1.1 The sector (Intent)		
• buildings and structures • infrastructure and civil engineering products • building services engineering • professional and managerial roles and responsibilities associated with the built environment sector.		Add colour to these boxes to RAG rate your understanding
Implementation	Impact	
1.1.1. Buildings and structures	Learners should know: • the main types of buildings and structures covered within the sector: residential and non-residential buildings, bridges and roads • typical component parts of buildings and structures, including walls, floors and openings.	Clear understanding
1.1.2. Infrastructure and civil engineering products	Learners should be aware of the following facilities and systems: • roads • railways • bridges • tunnels • water supply and sewerage systems • electrical grids • telecommunications.	
1.1.3. Building services Engineering	Learners should be aware of the function of the following services in buildings: • mechanical services, including escalators and lifts, heating, ventilation, air conditioning • electrical services, including energy supply, lighting and low voltage (LV) systems, communication lines, telephones and IT networks, fire detection and protection, security and alarm systems • services that support public health, including plumbing for water supply, and domestic hot water, drainage of wastewater (sewage) and stormwater drainage.	
1.1.4. Professional and managerial roles and responsibilities associated	Learners should know the following professional roles and be aware of the responsibilities of each (listed below) regarding the design and construction of a project through to its completion and handover:	

with the built environment Sector	• designer/architect • civil/structural engineering • contracts manager and site manager • surveyor • quantity surveyor. Learners should be aware of the professional associations such as CIOB, RICS, RIBA3, and the benefits of membership.	
• Designer/architect	Learners should be aware that an architect: • creates new buildings and/or renovations or changes existing buildings • produces designs to meet client requirements along with regulations, legislation and environmental requirements • produces detailed drawings for the contractor • manages the post design stages of the project for the client.	
• Civil/structural Engineering	Learners should be aware that a civil and structural engineer: • designs, plans and manages construction projects • solves design and development problems • produces a structural solution in terms of the design codes, such as Building Regulations or British Standards • assesses potential risks within a project.	
• Contracts manager and site manager	Learners should be aware that a contracts manager or site manager: • is responsible for coordinating construction site activities • manages the progress of the site and undertakes site meetings • organises resources of labour, plant and materials • undertakes the day-to-day activities on site • is responsible for health and safety on site and for the welfare of workers.	
• Surveyor	Learners should be aware that a surveyor: • surveys land, measuring existing features of the natural and built environment • sets out construction works in accordance with the drawings and specification • produces built data and drawings for architects and structural engineers.	
• Quantity	Learners should be aware that a quantity surveyor:	

surveyor	• is responsible for the financial management of a project • makes payment to subcontractors and suppliers • produces a final account at the end of a project • is responsible for the control of budgets and control of cost.	

1.2 The Built Environment life cycle	
• raw material extraction • manufacturing • construction • operation and maintenance • demolition • disposal, reuse or recycling.	
Implementation	Impact
1.2.1 Raw material extraction	Learners should know that the following industries extract raw materials: • oil and gas • forestry • quarrying • mining.
1.2.2 Manufacturing	Learners should be aware of the following means of transforming raw materials into finished goods: • Timber: felled logs are cut into 'boards' and then seasoned to remove excess water • Engineered wood products (EWP): designed to overcome limitations on size of sawn timber, including trussed rafters, structural sections and manufactured boards such as plywood and oriented strand board (OSB) • steel: • structural steel – made into standard column and beam sections • stainless steel – made into fixings and fastenings • lightweight mild steel sections – lintels, purlins and rails • profiled sheeting – wall and roof cladding. • copper: manufactured to produce building services products such

