources:  PPE  Suitable hand and power tools  Systems and system pipework for installation  Controls and components as required | Q&A      Install components and controls English skills (reading, writing, technical vocabulary) |
| 134-135  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | 2.13 Install  components to  heating appliances  2.14 Install controls  into a range of  heating systems | Activity:  Starter task example:   * Recap Q&A – Tutor led discussion and direct questions regarding the filling processes for open and sealed systems.   Delivery:  Practical session – Install controls and components to heating systems, fill and vent the system:   * In this session students will continue from previous practical session based on a range of controls and components. * Students will fill and vent a system as part of the completion of the task. * Students to produce a step by step procedure before filling and venting which tutor must check before commencement. * Tutor to specify which system to fill and vent and supervise whilst charging and venting the system.   Knowledge and skills check example:   * Practical tasks - Install components, install controls, produce step by step procedure and fill and vent the system.   Resources:  PPE  Hand tools  Power tools  Controls and components as required  Systems of pipework for installation process |  |
| 136  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7, K1.8, K1.10, K1.11, S1.12, S1.13, S1.14, S1.16, S1.17, S1.18, S1.19 | Activity:   * A self study and reflection session has been added here as the formal Information and data element of the Heating system delivery is completed. * This time may be used for tutors to assess knowledge and understanding of the content covered so far, offer feedback or for students to complete their own reflection or deeper study. |  |
| 137  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Recap and skills refresher task – Calculate scales on quick examples using scale rulers   Delivery:  Using PowerPoint K1.7 K1.8 Below Ground Drainage Systems, deliver the following content:   * The need for drainage systems * Pipe sizes and components of below ground drainage * Falls and gradients * Combined system layout * Discuss requirements and building regulations relating to drainage, rainfall and surface water. * Examine common pipe sizes, parts and fittings including traps and gulleys. * Discuss falls and the need for gradients. * Show students typical layouts and the requirements for connections to a combined drain in line with Building regulations. * Students to discuss the difference between rainwater and water taken from appliances giving the impact on the environment where this water is discharged.   Knowledge check example:   * Students to produce a sketch of a combined system and label all parts including depths and components.   Resources:  PowerPoint: K1.7 K1.8 Below Ground Drainage Systems  Building Regulation document H  Below ground drainage pipework and fittings  Gulleys and traps  Drawing paper, pencils and rulers | Calculate scale               Q&A          Produce labelled diagram Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 138  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Quick calculation task – calculate the fall for a drain using tutor given scenarios.   Delivery:  Tutor to deliver content on Below ground drainage systems – separate and partially separate drainage systems, including:   * System arrangements * Comparison to combined system * Pro’s and Con’s of each system type in relation to dwelling type, location and regulations. * Tutor to distribute block plans and drawings to examine dwellings and local area drainage layouts. * Students to state pros and cons of the 3 individual systems for given scenarios in classroom discussions.   Knowledge check example:   * Knowledge test paper – Below ground drainage system types and requirements. Students to work individually to complete the test before tutor led discussion of answers.   Resources:  Examples of block plans and drawings  Knowledge test paper | Calculation task       Q&A – Pro’s and con’s    Knowledge test paper English skills (reading, writing, technical vocabulary) |
| 139  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  S2.19 Position and secure components in plumbing systems  S2.2 Prepare a safe working environment to conduct plumbing and heating system installation | Activity:  Starter task example:   * Toolbox talk – Use of Chemicals and COSHH. Learner nominated to deliver safety information relating to using chemicals relevant to today’s session or as required.   Delivery:  Practical session – Below ground drainage systems and components   * Tutor to give demonstration of techniques used to cut and joint below ground drainage components including: * Pipework * Tee and elbow fittings * Gulley and traps * Students to carry out small task to cut pipe to length, file and make up fittings to size * Students to state the required fall for the specific length made.   Knowledge check example:   * Students to produce practical pipework and component pieces to set dimensions and state the required fall.   Resources:  PPE  Drainage pipework  Fittings  Lubricants  Tape measures  Levels  Suitable tools | Q&A Toolbox talk    Cut pipework to length   Connect fittings and components Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 140  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.12 Types of  waste and waste  products and the  associated systems  and attributes | Activity:  Starter task example:   * Quick chain quiz – Tutor Q&A direct questions focussing on previous content in which students have to make a chain of correct answers by nominating a peer to answer the next question.   Delivery:  Tutor to deliver content on Below ground drainage systems – Soakaways, cesspits and septic tanks, including:   * Soakaways * Cesspits * Septic tanks * Building regulations relevant to installation and maintenance * Use videos to support delivery [How Does A Soakaway Work](https://www.youtube.com/watch?v=dCgjUrQMJ3w) and [Build a DIY Soakaway in a Day! Solving Rainwater Runoff Problems](https://www.youtube.com/watch?v=mDq20vU1P14) * Where possible examine examples of installations in centre * Discuss regulations and impact on the position of cesspits and septic tanks   Knowledge check example:   * Missing blanks quiz – students complete passages relating to today’s content by adding the missing phrases or information   Resources:  Links to videos  Missing blanks exercise sheets | Q&A          Missing blanks exercise English skills (reading, writing, technical vocabulary) |
| 141  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  S2.19 Position and secure components in plumbing systems | Activity:  Starter task example:   * Work experience update – discuss work experience as a group and tutor to identify further opportunities available to students   Delivery:  Sanitation systems – Pipework, fittings and components   * Tutor to distribute and discuss the range of pipework, materials and components used within above ground drainage systems including: * Pipework materials and range of sizes 1 ¼”, 1 ½”, 2” and soil pipe 110mm and 160mm * Solvent weld pipe * Push fit pipe * Fitting types * Solvent weld fittings * Push fit fittings * Compression fittings * Tutor to identify the use and limitations of each including cutting and jointing methods. * Students to name all components in team exercise where they must label each component part. * Use links to websites to look at typical ranges [Waste Pipe Fittings | Drain Pipe Fittings | Wolseley](https://www.wolseley.co.uk/drainage/waste-pipe-and-fittings/)   Knowledge and skills check example:   * Practical task - Students to cut short pieces of waste pipe to length and join using specified fittings.   Resources:  Range of above ground drainage pipework materials and fittings  Pipe cutters  Saw  Tape measures  Files  PPE | Identify components team task     Cut and connect waste pipe task Maths skills (measurement, scale, calculation, costing) |
| 142  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Discussion relating to articles and latest news within Plumbing and heating Industry magazines.   Delivery:  Tutor to deliver content on Sanitation systems – Primary ventilated stack systems, including:   * System components * System principles * Stack location and dimensions * Tutor to distribute components such as bosses and pan connectors * Students to sketch system and dimensions with labels.   Knowledge check example:   * Online quiz as individuals or teams as directed by tutor based on today’s session content   Resources:  Stack system fittings | Q&A    Produce layout diagram    Online Quiz English skills (reading, writing, technical vocabulary) |
| 143  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Quick quiz – short MCQ question set to check retention of information from previous session. Tutor to lead discussion regarding the answers   Delivery:  Tutor to deliver content on Sanitation systems – Secondary ventilated stack systems and Ventilated branch discharge systems, including:   * System components * System principles * Stack location and dimensions * Identify connection clearances and zones where stack connections are permitted. * Students to sketch system and dimensions with labels. * Examine installed systems and look at stack connection locations.   Knowledge check example:   * Installation process statement – Students to produce a written step by step process statement to describe the installation requirements including clearances and dimensions.   Resources:  Examples of installed systems | MCQ     Produce drawing     Produce installation statement |
