Unit 325HV: Understand fuel systems for industrial and commercial heating and ventilation systems

# Delivery guide

Unit information

This unit covers the knowledge and understanding of the options available for fuel supplies to heat producing equipment in industrial and commercial buildings. Learners will understand the regulations attached to these fuel types and the methods used to select and size, install and test the fuel system pipework in line with current regulations and requirements.

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

* What are the different types of fuels used in heat producing appliances?
* What is the combustion process used in commercial heat producing appliances?
* What are the ventilation fluing requirements?
* How do the industry standards and regulations apply to the installation of fuel systems?

Learning outcomes

1. Understand the applications, advantages and limitations of different fuel supply systems and components used within industrial and commercial heat producing appliances
2. Understand the combustion of fuels for industrial and commercial heat producing appliances
3. Understand the basic ventilation and fluing requirements for industrial and commercial heat producing appliances
4. Understand the appropriate industry standards and regulations relevant to installing fuel systems
5. Understand the methods, techniques and jointing methods for fitting, fixing and connecting natural gas and LPG pipework
6. Understand the methods, techniques, and jointing methods for fitting, fixing, and connecting oil pipework
7. Understand the methods and techniques for purging and confirming the integrity of installed fuel systems
8. Understand the methods for determining the type and size of equipment and components used in gas systems

Suggested resources

Textbooks

* IGE/UP/1 Edition 2+A:2005 – *Strength testing/tightness testing/direct purging of industrial and commercial gas installations*.Derby:IGEM.
* IGE/UP/1A Edition 2+A:2005 – *Strength testing/tightness, tightness testing and direct purging of small, low pressure industrial and commercial natural gas installations*. Derby:IGEM.
* IGEM/UP/2 Edition 3 – *Installation pipework on industrial and commercial premises*. Derby:IGEM.
* IGEM/UP/10 Edition 4+A:2016 – *Installation of flued gas appliances in industrial and commercial premises*. Derby:IGEM.
* OFTEC *Technical Guide Books* 1–5.
* SFA Guide to Building Regulations and Solid Fuel Heating. Derbyshire:Solid Fuel Association.

Websites

* [Energy and Utility Skills | Homepage](http://www.euskills.co.uk/)
* [GOV.UK | The Gas Safety (Installation and Use) Regulations 1998](https://www.legislation.gov.uk/uksi/1998/2451/contents/made)
* [HETAS | Homepage](http://www.hetas.co.uk/)
* [HSE | Gas Safety](https://www.hse.gov.uk/toolbox/gas.htm)
* [IGEM | Homepage](http://www.igem.org.uk/)
* [OFTEC | Homepage](http://www.oftec.org/)