	as electric cable and water/gas pipes • plastic: manufactured to produce building services products such as water pipes • crushed rock materials: used as hardcore and granular fill materials reduced to 20mm crushed grading • clay: natural clay minerals are crushed, shaped, dried and then fired in ovens to produce bricks • cement: raw materials such as limestone are crushed, blended and heated in a kiln to make cement • mortar: sand, cement and water are mixed to make a paste used to bind and point building blocks. • concrete: • cement, water and aggregate (gravel, sand or rock) are mixed together to make concrete • combined with steel bars or mesh to make reinforced concrete lintels and prestressed products such as floor beams.
1.2.3 Construction	Learners should know and understand the following forms of construction activities: • new buildings and structures and the assembly on site of prefabricated elements • alteration, conversion, and renovation of existing buildings and structures • civil engineering works such as roads and bridges • mass concrete foundations and large diameter drainage schemes • installation of mechanical, electrical, gas and communication services.
1.2.4 Operation and maintenance	Learners should know and understand that operation can involve: • controlling and monitoring of heating, cooling and lighting systems • the provision of security, cleaning and other ancillary services, including testing and evacuation procedures • maintenance may take the form of: • planned and preventive maintenance: carried out on a regular basis, in order to keep something in working order or extend its life • cyclical maintenance: replacing over a cycle of work as an investment in stakeholders' comfort levels • emergency or reactive maintenance due to safety reasons for stakeholders. Learners should be aware that a building operation and maintenance manual: • is given to the client or end user on completion in accordance with the Construction, Design and Management (CDM) Regulations relevant sections • contains information regarding the operation, maintenance, decommissioning and subsequent demolition of a building.

1.2.5 Demolition	Learners should know that a pre-demolition plan includes details of: • hazardous materials such as asbestos, foam insulation, and medium density fiberboard • live utilities and disconnections • structures and load bearing party walls • site conditions and constraints • statutory requirements need to be considered • demolition may involve the use of explosives, hand demolition or machine demolition. • procedures include: • site security set up • disconnection of utilities • removal of hazardous materials • soft strip of non-structural elements • taking down superstructure • onsite crushing of demolition materials into filling that can be recycled • dust suppression measures • removal of slab and foundations.
1.2.6 Disposal, reuse or recycling	Learners should know that: • waste materials may be sent directly to landfill or salvaged for reuse or for recycling • waste materials can be retained on site in embankments and landscape bunding • excavation materials can be retained on site by a balanced cut and fill excavation • construction can produce a significant amount of waste so there are benefits to be gained from encouraging more reuse or recycling, including preservation of natural resources, creation of jobs and reduction in pollution • sustainable construction methods may include specifying materials that are sustainable and renewable from managed sources.

1.3 Types of building and structure
In this section learners will gain knowledge and understanding of the features and characteristics of: • different forms of infrastructure construction • low-rise: • residential dwellings

• commercial buildings • industrial buildings • agricultural buildings • community buildings • religious buildings • recreational buildings.	
Implementation	Impact
1.3.1 Different forms of infrastructure construction	Learners should know and understand that infrastructure construction: • covers a range of functions such as roads, motorways, services such as electrical distribution, harbour works, rail cycle paths, bridges and tramways • may have significant benefits to quality of life by providing economic, social and environmental benefits on a local or national scale • may have significant drawbacks, including economic, social and environmental, on a local or national scale. • projects are often controversial because developers, planning authorities and communities have to weigh the benefits against drawbacks.
1.3.2 Residential dwellings	Learners should be aware that residential dwellings: • are used as places of habitation • are among the smallest types of building • often vary by location with multi-dwelling structures such as apartment blocks in urban areas and single detached properties in rural areas • are often made of block or timber frame construction • are in demand because there is a shortage of available, affordable homes in the UK.
1.3.3 Commercial buildings	Learners should be aware that commercial buildings: • are used to provide services or retail products to customers • accommodate business activities, usually undertaken to make a profit for the owners • are usually adapted to fulfil the purpose of the business • may be purpose-built or converted to enable a change of use • are often located in retail centres, in or out of town/city centres.
1.3.4 Industrial buildings	Learners should be aware that industrial buildings: • are usually larger buildings, adapted to specific functions • are often used for storing, processing, engineering or manufacturing materials • may be part of a new development, such as in a modern industrial park, or a refurbished older building or site.
1.3.5 Agricultural buildings	Learners should be aware that agricultural buildings: • are associated with farming and the agricultural industry • may be older buildings constructed using traditional materials and techniques • may be large modern buildings, designed to suit a particular function and the rural landscape/environment in which they are situated.

1.3.6 Community buildings	Learners should be aware that community buildings: • are used by members of a community • are usually located in a convenient location for the community using the building • may be modern or older buildings, sometimes converted to enable a change of use.
1.3.7 Religious buildings	Learners should be aware that religious buildings: • usually serve as places of worship • vary considerably in terms of age, size and architectural style • often include elaborate architecture, with towers or domes, and may therefore be one of the most expressive and influential structures in the local built environment.
1.3.8. Recreational buildings	Learners should be aware that recreational buildings: • vary considerably in terms of size and style • may be buildings in their own right or extensions to other buildings to enable an existing business to offer recreational activities • may be designed for a specific function or versatile to accommodate a range of functions.