| 144  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * Review of process statements produced by students in previous session in peer discussion   Delivery:  Tutor to deliver content on Sanitation systems – Stub stack systems, including:   * System components * System principles * Stack location and dimensions * Identify connection clearances and zones where stack connections are permitted. * Students to sketch system and dimensions with labels. * Examine installed systems and look at stack connection locations.   Knowledge check example:   * MCQ knowledge check based on all the above ground sanitation systems covered in recent sessions. On completion swap papers for tutor led discussion and peer marking   Resources:  Examples of installed systems | Q&A       Produce layout diagram       MCQ knowledge test English skills (reading, writing, technical vocabulary) |
| 145-146  6 hours | Outcome 2 Install plumbing and heating systems | S2.20 Prepare a safe working environment to conduct plumbing and heating system installation  S2.19 Position and secure components in plumbing system  S2.2 Select tools, equipment and materials  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:   * Toolbox talk – working at with power tools. Tutor to nominate a learner to talk through processes with group.   Delivery:  Practical session – Above ground drainage system installation   * Tutor to identify the specification for session regarding dimensions, layout and system type. * Students to work in small groups to install a sanitation system such as: * Primary ventilated stack system * Secondary ventilated system * Stub stack system * Students to select materials and equipment required for the installation * Students to fabricate, position and fix the system into place * On completion, each team is to measure and mark a peer groups work before feeding back in group discussion.   Resources:  PPE  Installation drawings  Tools relevant to installation  Tape measures  Spirit levels | Install sanitary system pipework |
| 147  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.12 Types of waste and waste products and the associated systems and attributes | Activity:  Starter task example:   * Long term recall task – Short quiz based on systems coverage up to date. 10-12 questions before peer marking and discussion.   Delivery:  Rainwater systems – Principles of rainwater collection   * Tutor to discuss the content relating to rainwater systems within Building regulations document H and examine the document with students. * Discuss rain intensity and charts relating to rain fall by region. * Discuss the principles of calculating rainwater fall in the UK. * Demonstrate the process of calculating roof areas for rainwater systems. * Students to calculate rainfall quantity and roof areas in given scenarios.   Knowledge check example:   * Scenario based questions – students calculate rainfall and answer scenario questions relating to rainwater system principles.   Resources:  Building Regulation Document H  Rainwater charts  Scenario based questions | Systems quiz         Calculate roof area  Calculate rainwater quantity       Scenario questions Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 148  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.16 Scientific principles and concepts to plumbing engineering | Activity:  Starter task example:   * Crossword task – Students identify words and phrases relating to sanitation systems.   Delivery:  Rainwater systems – Gutters and downpipes   * Tutor to distribute a range of gutter profiles and discuss the need for deep profile types. * Demonstrate the process connecting and discuss the expansion joints. * Explain how expansion can be calculated and discuss coefficients for plastic. * Demonstrate how to calculate fall and offer examples for students to calculate. * Discuss fittings including running outlets and end caps and discuss the common sizes for downpipes. * Look at and examine brackets and the process of installing brackets at correct distances. * Use an installed example to check for correct fall and bracket centres as a group.   Knowledge check example:   * Set task for students to quantify the correct materials for the installation of gutters and downpipes for a given scenario. Learner should also identify the correct fall for the given example. On completion swap for peer marking with tutor led discussion.   Resources:  Examples of Gutter profiles  Rainwater fittings  Rainwater brackets  Tape measures  Spirit level | Crossword task     Calculate falls and gradients      Quantify materials Maths skills (measurement, scale, calculation, costing) |
| 149-150  6 hours | Outcome 2 Install plumbing and heating systems | S2.20 Prepare a safe working environment to conduct plumbing and heating system installation  S2.19 Position and secure components in plumbing system  S2.2 Select tools, equipment and materials  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:   * Toolbox talk – Working at height. Tutor to nominate a learner to lead on toolbox talk relating to work at height.   Delivery:  Practical session – Install rainwater systems including guttering and downpipes.   * Tutor to give demonstration of installation techniques using students to help demonstrate. * Tutor to set task for students to install gutters, brackets and downpipes in small groups or pairs as necessary. * Tutor to provide a suitable diagram including dimensions. * Students to list and collect all relevant tools and materials. * Learner to work in pairs or groups to install the components to the correct dimensions as per the diagram. Ideally the installation location is a replicated area at low level. * On completion tutor to discuss the process of performance testing before carrying out supervised test where suitable to do so. * On completion students are to disassemble the system   Knowledge and skills check example:   * Students to install a rainwater system including gutters, brackets and downpipes before carrying out a performance test.   Resources:  PPE  Tape measures  Spirit level  String lines  Gutters  Brackets  Outlets and fittings  Relevant tools  Drills  Fixings | Q&A   Toolbox talk   Practical installation English skills (reading, writing, technical vocabulary) |
| 151  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems | Activity:  Starter task example:   * CV writing discussion – Tutor to discuss the best practices regards CV writing.   Delivery:  Tutor to deliver content on Rainwater harvesting and grey water re-use systems, including:   * Rainwater harvesting systems: * Storage * Filtration * Uses * Greywater systems: * Storage * Filtration * Uses * System controls * Implications on the environment * Tutor to highlight the system layouts and locations of components. * Tutor to use videos and links to support explanations including [What's the best rainwater harvesting system for me?](https://www.youtube.com/watch?v=-HdVPCF4m1w) [Rainwater Harvesting & Greywater Recycling | Stormsaver](https://www.stormsaver.com/) * Tutor lead discussion regarding the advantages and disadvantages of reusing waste water.   Knowledge check example:   * MCQ knowledge test to be completed individually before tutor led discussion of answers.   Resources:  MCQ knowledge test | Q&A      MCQ knowledge test English skills (reading, writing, technical vocabulary) |
| 152-153  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.12 Types of waste and waste products and the associated systems and attributes | Activity:  Delivery:   * This session is intended to allow students to carry out further reading or complete assessments or assignments as per tutor requirements. * Tutor may wish to set short tasks or issue work to complete based on above and below ground drainage systems, rainwater systems and all relevant components. * Tutor may also wish to use this time to arrange guest speakers or visits. |  |
| 154  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.9 Factors that affect the choice and suitability of components in a plumbing and heating system | Activity:  Starter task example:   * Industry magazine article discussion – Tutor to highlight a new article relating to Industry and discuss with group.   Delivery:  Factors that affect the choice and suitability of components in a plumbing and heating system –   * appliances * purpose * size * location * temperature * flow rate * pressure * environmental * customer needs * cost * end users’ needs * building regulation requirements * occupants * fuel availability * local availability * Tutor to discuss the implications on poor system and component selection regarding plumbing and heating systems. * Distribute flip chart paper and board pens for group task - Students to use group work to list the effect of poor system and component selection may have on business and the client. * Tutor led feedback from initial discussions. * Tutor to lead group work session in which each group is given a small number of the factors each to consider before working as a group to give examples of each and how they can be checked and the impact these factors may have. * Feedback in tutor led group discussion session.   Knowledge check example:   * Group work session with tutor led feedback.   Resources:  Flip chart paper  Board pens | Group work task |