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Understand the applications, advantages and limitations of different fuel supply systems and components used within industrial and commercial heat producing appliances | * 1. The types of fuel gases used in industrial and commercial application | * Learners to know the range of fuels used in Industrial and Commercial (I&C) heat producing appliances and how they are sourced and distributed within Wales and the UK including: * natural gas * Liquefied Petroleum Gas (LPG) * biogas/biomethane. |
| * 1. The types of solid fuel alternatives in industrial and commercial applications | * Learners to know the range of solid fuels used in I&C heat producing appliances and how they are sourced and distributed within Wales and the UK including: * woodchip * biomass * wood pellets * chipped coal * pulverised coal. |
| * 1. The types of fuel oil used in industrial and commercial applications | * Learners to know the range of fuel oil used in I&C heat producing appliances and how they are sourced and distributed within Wales and the UK including: * category C * category D * category E * category F * category G * oils * kerosene. * Learners to be shown examples and images of the difference in viscosity between these oils. |
| * 1. The advantages and limitations of the range of fuels | * Learners to be shown presentations and videos to discuss how the fuels compare in terms of: * storage requirements * distribution limitations * site location * local restrictions to the use of smoke producing fuels * maintenance requirements * efficiency * environmental factors. * Learners to know the direct and indirect impacts to the environment of: * natural gas * LPG * biogas * woodchip * wood pellets * biomass * chipped coal and oils * pulverised coal. * Learners to know the restrictions and legislation that control smoke producing equipment. * Learners to be set tasks to determine suitable fuels for given scenarios and to know the advantages and limitations for each before discussing as a group. |
| * 1. The storage requirements for commercial solid fuels | * Learners to know the environments suitable for the storage of solid fuels and the requirement to keep fuels dry. * Learners to be shown manufacturers’ literature and videos of how solid fuels are stored in hoppers and silos. * Learners to be shown presentations to explain how solid fuels are distributed to the appliance by use of screws and augers. * Learners to know the requirements for fire protection when storing solid fuels using the Building Regulations and to know the access requirements for vehicles when delivering fuels to a site. |
| * 1. The features and requirements of oil storage tanks | * Learners to know the legal requirements for the storage of fuel oils using the Building Regulations and Oil Firing Technical Association (OFTEC) guidance documents. * Learners to be shown presentations and images to discuss the specific requirements for oil storage tanks and the use of bund walls including: * tank location relevant to water sources * angle and slope * position and size of connection including inlet * outlet and vents * positioning and operation of valves, to include drain, sludge and fire valves * the use of oil filters * sleeving of oil pipes using puddle flanges. * Learners to be shown examples of oil tank components and to be able to explain the types of level indicators used on the oil tank. |
| * 1. The distribution network for natural gas supplies | * Learners to be shown presentations to discuss the National Transmission System (NTS) network for natural gas. * Learners to know the range of pressures within the system including: * low pressure * medium pressure * intermediate pressure and * high pressure. * Learners to be able to identify the role of Wales and West Utilities within Wales’s gas network and the other distributors within England. |
| * 1. The storage requirements of LPG gases | * Learners to examine the guidance within the Gas Safety (Installation and Use) Regulations 1998 relevant to the storage of LPG gas for use in heat producing equipment. * Learners to be given copies of the Gas Safety (Installation and Use) Regulations 1998 guidance books and to be set tasks to investigate specific requirements such as location, support, valve locations, buried pipework and access. * Learners to be shown presentations to explain the requirements for bulk and individual storage of LPG gas. |
| 1. Understand the combustion of fuels for industrial and commercial heat producing appliances | * 1. The types of heat producing appliances used within industrial and commercial buildings | * Learners to know the range of fuel burning appliances generally found within I&C buildings including: * package boilers * sectional boilers * shell and tube boilers * modular boilers * water heaters * warm air heaters * radiant tube heaters * gas fired unit heaters. * Learners to be shown presentations, videos and physical examples to identify the main differences in their construction and operation. * Learners to be shown the process of transferring heat from products of combustion into the air or water in a range of appliances where possible. * Learners to understand the use of heat exchangers and the principle of the flue. * Learners to be aware that fuel fired appliances require oxygen to complete the combustion process and to be able to give examples of where air is taken into a range of appliances and how the products of combustion are removed. |
