Unit 202: Changing practices over time

# Delivery guide

Unit information

The purpose of this unit is for learners to understand how materials, tools and techniques have changed and adapted from pre-1919 practices to the current practices, as well as looking to the future.

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

* What are the changes in building services engineering methods used between 1900 and the present day?
* What are the relationships between trades and the environment?
* Why are we dependent on good communication with other trades?

Learning outcomes

1. Know the changing construction and built environment sector
2. Know the changes in building services engineering materials, tools, and techniques over time
3. Understand the relationship between trades and the environment
4. Understand connected practice in the construction and building services engineering

Suggested resources

Websites

* [Engine Shed | Traditional Mortars: Going Full Circle](https://blog.engineshed.scot/2018/08/24/traditional-mortars-going-full-circle/)
* [Elemental Green | 10 Eco Building Materials Revolutionizing Home Construction](https://elemental.green/10-eco-building-materials-revolutionizing-home-construction/)
* [Future Generations Wales | Well-being of Future Generations (Wales) Act](https://www.futuregenerations.wales/wp-content/uploads/2017/01/150623-guide-to-the-fg-act-en.pdf)
* [NBS | What is Building Information Modelling (BIM)?](https://www.thenbs.com/knowledge/what-is-building-information-modelling-bim)
* [Modular Building Institute | What Is Modular Construction?](http://www.modular.org/HtmlPage.aspx?name=why_modular#:~:text=Modular%20construction%20is%20a%20process%20in%20which%20a,the%20most%20sophisticated%20site-built%20facility%20%E2%80%93%20without%20compromise.)
* [How Stuff Works | Top 10 Green Heating and Cooling Technologies](https://home.howstuffworks.com/home-improvement/construction/green/10-green-heating-and-cooling-technologies.htm#:~:text=Top%2010%20Green%20Heating%20and%20Cooling%20Technologies.%201,4%204%3A%20Biodiesel.%205%205%3A%20Absorption.%20More%20items)
* [GOV.UK | Smart meters: A guide](https://www.gov.uk/guidance/smart-meters-how-they-work)
* [Wikipedia | Chartered Association of Building Engineers](https://en.wikipedia.org/wiki/Chartered_Association_of_Building_Engineers#:~:text=%20%20%20Abbreviation%20%20%20CABE%20,construction%20sec%20...%20%2010%20more%20rows%20)
* [The IAA | PAS 2030](https://www.theiaa.co.uk/pas-2030/)
* [Natural Resources Wales | Scrap metal dealers public register](https://naturalresources.wales/permits-and-permissions/scrap-metal-dealers-public-register/?lang=en)
* [Designing Buildings Wiki | Home](https://www.designingbuildings.co.uk)
* [Designing Buildings Wiki | Modular vs traditional construction](https://www.designingbuildings.co.uk/wiki/Modular_vs_traditional_construction)
* [Energy Saving Trust | Home](https://energysavingtrust.org.uk/)
* [Science Museum | Electrifying: The story of lighting our homes](http://www.sciencemuseum.org.uk/objects-and-stories/everyday-wonders/electric-lighting-home)

Textbooks

* Chudley. R. (2020) *Chudley and Greeno’s Building Construction Handbook.* 12th edition. London: Routledge.