| 155-156  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.9 Factors that affect the choice and suitability of components in a plumbing and heating system  S2.17 Check heating products are in accordance with design parameters | Activity:  Starter task example:   * Group task – Why is it important to confirm products are in accordance with design parameters? Groups to create list and then Discuss as a class.   Delivery:  Tutor to identify and discuss relevant design parameters for plumbing and heating products including:   * temperature * flow rate * pressure * functional testing of electrical and mechanical controls. * Tutor to use PowerPoint presentation, test equipment, manufacturers instructions and industry standards to explain how to check heating products are within design parameters: * boiler size * zone valves * controls * pressure vessels * feed and expansion cisterns * circulating pumps * Tutor to set scenario for students to research. Students may be given a suitable situation or heating system specification in which they select suitable components. This may require students to list all required components and justify their selection against a specification. * On completion, each group should swap their scenario findings and peer groups should check to confirm that these selected components are suitable before justifying this to tutor in class feedback session.   Knowledge check example:   * Feedback findings to tutor in class discussion as peer assessed exercise. Each group to feedback their opinion as to whether the selected components are suitable and justify.   Resources:  Manufacturers instructions  British standards suitable to the components  Computers for research | Q&A                Group task   Peer marking and justification English skills (reading, writing, technical vocabulary) |
| 157  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.8 Components used in plumbing and heating systems  K1.9 Factors that affect the choice and suitability of components in a plumbing and heating system  S2.17 Check heating products are in accordance with design parameters | Activity:  Starter task example:   * Radiator types recap – Students to identify a range of radiator types and connections from given images.   Delivery:  Tutor to deliver content on Radiator sizing and selection, including:   * How radiator selection is achieved * Radiator mean temperature * Temperature difference * Adjustment factors * Radiator outputs * Demonstrate the process for sizing a radiator based on room heat requirements. * Set worked examples for class to work through. * Distribute radiator catalogue for students to select suitable radiators for a given scenario.   Knowledge check example:   * Scenario task, students are to determine whether a radiator is suitable for a given room and scenario.   Resources:  Radiator catalogues  Calculators | Identify radiator types and connections     Calculate radiator outputs          Scenario task Maths skills (measurement, scale, calculation, costing) |
| 158-159  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  K1.11 Appliances supported by plumbing and heating systems  S2.19 Appliances supported by plumbing and heating systems  S2.4 Mark out requirements | Activity:  Starter task example:   * Recap – students are to state a fact regarding boiler types before nominating a peer to do the same.   Delivery:  Practical session – Installation of heating system and components – Boiler installation   * Tutor to set criteria for the session. * Students are to work in pairs to install a combination boiler at given height and location. * Students to ensure that boiler is suitable for scenario provided by tutor. * Students are to connect the flue to the boiler. * Students to connect initial pipework to boiler for further connection later. * On completion tutor is to check dimensions and installation quality.   Knowledge and skill check example:   * Install boiler to given specification.   Resources:  PPE  Hand tools  Drills and drill bits  Fixings  Tape measures  Spirit levels  Boiler templates | Q&A       Install boiler and flue English skills (reading, writing, technical vocabulary) |
| 160-161  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.7 Plumbing and heating systems  K1.8 Components used in plumbing and heating systems  S2.12 Install heat emitting devices  S2.13 Install components to heating appliances  S2.16 Install seals for heat emitting devices  S2.9 Install clips/brackets to different types of building fabric  S2.4 Mark out requirements | Activity:  Starter task example:   * Recap – Students to state one fact each they remember from radiator sessions before nominating a peer to do the same.   Delivery:  Practical session – Install radiators, clips and brackets for pipework.   * Tutor to set task and specification for students to connect pipework from previously installed boiler. * Explain to students the pipework routes and centres for students to work to * Tutor to give dimensions and heights for radiator positions. * Students to dress the radiators and hang in correct position. * Students are to select the suitable materials for the installation. * Students are to install clips and brackets for pipework. * On completion tutor to check centres and dimensions and give feedback to students before installation continues in next session   Knowledge check example:   * Install brackets to given dimensions. * Install radiators to given dimensions.   Resources:  PPE  Hand tools  Drills and drill bits  Fixings  Tape measures  Spirit levels  Radiators  Clips and brackets  Radiator valves | Q&A      Install radiators  Install clips English skills (reading, writing, technical vocabulary) |
| 162-163  6 hours | Outcome 2 Install plumbing and heating systems | S2.7 Cut pipes  S2.2 Select tools, equipment and materials  S2.12 Install heat emitting devices  S2.13 Install components to heating appliances  S2.8 Connect materials using jointing methods | Activity:  Starter task example:   * Recap task – Bending copper pipe – tutor to nominate a learner to recap and demonstrate the process for forming a bend in copper pipe   Delivery:  Practical session - Install pipework to radiators from boiler   * Tutor to deliver specification for task including pipework material types and jointing methods. * Students to continue to work in small groups to connect the previously installed boiler to radiators. * Students are to gather materials and tools to perform the task. * Tutor to monitor group progress and offer guidance as required. * On completion tutor to mark against agreed dimensions and feedback to students * Where possible, keep system pipework installed for testing at later date.   Knowledge check example:   * Install pipework to given dimensions.   Resources:  PPE  Suitable tools and power tools  Bending machines  Pipework  Fittings  Sundries (Solder, flux, wire wool, olives) | Q&A  Recap task       Install pipework to given dimensions Maths skills (measurement, scale, calculation, costing) English skills (reading, writing, technical vocabulary) |
| 164 – 165  6 hours | Outcome 2 Install plumbing and heating systems | S2.7 Cut pipes  S2.2 Select tools, equipment and materials  S2.12 Install heat emitting devices  S2.13 Install components to heating appliances  S2.8 Connect materials using jointing methods | Activity:  Starter task example:   * Toolbox talk- Nominate one learner to highlight the safety requirements of working with compressed and flammable gases.   Delivery:  Install cold water pipework:   * Following on from previous sessions, students are to install a cold supply to a combination boiler previously fitted. * Students to work in same small groups to mark out and fix brackets and clips for pipework. * Students to gather all materials required for the installation including valves etc. * Once tutor has agreed clips dimensions and suitability, students to install pipework and connect to boiler. * Students to leave work area clean and tidy. * On completion tutor to mark against set specification and feedback. * Leave system in place where possible so that hot water can be connected in next session.   Knowledge check example:   * Install cold water pipework to boiler.   Resources:  PPE  Suitable tools and power tools  Bending machines  Pipework  Fittings  Sundries (Solder, flux, wire wool, olives) | Q&A      Install pipework to boiler English skills (reading, writing, technical vocabulary) |