| * 1. The properties of a range of fuels for commercial heat producing appliances | * Learners to know the terms attached to the properties of fuels including: * calorific value * flammable limits * stoichiometric mixtures * waxing * flash temperatures * Wobbe Index (WI) * specific gravity * flame speed * flame temperatures * gross and net efficiency and pressure. * Learners to know these properties for: * natural gas * fuel oil * biomass. |
| * 1. The combustion process as it applies to fuels used in commercial heat producing appliances | * Learners to know the contents of natural gas, LPG and fuel oil. * Learners to know the chemical formulas for these fuels and their chemical composition. * Learners to know the formula for complete combustion of these fuels, which should identify the requirements for both fuel and air. * Learners to be shown what happens when either of these quantities change, and the resulting incomplete combustion. * Learners to be given practical demonstrations of flames that are burning efficiently and those that are not. This may be an appliance or perhaps a gas torch that can be adjusted to show changing conditions. * Learners to be able to identify basic flame patterns for good and bad examples of combustion. |
| * 1. The main causes of incomplete combustion with solid fuels | * Learners to be able to list a range of causes of incomplete combustion. * Learners to be able to give examples of physical causes which lead to situations such as: * damp fuels * insufficient ventilation * poor fluing * flame chilling * impingement * vitiation. * Learners to be able to compare these causes with those which may affect oil and gas fired appliances such as: * insufficient or excessive flame speed * insufficient ventilation * poor fluing * flame chilling * impingement * vitiation * insufficient gas or oil rates. * Learners to be shown the physical signs of incomplete combustion and how to detect them on physical appliances. |
| * 1. The potential effects of carbon monoxide when incomplete combustion takes place | * Learners to be given examples of cases of carbon monoxide (CO) poising from media records and the reported causes and outcomes. * Learners to be shown the charts on expected physical effects of CO poisoning and how it affects the human body including: * nausea * vomiting * headache * unconsciousness * death. * Learners to know the term Parts per Million (PPM) and how this is used to measure CO. * Learners to know the ideal ratios between CO and carbon dioxide (CO2) for appliances. |
| * 1. The measures necessary to ensure that exposure to carbon monoxide does not take place | * Learners to be shown normal ambient CO levels in a range of locations within the centre using a CO detector or flue gas analyser. * Learners to look at the British Standards associated with the detection of CO within I&C buildings and the specific requirements when a solid fuel appliance is installed. * Learners to examine a range of CO detectors and flue gas analysers, which can be used to determine CO levels. * Learners to make lists of precautions that can be taken to reduce the risk of exposure, such as: * regular maintenance * correct combustion * clear flues * following manufacturers’ literature * legislation and guidance. * Learners to be shown how to conduct regular smoke testing of chimneys and flues to ensure flue pull is sufficient and brick chimneys are not allowing products of combustion to leak into the building. |
| 1. Understand the basic ventilation and fluing requirements for industrial and commercial heat producing appliances | * 1. The function and operation of a flue | * Learners to be able to explain the principles of the flue. * Learners to be shown the principle of the chimney effect in the workshop where possible and flues ‘pull’ using smoke pellets. * Learners to be shown the difference between a cold and warm flue by using a blow lamp to pre-heat a flue before testing its performance. * Learners to be shown the effect of an extractor fan on the flue by once again using a smoke pellet, this time when a fan is running in the same area. |
| * 1. The types and categories of flues used for industrial and commercial appliances | * Learners to know the types of flues used in I&C applications. * Learners to be shown physical systems and to be able to identify the differences between the types. * Learners to know the difference between open and room sealed types. * Learners to look at how air is brought into the boiler room etc. for open flued appliances and to be shown examples of room sealed appliance flues identifying air inlets. * Learners to know how flues are labelled according to burner type and the use of fans, in addition to open flue and room sealed flues, including: * natural draught * forced draught * induced draught * room sealed * open flue * flue dilution. * Learners to be shown the table of flue types and their relative category label. * Learners to know about the flue dilution system and why it may be used in certain circumstances. * Learners to know the requirement for interlocks when fans are used within systems. |