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| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Know the changing construction and built environment sector | * 1. The factors influencing pre-1919 construction | * Learners to understand how pre-1919 construction and engineering resources were sourced and used locally due to transport constraints that dominated the type and look of buildings in certain areas, e.g. local quarries would produce different-looking and different types of aggregate from region to region. * Learners to have an understanding of binders and mortars used pre-1919, such as different types of lime used and how they were produced and slaked. * Learners to have an understanding of the basic qualities and uses of mortars, aggregates, binders, internal and external functional and decorative finishes, stone, slate, timber and earth. * Learners to have a knowledge of lime used pre-1919, such as quick lime and hot lime. |
| * 1. The factors influencing post 1919 to modern construction | * Learners to know how transport systems were developed from pre-1919 to post-1919, which helped to revolutionise the building services engineering industry and made more varied construction materials available from around the country. * Learners to understand cost implications, both good and bad, when more materials became available for purchase to construct buildings and supply building services engineering. * Learners to know that more prestigious buildings, such as churches, government and commercial buildings (such as banks, hotels, etc.) would generally use more expensive materials to complete external and internal architectural finishes, which would mean more expensive build costs. * Learners to know more modern buildings post-1919 would incorporate Damp Proof Membrane (DPM), Damp Proof Course (DPC), steel and glass into building projects and the effect this had on the types and speed of construction. * Learners to have an understanding of modern building services engineering materials and their uses, such as plastic and copper. |
| * 1. The factors influencing 21st century construction | * Learners to have a good understanding of what is meant by sustainable construction for modern 21st century building projects. * Learners to understand the importance of the Well-being of Future Generations (Wales) Act 2015 for the construction industry. * Learners to have a knowledge of the quality and uses of building materials used for 21st century building projects particular to achieving zero carbon footprint. * Learners to be aware of traditional methods of building surveying and design, such as Computer-Aided Design (CAD) and Building Information Modelling (BIM). * Learners to understand the difference and benefits of using modern software for use of 2D and 3D design tools compared to traditional methods. * Learners to have some knowledge of limitations to planning and design in construction when using 2D and 3D software technologies. * Learners to undertake research on types of modular buildings and off-site construction methods for 21st century builds. |
| 1. Know the changes in building services engineering materials, tools, and techniques over time | * 1. The considerations required when performing building services engineering work on pre-1919 buildings and structures | * Learners to have knowledge of methods, applications and techniques used to fit out buildings and structures pre-1919. * Learners to have an understanding of and to be able to list the types of tools used to fit out buildings and structures pre-1919. * Learners to research methods and resources used pre-1919 in application of building services engineering for buildings and structures. * Learners to research traditional finishes (renders, plasters, paints) pre-1919 and to understand the implications of repairs in historical buildings which may have protection orders on them. * Learners to research methods and materials and resources used in installation of plumbing pre-1919. * Learners to be made aware of the terms ‘listed buildings’ and ‘conservation areas’. * Learners to have an understanding of traditional building services engineering materials and their uses, such as lead and cast iron. |
| * 1. Post-1919 and modern construction techniques and building services | * Learners to have a knowledge of methods, applications and techniques used to fit out buildings and structures post-1919. * Learners to have an understanding of and to be able to list the types of tools used to fit out buildings and structures post-1919. * Learners to research and to be able to list the types of materials used in application of building services engineering for buildings and structures post-1919. * Learners to be made aware of the evolution of solid to cavity wall (brick, block and modern timber framing), prefabricated floor, wall, roof and joinery components, modern heating and ventilation systems, electrical installations, water and waste management systems. * Learners to have an understanding of modern building services engineering materials and their uses, such as plastic and copper. * Learners to have an understanding of the introduction of electricity and plumbing systems, including indoor bathrooms and baths, into domestic properties. |
| * 1. The new and emerging technologies in the building services engineering trade and the impact they are having/may have on existing practice | * Learners to research modern day application techniques of their chosen pathway: * Plumbing and Heating: environmental technologies (heat pumps, solar thermal (hot water), ground source heat pump, air source heat pump, biomass, etc.), hydrogen as a new mains gas * Electrical: electric vehicle charging points, smart metering, battery technologies, Photo Voltaic (PV). * Learners to know how to access information on new developments in their trade, such as through professional engineering institutions, industry bodies and trade associations, articles, trade press, formal Continuing Professional Development (CPD), manufacturers’ information, etc. * Learners to be able to recognise how keeping up to date with industry initiatives and developments can help BSE businesses, the sector and the environment. * Learners to research the Chartered Association of Building Engineers (CABE). |
| 1. Understand the relationship between trades and the environment | * 1. Industry regulation, sustainability and the natural environment | * Learners to research government policy on sustainability, e.g. Environment (Wales) Act 2016, Environmental Protection Act, Hazardous Waste (England and Wales) Regulations, Control of Pollution Act. * Learners to research Building Research Establishment Assessment Method (BREEAM) and how it fits into 21st century construction practice. * Learners to have knowledge of Passivhaus types of construction techniques to achieve government initiative and policy standards on zero carbon footprint. * Learners to know what should be done when there is a discovery of protected species during the construction process, e.g. bats and newts, as required by The Conservation of Habitats and Species Regulations 2010. * Learners to research key aspects of Publicly Available Specification (PAS) 2030 (and 2035) and the PAS 2030 installer scheme (a scheme that supports those installing energy efficiency measures). |
| * 1. Ecological considerations and principles | * Learners to have a knowledge of government policy and ecological considerations when undergoing any work which may affect protected wildlife and habitats, e.g. nesting birds, rare plant species. * Learners to understand implications for future development that is planned on areas considered to be flood plains and the effect this could have on the buildings and surrounding areas. |
| * 1. Sustainable approaches | * Learners to have a knowledge of sustainable considerations used in Common Built Environments (CBE) and recognise the scope of their use to maintain a healthy building that is user friendly for 21st century applications under sustainable construction e.g. alarm installation,  wi-fi installation. * Learners to list various ways a building can offset its carbon footprint to meet 21st century building targets and expectations, including heat recovery and ventilation, rainwater harvesting, fuel cells, solar panels, heat and cooling pumps, zero carbon buildings. |
| * 1. Waste disposal in building services | * Learners to have a knowledge of modern methods of waste disposal and recycling of construction materials. * Learners to research Waste and Resources Action Programme (WRAP) and link this to on-site construction waste disposal initiatives. * Learners to know about hazardous waste disposal initiatives and link this to Control of Substances Hazardous to Health (COSHH) Regulations. * Learners to research and recognise how scrap materials can hold value (such as copper as it is a finite resource) and to be aware of the public register of scrap metal dealers in Wales. * Learners to have an awareness of the content and production of a Site Waste Management Plan (SWMP). |
| 1. Understand connected practice in the construction and building services engineering | * 1. Interdependencies between trades | * Learners to engage in a project scenario of their chosen pathway and task of their choice and link this to how to communicate with all other trades within the process regarding timings of first and second fix and to know how to work together collaboratively to complete a successful project. * Learners to have an understanding of the roles and responsibilities of different trades within on-site construction and building services, such as bricklayer, joiner, plasterer, tiler, electrician, Heating & Ventilation (H&V) fitter, gas fitter, decorator, groundworkers, plumber, roofer, etc. |