| 166 – 167  6 hours | Outcome 2 Install plumbing and heating systems | S2.7 Cut pipes  S2.2 Select tools, equipment and materials  S2.12 Install heat emitting devices  S2.13 Install components to heating appliances  S2.8 Connect materials using jointing methods | Activity:  Starter task example:   * Guest speaker / stakeholder partner visit – Invite suitable stakeholder or external partner to demonstrate plumbing and heating technologies and equipment.   Delivery:  Practical session – Install hot water pipework:   * Tutor to issue specification for students to install hot water pipework from existing boiler to a small wash hand basin. * Students to gather all materials and equipment required for the installation. * Students to connect pipework to boiler and fix and position clips for installation. * Students to make final connection to the WHB outlet. * On completion tutor to check dimensions against given specification and offer feedback to students. * Students to tidy work area but leave system installed for later testing and commissioning where possible.   Knowledge check example:   * Install hot water pipework systems.   Resources:  PPE  Suitable tools and power tools  Bending machines  Pipework  Fittings  Sundries (Solder, flux, wire wool, olives) | Q&A          Install pipework systems English skills (reading, writing, technical vocabulary) |
| 168  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.12 Types of waste and waste products and the associated systems and attributes | Activity:  Starter task example:   * Science content recap – Each learner should state a fact relating to types of corrosion before nominating a peer to do the same.   Delivery:  Tutor to deliver content, including:   * The hazards to the user and interaction with other parties, including the undertaker and treatment. * Methods to reduce corrosion in heating systems. * Methods to remove existing corrosion using chemical flushing and * power flushing methods in heating systems. * Systems: septic tanks, wastewater lifters, macerators, heating systems * Attributes: smells, bacteria, magnetite, corrosion * Tutor to demonstrate and show examples of system content including magnetite. * Discuss methods that can be used to combat corrosion in systems and how waste products can be disposed of properly.   Knowledge check example:   * Open question paper knowledge check. Students answer questions based on today’s session in short written answer format.   Resources:  Examples of corrosion affected systems  Examples of chemical products for treatment and protection  Open written question paper knowledge test | Q&A                 Open question paper English skills (reading, writing, technical vocabulary) |
| 169  3 hours | Outcome 2 Install plumbing and heating systems | S2.7 Cut pipes  S2.2 Select tools, equipment and materials  S2.13 Install components to heating appliances  S2.8 Connect materials using jointing methods  S2.19 Position and secure components in plumbing system | Activity:  Starter task example:   * Quick information gathering task – students should use mobile devices to try and download or access an example of a relevant manufacturers instruction for the session ahead.   Delivery:  Practical session – Install components including:   * System filters * Automatic air vents * Drain valves * Tutor to explain today’s task in which students in small groups will have the opportunity to install components to the previously installed system. * This will follow on from previous sessions in which protection against corrosion was discussed. * Students to gather all relevant materials and equipment to complete the task and follow manufacturers guidance. * On completion tutor to feedback on installation. * Where possible leave systems in place for later practical tasks.   Knowledge and skills check example:   * Install system components practical task   Resources:  PPE  Suitable tools and power tools  Corrosion filters  Drain valves  Auto air vents  Fittings  Manufacturers instructions | Research manufacturers instructions      Install components English skills (reading, writing, technical vocabulary) |
| 170  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.13 The effects of damage interference from external sources on system operation | Activity:  Starter task example:   * Mind map task – Students are to create a list of potential external sources that could lead to damage of systems.   Delivery:  The effects of damage interference from external sources on system operation:   * Tutor to give overview of session and give examples of external sources following mind map starter task including: * electrolytic action * atmospheric corrosion * chemical damage * water damage * heat damage * mechanical damage * UV damage * freezing * cold * vibration * Tutor to set task in which students are split into small groups to carry out short research task – identify methods of protecting systems against external damage based on Installation periods and user operating periods. * Students to create a short presentation to feed back into class based on findings.   Knowledge check example:   * Produce and deliver short presentation based on protection against external damage.   Resources:  ILT equipment  Flip chart paper  Board pens | Mind map exercise       Research task |
| 171-172  6 hours | Outcome 2 Install plumbing and heating systems | S2.14 Install controls into a range of heating systems  S2.18 Install control systems for the heating system | Activity:  Starter task example:   * Recall task – Students to write down and discuss the Safe Electrical isolation process and discuss in tutor led discussion.   Delivery:  Practical session – Install controls to heating systems:   * Tutor to demonstrate the process of installing a wireless room thermostat. * Tutor to distribute wiring diagrams and study as a group. * Distribute manufacturer’s instructions for students to study. * Tutor to explain the terminals and the connections required. * Set task for students to produce a basic wiring diagram before installation. * Students to install wireless room thermostat and receiver to the previously installed systems. * On completion tutor to check the quality of wiring and connections. * Students to tidy workspace.   Knowledge and skills check example:   * Students are to complete a wiring diagram before connecting a wireless room thermostat to the previously installed system and boiler.   Resources:  PPE  Manufacturers instructions  Drawing paper  Pens and pencils  Rulers  Control equipment (Thermostats)  Suitable tools for electrical work  Drill  Fixings | State the electrical isolation process            Produce wiring diagram     Install controls to system |
| 173  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | S2.22 Update line diagrams and installation plans  S2.23 Update digital building information management system software | Activity:  Starter task example:   * Tutor to Introduce YouTube channel - @TheB1M and show examples of useful videos within the channel.   Delivery:  Update line diagrams/installation plans and BIM software:   * Tutor to discuss drawing types and the use of O&M manuals as part of end of project handover. * Students are to produce an updated system drawing now that the systems they have installed are nearing completion. * Tutor to introduce BIM software examples with guest speakers from the BIM industry. * Use Videos to help explain the use of BIM such as [What is a "BIM Model"? | The B1M](https://www.youtube.com/watch?v=s1yN-LMs_jU)   Knowledge check example:   * Produce updated system diagrams.   Resources:  Examples of as fitted site drawings  Drawing paper  Pens  Pencils and rulers |  |
| 174-175  6 hours | Outcome 2 Install plumbing and heating systems | S2.7 Cut pipes  S2.2 Select tools, equipment and materials  S2.13 Install components to heating appliances  S2.8 Connect materials using jointing methods  S2.19 Position and secure components in plumbing system | Activity:  Starter task:   * Students are to produce a quick end to centre waste pipe measure and cut task as directed by tutor to recap on waste pipework jointing.   Delivery:  Practical installation – Install waste water pipework   * Tutor to explain today’s task and specification. * Students are to install waste pipework from boiler condense and discharge pipework to a drain using waste pipework. * Students are to install waste connections to the wash hand basin they connected to in previous sessions. * Tutor to offer guidance throughout. * On completion tutor to mark against dimensions and offer feedback. * Students to tidy workspace and where possible leave system in position for commissioning at a later date.   Knowledge and skills check example:   * Install condense pipework. * Install waste pipework.   Resources:  PPE  Suitable tools and power tools  Waste pipework  Jointing materials  Fittings  Manufacturers instructions | Produce centre to end measurements    Install condense pipework   Install waste pipework Maths skills (measurement, scale, calculation, costing) |
| 176  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 – K1.14 – Plumbing and heating systems | Activity:  Starter task example:   * Work experience discussion – tutor to lead discussion regarding progress of work experience and introduce any opportunities that may be available.   Delivery:  Plumbing and heating systems overview recap of Plumbing and heating system content   * Tutor to use revision tasks and previous PowerPoints to conclude the general delivery of the systems content. * Use peer to peer tasks such as producing MCQ for group to group quizzes or online tutor led quizzes such as Kahoot. * Use this session for students to raise questions related to items they do not yet fully understand.   Knowledge check example:   * Online quiz. * Peer to peer MCQ questions in teams. | Q&A      Peer to peer quiz   On line quiz English skills (reading, writing, technical vocabulary) |