| * 1. Types of materials suitable for flues | * Learners to examine a range of physical flues and to know the materials used for their construction including: * twin wall flue pipe * single wall flue pipe * metal flue liner * concrete liner * flue blocks * high alumina cement pipes * kiln burnt/pumice pipes * salt glazed pipe * clay liners * stainless steel * plastics. * Learners to use the Gas Safety (Installation and Use) Regulations 1998 guidebooks and manufacturers’ literature to identify the rated temperatures for flues of different constructions and the requirement for clearance from flammable materials. * Learners to look at maximum flue lengths, angles and the use of bends within these flue types and the effect of high efficiency condensing appliances of the use of flues, including the removal of condensate. |
| * 1. The components found within flue systems | * Learners to be able to identify a range of components within the flue system including: * primary flue * secondary flue * down draft diverter * terminals * flue draft stabiliser * fans * pressure switches * flow switches * thermal insulation. * Learners to be set tasks to identify components or to identify and label real system components. * Learners to be aware of the minimum and maximum distances and dimensions of the flue sections, such as primary, secondary and terminals and correct positioning of each including terminal locations. |
| * 1. The reasons for ventilation | * Learners to know about combustion by discussing ventilation in more detail. * Learners to know why ventilation is required and the effects on the appliance when it is inadequate. |
| * 1. The methods of providing ventilation | * Learners to be shown physical examples in centre of ventilation types, such as a range of grilles. * Learners to be able to explain the basic requirements used to determine the size of ventilation openings for natural draught and room-sealed appliances. * Learners to be shown images and videos to demonstrate the use of mechanical ventilation and to know the importance of positive pressures for spaces containing appliances including: * natural ventilation * mechanical ventilation * ducted ventilation * high level * low level * grills * vents * balanced compartment. * Learners to work through the methods used to calculate basic mechanical ventilation rates and to refer to the Gas Safety (Installation and Use) Regulations 1998 guidance documents and manufacturers’ instructions for appliances. |
| * 1. The signs of inadequate ventilation | * Learners to be set exercises to determine situations where ventilation is inadequate using pre-determined appliances and scenarios. * Learners to know about guides for boiler room temperatures at low, middle and high levels. * Learners to be shown the effect of inadequate ventilation on an appliance using a flue gas analyser. |
| 1. Understand the appropriate industry standards and regulations relevant to installing fuel systems | * 1. The types of statutory legislation, standards and guidance information that applies to the installation of industrial and commercial fuel supply systems | * Learners to understand the requirements to meet legislation using regulations, guidance notes and manufacturers’ guidance. * Learners to be familiar and to refer to these documents and their contents. * Learners to be aware of a range of documents, to know what information is within them and how to find it including: * Gas Safety (Installation and Use) Regulations 1998 * IGEM/UP/2 Installation pipework on industrial and commercial premises * HSL56 Reg 24 * OFTEC technical publications * Building Regulations 2010 Approved Document A: Structure * Building Regulations 2010 Approved Document B: Fire Safety * Building Regulations 2010 Approved Document F: Ventilation * Building Regulations 2010 Approved Document J: Combustion appliances and fuel storage systems * Building Regulations 2010 Approved Document L2A: Conservation of fuel and power in new buildings other than dwellings * Building Regulations 2010 Approved Document L2B: Conservation of fuel and power in existing buildings other than dwellings * Building Regulations 2010 Approved Document Part P: Electrical safety – Dwellings * Institute of Gas Engineers and Managers (IGEM) Standards * British and European Standards * Non-Domestic Building Services Compliance Guide * manufacturers’ information * Control of Substances Hazardous to Health (COSHH) Regulations 2002 * Dangerous Substances and Explosive Atmospheres (DSEAR) Regulations 2002 * Pressure Systems Safety (PSSR) Regulations 2000 * Pressure Equipment Directive (PED) * Clean Air Act 1993 * Environmental act 1990. |