1.4 Technologies and materials	
• main elements and components of low-rise buildings • main materials involved in constructing walls, installing building services, fitting roofs and finishing interiors • renewable technologies and materials, including heat pumps, wind turbines and solar panels.	
Implementation	Impact
1.4.1 Main elements and components of low-rise buildings	Learners should know the functions of the following elements and components of low-rise buildings: • foundations • substructure • ground floor • super structure: • walls • upper floors • frame • roof supports • wall cladding • roof finishes.
1.4.2 Main materials involved in constructing walls, installing building services, fitting roofs and finishing	Learners should be aware that the following materials and components are used in the construction of walls, installing building services, fitting roofs and finishing interiors. External walls: • structural element: load bearing masonry (insulating blockwork), structural frame (steel or timber), structural insulated panels (SIP) • insulation: mineral fibre rolls, sprayed foam, rigid foam slabs • external cladding: brick or rendered blockwork, steel sheeting,

interiors	aluminium faced insulated panels, curtain walling. Internal walls and floors: • block or stud (timber or steel) partitions • timber, concrete or steel floor joists. Secondary structures: • steel lintels, joists and timber trussed rafters for masonry walls • sheeting rails and purlins for steel frames. Roof finishes: • slate or concrete tiles for timber trussed roofs • steel sheeting over insulated lining trays for steel framed structures • rubber based sheeting or fibreglass for flat roofs. Internal finishes: • floor screeds and boards• plasterboard for walls and ceilings • wall plaster and decorations. Building services: • incoming services run through sub-structure walls and then extended for internal distribution • internal drainage run through external walls for connection to underground systems. Building services materials: • plastic and copper pipework for plumbing and heating services • plastic rainwater goods and drainage systems • copper cable for electricity and communication systems.
1.4.3 Renewable technologies and materials, including heat pumps, wind turbines and solar panels	Learners should know that energy may be generated or collected from renewable sources, as opposed to generated by burning finite resources such as fossil fuels. Learners should know and understand the main principles of the following forms of renewable technologies and be aware of the main benefits and limitations of their use: • Solar Energy: • solar photovoltaic: conversion of sunlight into electricity using photovoltaic (PV) cells/panels • solar thermal: conversion of sunlight into thermal energy (or heat). • Wind turbines: • harness the power of the wind to generate electricity • domestic wind turbines may be pole mounted or building mounted. • Heat pumps: • ground source: uses pipes that are buried underground to transfer heat from the ground into the building • air source: transfers heat from the air outside of a building into the building • water source: transfers heat from a source of water outside of a building into the building. • Water: • rainwater harvesting • grey water re-use • hydro-generation of electricity (tidal/hydroelectric).

1.5 Building structures and forms	
• cellular constructions • rectangular frame constructions • portal frame constructions • heritage and traditional methods.	
Implementation	Impact
1.5.1 Cellular constructions	Learners should know that in cellular constructions: • load bearing walls provide the main vertical support and lateral stability for floors • external wall panels, lift shafts or staircases are used to provide stability • bridging components such as floors, roofs and beams are supported by load bearing walls • prefabricated modular construction, such as pods, may be used.
1.5.2 Rectangular frame constructions	Learners should know that in rectangular frame constructions: • weight is carried by a skeleton or framework of columns and beams, rather than being supported by walls. Learners should be aware that: • a lightweight timber-frame is a common structure used in the construction of contemporary housing • steel and reinforced concrete frames are used in larger structures • contemporary commercial framed buildings have replaced traditional external walls with the use of metal and glass screens, or curtain walls, as exterior cladding.
1.5.3 Portal frame constructions	Learners should know that in portal frame constructions: • beams or rafters are supported at either end by columns • columns are secured to pad foundations using holding down bolts • the joints between the beams and columns are 'rigid' so the beam can be reduced in size and can span large distances. Learners should know the terminology of the components of a portal frame detail drawing, including: • columns on base plates • rafters • apex and knee details • eaves beam • wind bracing • cold formed sections and connections Learners should be aware that portal frame constructions are: • often fabricated from structural steel, reinforced precast concrete, or laminated timber • lightweight and can be fabricated off-site, then bolted to a substructure.
1.5.4	Learners should be aware of:

Heritage and traditional methods	• the importance of heritage and traditional methods in the maintenance of the historic built environment: • to maintain the history and character of a building • to comply with planning regulations within conservation areas • to preserve our heritage for the benefit of present and future generations. • the maintenance methods used by heritage and traditional trades: • having a regular programme of maintenance to help prevent small problems escalating, or further deterioration occurring • matching existing materials and methods of construction where possible • retaining as much of the original fabric as possible in historically significant buildings.