| 177-180  12 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 – K1.14 – Plumbing and heating systems | Activity:  Starter task example:   * Guest speaker or stakeholder partner visit to give 15 minute presentation based on technical content.   Delivery:   * Group project – Students are to work in small groups to produce a 15- 20 minute Presentation based on an element of the Systems content. * Tutor to give a brief on the specification for this task including specific content for each individual group. * Students should base their presentation on one of the following areas (or as directed by tutor): * Cold water sources of supply and distribution * Cold water systems * Hot water systems * Heating systems * Rainwater systems * Above ground drainage systems * Below ground drainage systems * Grey water * Rainwater harvesting * Students are to work in independent teams to research and build professional presentation which will be delivered to the whole class formally in the future. * The presentation should be based on System design, operation or installation. * Tutor to allow students time to produce this whilst monitoring progress and offering technical support as necessary.   Knowledge check example:   * Produce formal presentation in small groups   Resources:  ILT equipment  Research materials  British standards  Legislation  Website links | Research project – produce presentation |
| 181 - 182  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 – K1.14 – Plumbing and heating systems | Activity:  Delivery:  Formal Presentation sessions:   * Students are to formally present their research project to the class and tutor. External stakeholders and partners may also be invited to review the sessions. * In small groups the students are to professionally and formally present their individual presentations to the class and guests. * Tutor and guests to mark and grade the quality of the presentation along with technical accuracy. * At the end of each session classmates and peers are to pose questions and feedback to the groups * It is expected that these presentations and feedback sessions will take a number of sessions to complete hence multiple sessions scheduled to do so.   Knowledge check example:   * Deliver professional presentation formally. * Produce peer feedback.   Resources:  ILT equipment | Deliver formal presentations |
| 183  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.6 – K1.14 – Plumbing and heating systems | Activity:  Delivery:   * This session has been included to allow students to complete assessments or further reading. * Tutor may wish to issue end of module assessment or to allow learner to complete outstanding work or further reading as we reach the end of the Plumbing and heating system delivery. |  |
| 184  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.35 Inspection techniques  K1.36 Factors to inspect during commissioning | Activity:  Starter task example:   * Classroom discussion – tutor to ask class to identify reasons why inspection is required before commissioning and testing. Students to collate ideas on flip chart paper before feeding back.   Delivery:  System commissioning - Inspection techniques and Factors to inspect during commissioning   * Tutor to discuss the application of visual inspections in commissioning systems and the importance of referring to manufacturer’s instructions. * Learner task – students are to try and define the term ‘Commissioning’ and its relevance in plumbing and heating systems. * Inspection techniques: * visual inspection * pre-commissioning checks * Tutor to set role play scenario – Offer a system which needs checks to be carried out. Small groups are to produce a list of checks that should be carried out before putting the system into operation. * Students to offer ‘client’ options as far as checks that are needed for the system suggested by the tutor * Inspections and checks including: * visual inspection * fill and vent * soundness test * flush * operational checks * commissioning documentation * handover procedure. * Factors: * appropriate checks to be made before commissioning * principles of commissioning * temperature * flow rate * pressure * Distribute and examine examples of pre commissioning checklists.   Knowledge check example:   * Scenario based knowledge check – produce a method statement relating to a given system for the pre commissioning checks required.   Resources:  Pre commissioning checklist  Scenario activity sheets | Q&A        Group activity       Produce method statement English skills (reading, writing, technical vocabulary) |
| 185-186  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.35 Inspection techniques  K1.36 Factors to inspect during commissioning  S3.3 Inspect the installation of components | Activity:  Starter task example:   * Long term recall task – Students are to list as many Valve types as they can and an example of their use.   Delivery:  Theory and Practical combined session – Pre commissioning of Plumbing and heating systems   * Tutor to set task for students to complete a pre commissioning checklist on the systems previously installed. * Where possible groups are to inspect peer groups installations and complete documentation * Before commencement tutor to discuss and explain the requirements of the checks including: * pipework installed as specified, positioned as drawing and plumb * appropriate brackets and supports fitted at specified intervals * joints cleaned and complete * valves/controls fitted as specified and positioned as drawing * fittings tight, flange bolts, unions, compression joints etc * commissioning/ test points fitted as specified and positioned as * drawing * D.O.C fitted as specified and closed * valves set in the correct position * controls set in the correct position * pipework painted as necessary * sensitive items isolated or removed as necessary * pipework installed to accommodate insulation * sleeves fitted as necessary * heat emitters installed as specified and positioned as drawing * storage and expansion vessels installed as * specified and positioned as drawing * appliances installed as specified and positioned as drawing * flues installed as specified and positioned as drawing * safety requirements adhered to * relevant people notified * relevant items cleaned wherever necessary * balancing of the heating system * On completion of commissioning sheets, groups to hand documents back to installer groups and feedback   Knowledge and skills check example:   * Complete pre commissioning checklist on installed system and feedback to peer group   Resources:  Manufacturers instructions relevant to system installed  Pre commissioning checklist sheets  Hand tools  Tape measures  Spirit levels | Recap task – Valves             Carry out pre commissioning checks   Complete pre commissioning documents |
| 187  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.37 Testing techniques | Activity:  Starter task example:   * Work experience update – Tutor to support and discuss work experience opportunities and lead discussion on recent experiences from students   Delivery:  System commissioning – Testing hot and cold water services for soundness   * Tutor to use practical demonstrations and British standards to deliver the process of testing hot and cold water services for soundness including: * Soundness test to industry requirements on plumbing and heating * system pipework and components: * initial fill * stabilisation * test to required pressure * check for leaks * check pressures after test period. * Tutor to demonstrate the equipment required to carry out: * Testing techniques: * air testing * hydraulic pressure testing * safety component operation * soundness testing * performance testing * Use open group discussion to identify safety requirements when conducting testing – focus on pneumatic testing dangers   Knowledge check example:  Method statement task – Students are to produce a Method statement based on testing a CH system as directed by tutor.  Resources:  Test equipment and gauges  System to demonstrate test  British standards  Method statement task sheet | Produce method statement |
| 188  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.37 Testing techniques | Activity:  Starter task example:  Recap task – Students to state a fact each from the previous session and then nominate a peer to do the same  Delivery:  System commissioning – Testing heating systems for soundness   * Tutor to use practical demonstrations and British standards to deliver the process of testing heating systems for soundness including: * Soundness test to industry requirements on plumbing and heating * system pipework and components: * initial fill * stabilisation * test to required pressure * check for leaks * check pressures after test period. * Tutor to demonstrate the equipment required to carry out: * Testing techniques: * air testing * hydraulic pressure testing * safety component operation * soundness testing * performance testing * Use open group discussion to identify safety requirements when conducting testing – focus on pneumatic testing dangers   Knowledge check example:  Method statement task – Students are to produce a Method statement based on testing a CH system as directed by tutor.  Resources:  Test equipment and gauges  System to demonstrate test  British standards  Method statement task sheet | Q&A                        Produce method statement English skills (reading, writing, technical vocabulary) |