| * 1. The responsibilities and limitations to authority of key personnel relating to the installation of fuel supply systems and equipment | * Learners to know the limits to their authority when working on fuel systems. * Learners to visit the website of Gas Safe, HETAS and OFTEC to identify their roles within industry. * Learners to be able to explain the processes involved in becoming a competent engineer and the assessment processes involved. * Learners to know that landlords have responsibilities and should use the Gas Safety (Installation and Use) Regulations 1998 to investigate what these responsibilities are within tasks. * Learners to be shown media reports to highlight the outcomes of those who have worked on gas systems without correct training and competence and to know the potential legal and custodial results of these actions. |
| * 1. The procedure for notifying works carried out to the relevant building control body | * Learners to be shown links to local authority webpages to know what processes are needed before works on gas and fuel systems are carried out. * Learners to examine documentation required for gas operatives when carrying out work on gas systems. * Learners to look at the Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) Regulations 2013 and to be shown how to report situations. * Learners to be shown examples of RIDDOR reportable situations. |
| * 1. The key professional bodies who represent the fuel industry | * Learners to know the professional bodies for the BES industry and their roles in registration, training and safety development such as: * Gas Safe * OFTEC * Heating Equipment Testing and Approval Scheme (HETAS). * Learners to be familiar with weblinks to their relative webpages and to examine their roles within industry. |
| 1. Understand the methods, techniques and jointing methods for fitting, fixing and connecting natural gas and LPG pipework | * 1. The types of materials used for gas pipework | * Learners to be familiar with a range of pipe materials suitable for use on gas pipework systems internally, externally and underground including: * examine copper * Low Carbon Steel (LCS) * Polyethylene Pressure (PE) * corrugated stainless steel. * Learners to know the advantages and limitations of each type. |
| * 1. The different jointing methods used for gas pipework | * Learners to be shown a range of pipe fittings suitable for the types of pipework discussed. * Learners to be shown their jointing procedures within the workshop area and, where possible, allowed to practice jointing by: * welding * hard soldering (copper phosphorus) * flanges (welded and screwed) * flange categories * union joints * screwed * semi‐ridged couplings * compression fittings * Corrugated Stainless Steel Tubing (CSST) fittings * electrofusion weld * capillary joints * press-fit * swivel joints * quick release coupling * brazing * expansion joints. * Learners to know the advantages and limitations of each including jointing materials used in conjunction with these fittings such as: * single wrap Polytetrafluoroethylene (PTFE) * PTFE string * non-setting gas paste * gaskets and gas rated o rings for crimped fittings. |
| * 1. The safety control devices used on gas pipework | * Learners to be shown practical examples to discuss the purpose and operation of a range of gas control devices including: * emergency controls * manual isolation valves * automatic isolation valves * automatic valve shut off times * meters * regulators * non‐return valves * filters * solenoids * safety shut off valves * boosters * proving systems * low pressure cut‐off valve * pressure/flow switch. * Learners to examine appliances and their control devices. * Learners to look at a range of gas meters and relevant charts to identify their volume and maximum flow rates etc. * Learners to be tested on their knowledge of these devices such as identification tasks via exercises and tasks. |
| * 1. The requirements for supporting gas pipework | * Learners to know the types of brackets and supports suitable for a range of pipework materials. * Learners to be able to examine and discuss pipework installations within the centre. * Learners to understand the need for expansion devices on long lengths of pipework. * Learners to be given pipe bracket tables and to examine the difference between spacings for horizontal and vertical pipework and to be set tasks to identify bracket spacings for given scenarios. * Learners to know to use duck foot bends for vertical pipework. |
| * 1. The requirements for sleeving gas pipework through walls | * Learners to know the requirement for sleeving pipework through walls and the prevention of smoke and fire. * Learners to be able to explain the importance of sleeving and sealing at one end using examples within the centre. |
| * 1. The restrictions and requirements for installing gas pipework in ducts, voids and underground | * Learners to be given copies of the Gas Safety (Installation and Use) Regulations 1998 guidance books for small groups and to investigate the requirements and restrictions when installing pipework in ducts and voids. * Learners to be shown presentations to explain the ventilation requirements within risers and voids. * Learners to be set research tasks using the above guidance books to find solutions to given examples of pipework in ducts, risers and voids. |
| * 1. The pressure ranges of gas pipework systems | * Learners to know the range of pressures within typical systems. * Learners to already know the pressures attached to low, medium, intermediate and high-pressure distribution systems and to know the inlet pressures to meter regulators, the typical system standing pressures, the maximum pressure loss through a meter and the minimum working pressure to appliances. |