1.6 Sustainable construction methods	
• the environmental, financial, cultural and social benefits of sustainable construction methods • pollution and the preservation of the natural environment and natural habitats • sustainable materials used to create building frames, walls, roofs • waste disposal, re-use and recycling • planning permission, brownfield sites and greenfield sites.	
Implementation	Impact
1.6.1 The environmental, financial, cultural and social benefits of sustainable construction methods	Learners should be aware of the following benefits of using sustainable construction methods: • financial benefits: • minimising waste • reducing energy consumption • improving water efficiency • reducing operating costs • optimising the life cycle of buildings • cultural and social benefits: • protection of the environment • helps avoid the depletion of natural resources • improving environmental quality may: • improve occupants' comfort • create an aesthetically pleasing environment • improve air quality • improve productivity.
1.6.2 Pollution and the preservation of the	Learners should know and understand that construction methods should take account of factors including pollution, preservation of the natural environment and

natural environment and natural habitats	natural habitats. Learners should be aware of the following approaches to preserving the natural environment and natural habitats: • limiting the pollution released into water, air or the ground during construction and use of the built environment • places may be made into protected areas by organisations in each of the devolved countries of the UK (England, Scotland, Wales and Northern Ireland) such as Natural Resources Wales, Natural England, Scottish National Heritage or Department of Agriculture, Environment and Rural Affairs in Northern Ireland, which place restrictions on activities and developments • developers may try to reduce the impact on nature by building tunnels under roads for newts to use, or creating new roosts for bats when their original roosts are lost because of development • reducing carbon dioxide emissions during construction and use of the built environment.
1.6.3 Sustainable materials used to create building frames, walls, roofs	Learners should know that: • wood is a renewable construction material and is commonly used in homebuilding • steel used in construction contains recycled content and steel can be recovered and recycled again • recycled bricks may be used to create walls or crushed to be used as hard-core • straw bales can be used to create walls inside a frame • wool may be used as insulation instead of fibreglass or polyurethane • reclaimed slates or tiles, thatch or timber shingles can be used on roofs.
1.6.4 Waste disposal, re-use and recycling	Learners should be aware of the following in relation to waste disposal, re-use and recycling of materials: • Waste disposal • includes the classification of waste materials: hazardous, non-hazardous, origin, properties • the costs of landfill: financial, environmental and social • Re-use • salvaged construction products are re-used with little or no reprocessing, typically: bricks, slates, steel sections • the environmental impact of reprocessing is minimised • Recycling • processes typically include crushing, smelting, decontamination, sorting • there are a wide variety of potential end uses of recycled concrete, wood, metals, glass and plastic.
1.6.5. Planning permission, brownfield sites and greenfield sites	Learners should know that: • planning permission is a system that enables Local Planning Authorities (LPA) to control the development of the built environment in their area. Learners should know and understand the characteristics,

	benefits and drawbacks of brownfield sites, including that: • they have been used before and tend to be disused or derelict land • existing buildings may have to be demolished and there may be clean-up costs for land decontamination • redevelopment of brownfield sites can clean up environmental health hazards and eyesores • access roads, drainage and services may already be available onsite, reducing the cost of a new development. Learners should know and understand the characteristics, benefits and drawbacks of greenfield sites, including that: • they have not been built upon previously • they tend to be cheaper to develop, subject to legal and planning constraints. • infrastructure works, including new roads and utility connections must be taken into account.

1.7 Trades, employment and careers	
• bricklaying • stonemasonry • plastering • carpentry and joinery • electrical installation • plumbing installation • painting and decorating • flooring and tiling.	
Implementation	Impact
1.7.1 Bricklaying	Learners should be aware that a bricklayer: • works from plans and specifications • constructs structures by spreading layers of mortar, placing bricks/blocks, checking vertical and horizontal alignment • constructs brickwork using traditional bonding patterns.
1.7.2 Stonemasonry	Learners should be aware that a stonemason: • dresses, carves and lays traditional stonework, including dry-stone walling • repairs and cleans existing traditional stone mouldings and other features.
1.7.3 Plastering	Learners should be aware that a plasterer: • applies wet finishes and protective coverings on external walls • applies plaster to inside walls and ceilings • dry lines internal studs of walls • replicates traditional ornamental plasterwork using plaster, moulds and casts.