| 189  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.37 Testing techniques | Activity:  Starter task example:   * Recap session – students to identify types of sanitation systems from image cards   Delivery:  System commissioning – Testing sanitation, drainage and rainwater systems   * Tutor to use British standards and guidance to demonstrate the processes involved in testing drainage, sanitation and rainwater systems. * Tutor to distribute and demonstrate the use of manometers and bungs and discuss the pressures and durations involved in testing drainage systems * Tutor to demonstrate the process of checking rainwater systems for integrity * Set task for students to produce short method statement for testing of drainage systems * Discuss process as a group   Knowledge check example:   * MCQ test – testing of systems   Resources:  Testing equipment  Manometer  MCQ test | Identify sanitation systems        Produce method statement    MCQ test |
| 190-191  6 Hours | Outcome 2 Install plumbing and heating systems | S3.6 Test systems  S3.1 Assess risks associated with completing activities | Activity:  Starter task example:   * Toolbox talk – Testing safety. Tutor to nominate a learner to conduct the toolbox talk on testing systems safely   Delivery:  Practical session – Testing of systems   * Tutor to set criteria for session where class is split into groups to carry out testing of the previously installed systems (where possible) * Students are to produce method statement to enable them to plan the safe process for the test: * Cold water system * Hot water system * Central heating system * A section of below ground drainage pipework * On completion of each system test students are to complete test certification and have this accepted by Tutor if successful * Students are to drain each system on completion in readiness for flushing and commissioning   Knowledge and skills check example:   * Conduct a soundness test on each of the systems as directed by tutor * Complete test certificate documents   Resources:  Testing equipment and gauges  PPE  Test certificates  Hand tools | Q&A Toolbox talk      Test systems for soundness  Complete test certificate English skills (reading, writing, technical vocabulary) |
| 192-193  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.36 Factors to inspect during commissioning  K1.37 Testing Techniques  K1.38 Documentation required for commissioning and verification of commissioning  K1.39 Technical information required for use by different stakeholders  S3.2 Interpret information and data  S3.4 Set heating controls  S3.5 Verify fitness for purpose of tools/equipment  S3.7 Ensure accuracy and compliance with intended outcomes  S3.8 Adjust heating system parameters to commission  S3.9 Record data from commissioning checks  S3.10 Compare commissioning results against design parameters | Activity:  Starter task example:   * Recap – list checks required for commissioning of a sealed heating system. Students to spend 5 minutes creating list of actions before tutor leads group discussion   Delivery:  System commissioning – Commission heating and hot water system   * Tutor to explain session requirements – students are to work in small groups to flush, fill, vent and commission the previously installed (where possible) combination boiler and associated system * Students are to make a list of tools and equipment required for the process and collect * Students to check that equipment is suitable and within calibration dates * Students are to flush, fill and vent before adding chemical treatment to the heating system * On commissioning the students should check temperatures, flow rates at outlets and balance heat emitters * Under supervision students may check operation of appliance and flue using suitable tests and checks including flue gas analysis * Tutor to supervise each group whilst basic electrical checks are carried out such as polarity and run current * Students should refer to manufacturers instructions and information to allow correct setting of controls and temperatures * Students should record all data and information so that handover and commissioning documents can be completed in following session   Knowledge and skills check example:   * Commission the heating, cold and hot water services   Resources:  PPE  Weir gauge  Thermometers  Voltage meter  Proving unit  Multimeter  Ammeter  Flue gas analyser  Commissioning sheets  Benchmark certificate (copies)  Hand tools |  |
| 194  3 hours | Outcome 2 Install plumbing and heating systems | S3.2 Interpret information and data  S3.9 Record data from commissioning checks  S3.10 Compare commissioning results against design parameters  S3.11 Complete required documentation and handover documentation  S3.12 Present technical information orally for different stakeholders | Activity:  Starter task example:   * Crossword puzzle – commissioning and testing   Delivery:  System commissioning – Commission heating and hot water system   * Tutor to distribute and discuss copies of example benchmark and commissioning documentation * Classroom discussion of the processes and information required on the documents * Students to examine the recorded data from the previous session and compare against manufacturers data * Where data is not correct or out of tolerance then students should make adjustments and recommission * Working in groups students should complete the documentation and handover to tutor giving verbal explanation of system operation in role play scenario as customer   Knowledge and skills check example:   * Complete commissioning documentation and handover documents to tutor (customer) * Give verbal instruction on system operation to tutor (Customer)   Resources:  Example benchmark certificates  Examples of commissioning data | Crossword puzzle       Complete commissioning documentation   Give verbal instruction to customer |
| 195-196  6 hours | Outcome 2 Install plumbing and heating systems | S3.2 Interpret information and data  S3.9 Record data from commissioning checks  S3.10 Compare commissioning results against design parameters  S3.11 Complete required documentation and handover documentation  S3.12 Present technical information orally for different stakeholders | Activity:  Starter task example:   * Fact cards – students are to match system types to the descriptions on other cards as a recap to the relevant systems in session   Delivery:  Practical session – Commissioning alternate systems – Grey water systems, Boosted cold water systems   * Tutor to explain session requirements – students are to work in small groups to commission alternate systems including Boosted CWS, Greywater systems and rainwater systems (as available in centre) * Students are to make a list of tools and equipment required for the process and collect * Students to check that equipment is suitable and within calibration dates * Students are to inspect, flush and fill as appropriate and as directed by tutor * On commissioning the students should check temperatures, flow rates and electrical performance as required * Tutor to supervise each group whilst basic electrical checks are carried out such as polarity and run current * Students should refer to manufacturers instructions and information to allow correct setting of controls and pressures etc * Students should record all data and information so that handover and commissioning documents can be completed and passed to tutor (Customer)   Knowledge check example:  Commission systems in line with manufacturers guidance  Resources:  PPE  Weir gauge  Thermometers  Voltage meter  Proving unit  Multimeter  Ammeter  Commissioning sheets  Hand tools | Card matching activity     List tools and equipment      Commission systems |
| 197  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | K1.35 – K1.39  S3.1 – S3.12 | Activity:  Delivery:  Commissioning of systems – Assessment of learning   * Tutor to set knowledge test to assess students understanding of the test and commission element of the course. * Issue mock test for students to complete individually * On completion, students are to swap papers and peer mark before tutor led discussion of the answers as a class   Knowledge check example:   * Knowledge test – Testing and commissioning of plumbing and heating systems   Resources:  Knowledge test papers | Knowledge test English skills (reading, writing, technical vocabulary) |
| 198  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 Install plumbing and heating systems | All / As required | Activity:  Delivery:   * This session has been added at a natural completion of the Testing and commissioning content. * Learner may use this time to complete written work, do further reading or studies. * Tutors may use this time to conduct one to one sessions with students or to invite guest speakers or stakeholder partners |  |