| * 1. The methods of protecting and identifying gas pipework | * Learners to be shown presentations to explain the procedures to mark and identify gas pipework. * Learners to know the suitable colours and methods to label gas pipework, including guidance on suitable positions and distance for tape. * Learners to be able to suggest methods to protect pipework from mechanical damage and corrosion, such as correct material choice and physical positioning. * Learners to be shown examples of marking tape for above-ground pipework and metallic strip gas warning tape for placing above underground PE pipework. |
| * 1. The protection of pipework, appliances and equipment against vibration | * Learners to examine a range of anti-vibration mountings for pipework and boosters. * Learners to know how and where flexible connections should be used including suspended appliances, catering equipment and boosters. * Learners to examine expansion joints and anti-vibration joints suitable for use on gas pipework and to be able to explain the use of anchors and guides on these components to protect against strain and damage. |
| * 1. The requirements for equipotential bonding of gas pipework and components | * Learners to be shown presentations to explain the purpose of equipotential bonding. * Learners to examine examples of equipotential bonding within physical systems. * Learners to know the maximum distance from gas meters and the minimum Cross-Sectional Area (CSA) of equipotential bonding to gas systems. * Learners to be shown the process for breaking a joint on metallic pipework and maintaining equipotential bonding within the pipework whilst work is being carried out. * Learners to be set pipework tasks to demonstrate their ability to carry out work whilst maintaining an equipotential. |
| * 1. The methods of installing gas pipework in multi‐story/multiple dwellings | * Learners to be shown diagrams and drawings to explain the requirements for pipework feeding multiple dwellings and multi-story buildings. * Learners to be able to draw ventilation locations within examples of pipework risers containing gas pipework. * Learners to able to sketch the arrangements for valves and fire stopping when entering multiple dwellings. * Learners to know the difference between primary and secondary meters and the requirement for notices and line diagrams where pipework enters the building. |
| 1. Understand the methods, techniques, and jointing methods for fitting, fixing, and connecting oil pipework | * 1. The types of materials used for oil pipework | * Learners to know the options for oil pipework between the storage tank and the appliance, and the advantages and limitations of both LCS and copper pipework. * Learners to be able to identify the limitation of pipe diameter for each material. |
| * 1. The different jointing methods used for oil pipework | * Learners to know the jointing methods for LCS and copper pipework when used to carry fuel oil between the storage tank and the appliance. * Learners to be given a range of fittings within the class and discuss their advantages and limitations including: * threaded * welded * brazed * manipulative joints * hard soldered. |
| * 1. The safety measure used in conjunction with oil pipework | * Learners to be shown images of oil systems and individual safety controls and devices to generate discussions around the controls and safety measures needed when installing oil system pipework. * Learners to use OFTEC guidance documents to investigate the individual requirements for the positioning and safety measures relating to tanks. * Learners to be able to produce layout drawings of oil tank systems including: * isolation valves * emergency control valves (ECV, AECV) * filters * de‐aerators * fire valves * fusible links * steel tanks * plastic tanks * integrally bunded tanks * underground tanks * fill pipe * extended fill pipe * vent pipe * drain valve * contents gauge * overfill alarms * fire stops * riser air vents. |
| * 1. The requirements for supporting oil pipework | * Learners to know bracket and support types for oil pipework. * Learners to use BESA TR/20 (Installation and testing of pipework systems. Part two – Medium temperature hot water heating) documents, B.S. 799 and OFTEC guidance to identify suitable clipping distances and discuss the most suitable types of support for LCS and copper pipework in a range of locations. |
| * 1. The requirements for sleeving oil pipework through walls | * Learners to examine methods of sleeving pipework through walls and look at examples where possible. * Learners to be given intumescent collars and to know their importance and purpose. |
| * 1. The methods of protecting and identifying oil pipework | * Learners to know the content of BS 1710:2014 Specification for identification of pipelines and services, and to look at the different codes and markings for oil pipework. * Learners to use British Standards to investigate the requirement for identification. * Learners to understand pipework location and the need for protection against impact and corrosion when external or underground. |