1.7.4 Carpentry and joinery	Learners should be aware that a joiner: • joins pieces of wood in a workshop, which a carpenter fixes on site. Learners should be aware that a carpenter: • installs floor joists, floorboards, roof trusses, wall partitions • fits interior woodwork – staircases, doors, skirting boards, cupboards, kitchens • replicates traditional ornamental mouldings.
1.7.5 Electrical installation	Learners should be aware that an electrician: • instals, inspects and tests electrical services and equipment • follows relevant safety regulations.
1.7.7 Painting and decorating	Learners should be aware that a painter and decorator: • prepares and applies paint, wallpaper and other finishes to interior surfaces • prepares and applies paint and other finishes to exterior surfaces • follows relevant safety regulations.
1.7.8 Flooring and tiling	Learners should be aware that a floor layer: • prepares and applies levelling compounds • lays carpet and vinyl floor finishes to internal surfaces • instals ceramic wall and floor tiles.

1.8 Health and safety	
In this section learners will gain knowledge and understanding of health and safety in relation to: • risks for employees, employers and the public during construction and the built environment projects • following procedures and carrying out risk assessments • relevant legislation, including Health and Safety at Work Act and Control of Substances Hazardous to Health (COSHH) regulations • using personal protective equipment (PPE) • safely working with gas, water and electricity • working at height and in enclosed spaces.	
Implementation	Impact
1.8.1 Risks for employees, employers and the public during construction and the built environment projects	Learners should know and understand that construction sites are hazardous environments with many risks: • workers are at risk from heavy construction equipment and vehicles, working at height, manual handling and slips, trips and falls • employers have the responsibility for the safe operation of sites and may be held to account in the case of accidents or incidents • the public may be at risk when close to a construction site, or if they gain access to the site, from harmful materials and site traffic.
1.8.2	Learners should know and understand the importance of

Following procedures and carrying out risk assessments	following the correct procedures (rules) so that contractors and employees work safely and prevent accidents and injuries. Learners should know that risk assessments include: • general assessments of health and safety risks on construction sites and associated control measures • specific assessments for particular hazards such as working at height, manual handling and noise, and associated control measures.
1.8.3 Relevant legislation including Health and Safety at Work Act and Control of Substances Hazardous to Health (COSHH) regulations	Learners should know and understand that regulations require employers to protect the wellbeing of workers, visitors and members of the public, and control exposure to hazards in order to prevent illness or injury, including by: • preparing risk assessments • deciding what control measures are necessary • preventing (or controlling) exposure to hazards • ensuring that the hierarchy of control is followed • monitoring the level of exposure to hazards • preparing procedures to deal with accidents • training and supervising employees.
1.8.4 Using personal protective equipment (PPE)	Learners should know and understand that regulations require employers to control exposure to hazards to prevent illness or injury by: • assessing the use of PPE as a control measure • preventing (or controlling) exposure to dangerous environments, such as heat, cold, chemicals, biological risks, falls from height and working in enclosed spaces, by the selection of the correct PPE for the task • training and supervising employees in the correct use, storage and maintenance of PPE.
1.8.5 Safely working with gas, water and electricity	Learners should know and understand the importance of following the correct safety procedures when working with gas, water and electricity: • gas and electric should only be worked on by a competent person who holds the necessary qualifications and accreditations (e.g. Gas Safe and NICEIC) • follow appropriate working practices, safety procedures and precautions • use the correct protective equipment • know the means of cutting off the supply of gas, water or electricity for isolation prior to carrying out work.
Working at height and in	Learners should know and understand that to ensure safety:

enclosed spaces	• those working at height must: • be properly planned and use an appropriate method of access (e.g. MEWP, Scaffold or access platform) • take account of weather conditions (if appropriate) • use equipment which is appropriately inspected • control risks from fragile surfaces and falling objects. • those working in enclosed spaces must manage risks from: • exposure to fumes • reduced oxygen levels • flooding/drowning • the risk of fire and explosive atmospheres • entrapment in machinery (if appropriate) PPE (e.g. harnesses) Learners should be aware that there must be arrangements in place to get the person out of the enclosed space safely and promptly if they become unwell.