| 199  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.44 Procedures involved in decommissioning systems  K1.45 Waste management procedures  K1.46 Safe removal of different types of waste from the working area  K1.47 Documentation required for decommissioning and verification of decommissioning activities  K1.48 Requirements for recording, labelling and reporting decommissioned systems | Activity:  Starter task example:   * Plumbing and heating magazine article discussion. Tutor to distribute copies of recent P&H trade magazine article and discuss as a class   Delivery:  Decommissioning – Hot and cold water systems   * Tutor to deliver content including: * The decommissioning procedures, and own role and responsibilities * Procedures for isolation and decommissioning: * notify relevant person * isolate fuel/electricity supply to the system as appropriate * isolate water supply * apply warning notices and signs * drain system to a suitable location * continuity bonding as required * temporary capping of pipework sections as required * notify building users * alternative supplies as required. * Decommissioning: * permanent * temporary * Tutor to use examples of installed systems to demonstrate procedures * Examine manufacturers literature and guidance and discuss the guidance as a class * Examine the previously installed and commissioned systems to create a method statement for the decommissioning process in following sessions   Knowledge check example:   * Produce a method statement for decommissioning of the hot and cold water system previously installed and commissioned   Resources:  Examples of installed systems  Manufacturers instructions | Q&A                       Produce method statement English skills (reading, writing, technical vocabulary) |
| 200  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.44 Procedures involved in decommissioning systems  K1.45 Waste management procedures  K1.46 Safe removal of different types of waste from the working area  K1.47 Documentation required for decommissioning and verification of decommissioning activities  K1.48 Requirements for recording, labelling and reporting decommissioned systems | Activity:  Starter task example:   * Recall quiz – Carry out quick quiz using online quiz software based on system layouts   Delivery:  Decommissioning – Hot and cold water systems   * Tutor to deliver content including: * The decommissioning procedures, and own role and responsibilities * Procedures for isolation and decommissioning: * notify relevant person * isolate fuel/electricity supply to the system as appropriate * isolate water supply * apply warning notices and signs * drain system to a suitable location * continuity bonding as required * temporary capping of pipework sections as required * notify building users * alternative supplies as required. * Decommissioning: * permanent * temporary * Tutor to use examples of installed systems to demonstrate procedures * Examine manufacturers literature and guidance and discuss the guidance as a class * Examine the previously installed and commissioned systems to create a method statement for the decommissioning process in following sessions   Knowledge check example:   * Produce a method statement for decommissioning of the hot and cold water system previously installed and commissioned   Resources:  Examples of installed systems  Manufacturers instructions | Quick quiz                      Produce method statement English skills (reading, writing, technical vocabulary) |
| 201  3 hours | Outcome 1 – Plumbing and heating common knowledge criteria | K1.44 Procedures involved in decommissioning systems  K1.45 Waste management procedures  K1.46 Safe removal of different types of waste from the working area  K1.47 Documentation required for decommissioning and verification of decommissioning activities  K1.48 Requirements for recording, labelling and reporting decommissioned systems | Activity:  Starter task example:   * Long term memory recall task – quick quiz based on sanitation system layout   Delivery:  Decommissioning – Drainage, rainwater and sanitation systems   * Tutor to deliver session and discuss procedures for isolation and decommissioning: * notify relevant person * appropriately dispose of contents and any additives * temporary capping of pipework sections as required * notify building users * alternative arrangements as required * Tutor to set task – students are to create a list of actions based on the previously installed sanitation systems or a given centre example of a system. Students to list decommissioning actions required for permanent or temporary decommissioning * Tutor to highlight the importance of waste management including correct disposal of waste contents and disposal of plastic and component parts   Knowledge check example:   * Produce method statement including decommissioning and waste management for the decommissioning of above and below ground sanitation systems and rainwater systems   Resources:  Flip chart paper  Board pens | Quick quiz            List actions for decommissioning of a given example   Produce method statement English skills (reading, writing, technical vocabulary) |
| 202-203  6 hours | Outcome 2 Install plumbing and heating systems | S5.3 Communicate with user to establish needs when decommissioning plumbing and heating systems  S5.1 Safely isolate valves/services to types of systems  S5.4 Safely electrically isolate the plumbing and heating system prior to decommissioning  S5.2 Apply control mechanisms from a risk assessment prior to working  S5.10 Safe disposal of waste products when decommissioning heating systems  S5.5 Handle materials to protect their integrity and safety  S5.6 Extract components and equipment from plumbing and heating systems  S5.8 Reinstate appropriate service post-decommissioning | Activity:  Starter task example:   * Tool box talk – Working with waste products that may contain biological waste – Tutor to nominate a learner to lead the discussion as a class   Delivery:  Practical session – Decommissioning Plumbing and heating systems   * Tutor to set criteria for today’s session. Students are to work in small groups or pairs to decommission sanitation and rainwater systems and components as planned for in previous session. * Students are to refer to their previously developed method statements. * Use role play scenario to allow students to demonstrate clear communication skills when dealing with the client * On completion students are to ensure work area is safe and clear   Knowledge check example:   * Role play scenario – decommission system with tutor as client   Resources:  PPE  Hand tools  Buckets and containers  Protective sheets for property  Method statements from previous session | Q&A    Decommission sanitation and rainwater systems English skills (reading, writing, technical vocabulary) |
| 204  3 hours | Outcome 2 - Install plumbing and heating systems | S5.9 Make good the building fabric  S5.10 Safe disposal of waste products when decommissioning heating systems | Activity:  Starter task example:   * Recap – building fabric types – students to list internal wall material and construction types on flip chart paper   Delivery:  System decommissioning – making good after decommissioning or works   * Use construction materials to make good the building fabric following component or system removal - filling holes with plaster, removing waste build materials * Tutor to give a list of scenarios in which making good may be required and discuss as a class * Examine examples of works required within the workshop space or centre and tutor to demonstrate techniques for rectification * In small groups or pairs students to carry out making good works such as filling holes, sanding or patching with mortar * Students to leave work area clean and tidy and remove waste materials from area   Knowledge and skills check example:   * Make good holes and damage to building fabric practical task after works   Resources:  PPE  Hand tools  Filler  Ready mix mortar | List internal wall types and finishes              Make good building fabric |
| 205  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 - Install plumbing and heating systems | K1.42 Documentation required for maintenance and verification of maintenance activities  K1.43 Actions required when faults cannot be rectified  S4.2 Explore end user or client requirements  S4.1Identify information requirements from a brief | Activity:  Starter task example:  Ask students why regular maintenance is essential for plumbing and heating systems.  Delivery focus:  Using PowerPoint K1.42 Planned maintenance of P&H systems, deliver the following content:   * Heating systems * Cold water systems * Hot water systems * Tutor to distribute manufacturers literature to examine the routine maintenance requirements for components and appliances * Students are to produce a short maintenance plan for a given system or component * Tutor to discuss examples of experiences of follow up actions when faults cannot be initially rectified including: * Time * costs * loss or temporary loss of industry operations * alternative provisions   Knowledge Check example:  Produce a maintenance activity plan for a given system or components as directed by tutor  Resources:  PowerPoint: K1.42 Planned maintenance of P&H systems  Manufacturers literature | Q&A                 Produce maintenance plan English skills (reading, writing, technical vocabulary) |