| * 1. The types of oil supply systems | * Learners to be shown presentations and images to help explain the advantages and limitations to the various oil system arrangements. * Learners to understand the use of high-level header tanks and the difference between one and two pipe systems including: * gravity * pumped * one pipe * two pipe. * Learners to be set tasks to select systems that are most suitable for a given scenario and discuss in groups. * Learners to be aware of the minimum head for high-level tanks above appliances. |
| * 1. The requirements for equipotential bonding of oil pipework and components | * Learners to be shown presentations to explain the purpose of equipotential bonding. * Learners to examine examples of equipotential bonding within physical systems. * Learners to know the minimum CSA of equipotential bonding to oil systems. * Learners to be shown the process for breaking a joint on metallic pipework and maintaining equipotential bonding within the pipework whilst work is being carried out. * Learners to be set pipework tasks in which they can demonstrate their ability to carry out work whilst maintaining an equipotential. |
| 1. Understand the methods and techniques for purging and confirming the integrity of installed fuel systems | * 1. The procedures for testing and purging gas supplies in accordance with IGE/UP1A | * Learners to use IGE/UP1A (Strength testing, tightness testing and direct purging of small, low-pressure industrial and commercial natural gas installations) to explain the process of tightness testing pipework up to 150mm. * Learners to be shown the process of determining test duration and maximum allowable drops before demonstrating a test within the centre and discussing the types of manometers required. * Learners to be set tasks to determine test procedures in given scenarios in small groups and calculate time periods and maximum allowable drops in existing systems. * Learners to examine the equipment required for carrying out both a direct and indirect purge of a commercial gas system. * Learners to be shown the procedure for calculating purge times and volumes before producing step-by-step procedures to allow a purge to be demonstrated within the centre. |
| * 1. The procedures for testing and purging oil supplies | * Learners to know the equipment required to carry out pneumatic air tests on oil pipework and discuss the guidance within TR20 and B.S. 799 for testing oil pipework. * Learners to be set tasks to produce step-by-step guides to testing and purging of oil lines. * Learners to inspect COSHH sheets for the disposal of fuel oils when pulling oil through to appliances and oil pumps. |
| 1. Understand the methods for determining the type and size of equipment and components used in gas systems | * 1. The methods for sizing and selecting ventilation requirements for gas appliances | * Learners to be shown presentations, manufacturers’ literature and the Gas Safety (Installation and Use) Regulations 1998 guidance books to discuss the types of ventilation suitable for gas appliances including: * open flued * room sealed * forced draught * suspended warm air heaters. * Learners to explain the methods of determining/calculating natural ventilation and mechanical ventilation and to use physical examples within the centre to demonstrate these processes. * Learners to be set tasks to determine the ventilation requirements for a range of appliances in differing situations such as: * boiler rooms * compartments * heated spaces * balanced compartments. |
| * 1. The method for calculating pipe sizes for gas pipework systems | * Learners to be given pipe sizing charts for gas pipework and to discuss their purpose. * Learners to know other methods of sizing, such as applications and programmes. * Learners to be shown presentations and tables to work through the process step-by-step, starting by looking at pipework routes and then determining the requirement for gas quantity to appliances. * Learners to know how to calculate sizes from charts and to check that pressure drops do not exceed pre-determined pressures. * Learners to be set tasks to work in small groups to calculate small pipe sizes for simple installations before discussing as a class. |
| * 1. The methods of determining gas meter size and suitability | * Learners to use tables and charts to discuss the operational limits of a range of gas meters. * Learners to be able to explain the term ‘meter volume’ and ‘Q max’ before determining the quantity of gas required for an appliance and determining whether a specific meter can deliver this quantity without exceeding its maximum delivery volume. * Learners to look at appliance manufacturers’ literature, to examine the gas consumption requirements and compare to types of meters available. |
| * 1. The methods of determining purge point sizes | * Learners to use the Gas Safety (Installation and Use) Regulations 1998 guidance books to examine the requirements for purge points of pipework up to 150mm. * Learners to discuss the best suitable locations for these and the minimum size in comparison to the largest pipe diameter. |