| 206  3 hours  **PPT available** | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 - Install plumbing and heating systems | K1.42 Documentation required for maintenance and verification of maintenance activities  S4.2 Explore end user or client requirements  S4.1Identify information requirements from a brief | Activity:  Starter task example:  Ask students why regular maintenance of a rainwater or drainage system might prevent structural damage to a property.  Delivery focus:  Using PowerPoint K1.42 Planned maintenance of non-potable water systems, deliver the following content:  The processes involved in carrying out planned and reactive maintenance on:   * Rainwater systems * Sanitation systems * Drainage systems * Grey water systems * Tutor to distribute manufacturers literature to examine the routine maintenance requirements for components and appliances * Students are to produce a short maintenance plan for a given system or component   Knowledge Check example:  Produce a maintenance activity plan for a given system or components as directed by tutor.  Resources:  PowerPoint: K1.42 Planned maintenance of non-potable water systems  Manufacturers literature | Produce maintenance plan |
| 207-208  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 - Install plumbing and heating systems | K1.42 Documentation required for maintenance and verification of maintenance activities  S4.5 Inspect the suitability of materials, tools and equipment  S4.9 Disassemble plumbing and heating system components when conducting maintenance  S5.7 Reconfigure systems | Activity:  Starter task example:   * Toolbox talk – safe isolation – Tutor to nominate a learner to deliver a toolbox talk based on safe isolation for maintenance   Delivery:  Practical session – Planned maintenance of plumbing and heating systems   * Tutor to identify the plan for the maintenance of systems in the workshop. * Students to work in pairs or as required by tutor to carry out maintenance of plumbing and heating systems and components * Tutor to distribute manufacturers literature and instructions relevant to the systems and components * In pairs students are to carry out routine maintenance activities in accordance with manufacturers instructions and previously created maintenance plans * Once each task is completed students are to complete job reports including any follow up requirements * Each group should move to the next task once completed so that students work on multiple systems / components   Knowledge and skills check example:   * Carry out routine maintenance following manufacturers instructions and maintenance plans * Complete maintenance reports   Resources:  PPE  Hand tools  Test equipment  Safe isolation lock off kit  Job reports  Manufacturers instructions  Maintenance plans | Q&A                     Practical maintenance tasks English skills (reading, writing, technical vocabulary) |
| 209-210  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 - Install plumbing and heating systems | K1.40 Fault-finding techniques  K1.41 Causes of typical faults in plumbing and heating systems  S4.2 Explore end user or client requirements  S4.6 Conduct fault finding  S4.8 Engineer corrective measures to rectify faults in heating systems | Activity:  Starter task example:   * Guest speaker – stakeholder or ex-student to discuss employment opportunities, career paths or experience   Delivery:  Tutor to deliver content including:   * end user discussions and questioning * consulting manufacturer’s instructions * following fault diagnosis flow chart * checking service history * knowledge gained from industry experience * Tutor to discuss system faults including: * poor installation * inadequate design * user error * environmental factors appliance/ component malfunction. * Plumbing typical faults: * leak in system pipework noise in systems * corrosion of system components * inadequate supply pressure at discharge points * loose pipework * trap seal loss * blockages in system components/pipework * incorrect backflow devices in relation to the fluid categories * lack of flow rate. * Heating typical faults: * pumping over * persistent venting * emitter cold spots * stuck TRVs * motorised valves not operating * heat when no demand * leaks * blockages * pump failure * control failure * expansion vessel losing pressure. * Use installed systems to demonstrate symptoms and set short scenario tasks for students to diagnose typical faults * Distribute failed components and highlight common faults and rectification processes   Knowledge check example:   * Scenario tasks – Tutor to issue a number of scenarios for faults using fault finding cards in Plumbing and heating systems. Students to work in pairs to ask tutor further questions to try and diagnose the issue   Resources:  Examples of systems and typical faults  Manufacturers literature  Failed components  Test equipment such as multimeters and thermometers  Fault finding task cards | Q&A                              Scenario tasks      Fault finding task cards English skills (reading, writing, technical vocabulary) |
| 211-212  6 hours | Outcome 1 – Plumbing and heating common knowledge criteria  Outcome 2 - Install plumbing and heating systems | S4.4 Analyse situations to identify potential causes for delays and errors  S4.5 Inspect the suitability of materials, tools and equipment  S4.6 Conduct fault finding  S4.7 Repair component faults in plumbing and heating systems  S4.8 Engineer corrective measures to rectify faults in heating systems  S4.9 Disassemble plumbing and heating system  S4.10 Fault-finding techniques  S5.7 Reconfigure systems | Activity:  Starter task example:   * Recap task – use manufacturer fault finding flow chart to diagnose an example fault   Delivery:  Practical session - System maintenance – Fault finding and rectification of Plumbing and heating systems   * Tutor to prepare a number of basic faults in plumbing and heating systems and components * In pairs students should carry out fault finding activities on these pre determined faults in turn. * Tutor to distribute manufacturers instructions including fault finding flow charts for students to reference * Once each fault has been diagnosed, the students should discuss with the tutor (acting as client) to agree / propose the next steps (rectify or decommission etc) * After each task is completed students should complete a job report for the tutor (acting as client) and reconfigure the system where appropriate * Each pair should rotate through each fault in turn   Knowledge and skills check example:   * Carry out fault finding activities * Propose rectification options to client * Produce job report   Resources:  PPE  Safe isolation lock off kit  Voltmeter and proving unit  Multi meter  Hand tools  Test equipment  Job reports  Manufacturers instructions | Use fault finding flow charts to diagnose fault      Carry out fault finding and rectification activities   Produce job reports and proposals English skills (reading, writing, technical vocabulary) |
| 213-214  6 hours | Outcome 2 - Install plumbing and heating systems | S4.2 Explore end user or client requirements  S4.3 Estimate and calculate time and resources  S4.4 Analyse situations to identify potential causes for delays and errors | Activity:  Starter task example:   * Introduce websites based on costing for work and tools used to help plumbers quote for work such as [How to Quote Plumbing Jobs (A Step-by-Step Guide)](https://fieldrocket.com/blog/how-to-quote-plumbing-jobs-step-by-step-guide-template/)   Delivery:  Planning follow on visits for maintenance and rectification tasks –   * Tutor to lead discussion on the effects of not being able to rectify a fault on a plumbing and heating system and how it impacts the client * Students to create mind map with impacts before classroom discussion * Discuss temporary supplies or heating that may be required for elderly and vulnerable * Tutor to set role play scenario for a given fault which includes further return visits and priced work such as a diagnosed failed heating pump which requires replacement * Tutor to discuss how hourly rates are calculated and give examples * Introduce trade website and distribute Plumbing and heating trade catalogues to assist such as [Heating & Plumbing | Screwfix](https://www.screwfix.com/c/heating-plumbing/cat830950) * On completion discuss as a class and compare prices * Tutor to explain how he or she would cost the rectification work and sources of information regarding quotes for jobs * Students are to cost the extra work including parts and labour and examine any impacts that this may have on the client. * Allow time for this before feeding back and discussing as a class * Using example in workshop or centre – students are to then carry out this process based on a real scenario * Students are to produce a written quotation with all costs and temporary services required and pass to tutor (acting as client) for their feedback.   Knowledge check example:   * Produce a quotation for plumbing work   Resources:  Trade catalogues  Trade website links  Calculators | Role play scenario task           Produce quote Maths skills (measurement, scale, calculation, costing) |

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