



SECTORAL STRATEGIC APPROACH TO COOPERATE ON SKILLS IN THE CONSTRUCTION INDUSTRY

WP5. STUDY ON OCCUPATIONAL PROFILES

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VET providers	Sectorial Representatives	Country
FLC(Coordinator)	CNC	Spain
IFAPME	Confédération Construction	Belgium
SATAEDU	-	Finland
CCCA-BTP	FFB	France
BZB	ZDB	Germany
BFW-NRW		
AKMI	PEDMEDE	Greece
TUS	-	Ireland
FORMEDIL	ANCE	Italy
VSRC	LSA	Lithuania
CENFIC	-	Portugal
ŠOLSKI	CCIS CCBMIS	Slovenia
	BUDOWLANI(Trade union)	Poland
EU Sectorial representatives		
FIEC		
EFBWW		
EBC		

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INTRODUCTION

This report is part of the Work Package 5 (WP5) of the Construction Blueprint project. It aims to identify, in each country of the partnership, the professional profiles that need to be reviewed and updated and new and emerging professions.

This methodology aims to take greater account of the needs and expectations of construction companies in terms of professional skills which are required and will be required in order to meet 2030 housing and climate action targets, new regulatory constraints, particularly in regard to energy performance, renewables, digitisation, decarbonation and circular economy.

In Ireland, in 2023, it is typical to see headlines on media such as [‘Shortage of surveyors may threaten construction output’](#) (02/02/2023), citing the Employment, Remuneration and Workplace Report by the Society of Chartered Surveyors, the news article specifically states *‘While 2,910 new positions are set to be created for surveyors over the next three years, just 1,829 new surveyors will enter the jobs market during the same period. This will leave a shortfall of around 1,081’*. This finding is likely to contribute to challenges in meeting both housing and climate action targets for Ireland. The subsequent issue for Irish Government and the construction industry and educational provision is to find workable solutions, not just for the shortage of surveyors but across the entire construction value chain where similar shortages owing to an aging workforce and a decline in attractiveness of construction jobs for both female participation and younger cohorts are becoming increasingly evident.

Emerging technologies and trends must also be considered in the challenge of upskilling, reskilling, and redeployment of workers in fields such as modern methods of construction, off site construction and manufacturing which will contribute positively to the evolution of the Irish construction industry. The identification of skill types and levels necessary to scale up transformation is the focus of a new EU LIFE funded project called Build up Skills Ireland 2030, led by TUS Midlands, Irish Green Building Council, Laois Offaly Education and Training Board and the Construction Industry Federation. A report is due in June 2023 and a roadmap or action plan to meet these gaps is due by March 2024.

Education and Training Boards are Irelands VET centres and focus heavily on construction trades, apprenticeships and further education and training. As part of this report curricula and pedagogies for construction workers, crafts, and professionals were reviewed to identify the type and quantity of training provision required to meet 2030 targets for energy use in the building sector.

A report carried out by the Irish government in 2019 entitled ‘Report on the Analysis of Skills for Residential Construction & Retrofitting 2023–2030’ has been particularly useful in this regard. This report was commissioned by SOLAS – the Further Education and Training Authority of Ireland and the Department of Further and Higher Education, Research, Innovation and Science

(DFHERIS). Its purpose was to quantify the additional construction skills which will be required to deliver the Government's targets in new housing and in the retrofitting of 446,300 homes over the period 2023-2030.

The report focuses on all construction skills – that is skills which correspond to every qualification level on the Irish National Framework of Qualifications (NFQ). In general, the education and training of persons in NFQ levels 1-6 is funded by SOLAS and delivered by sixteen Education and Training Boards (ETBs). In contrast, the education and training of persons for qualifications above level 6 is in general provided by higher education institutes. In addition, SOLAS also contracts training of levels 1-6 to Technological Universities, who provide training of various phases e.g., electrician, plumber etc. In effect from level 1 to 8 there are thousands of construction and construction related courses available at a variety of education centres in Ireland. In addition, the availability of continuous professional development courses, professional courses through registered bodies and entities like DASBE (Digital Academy for Sustainable Skills in the Built Environment) funded under the Irish Government's Human Capital Initiative are abundant.

There are four potential sources of supply for professional, technical, skilled, and semi-skilled construction workers in Ireland. These are the technological universities (TUs) and institutes of technology; the apprenticeship system; the Construction Skills Certification Scheme (CSCS) and an extensive range of relatively short vocational training courses. In addition, there are two sources of skills supply from outside of Ireland. Firstly, there are a significant number of skilled workers employed in the construction industry who have come to Ireland from another country within the European Economic Area (EEA). Secondly, there are a significant number of skilled workers who were born outside of the EEA and are employed in the industry, having availed of the work permit scheme.

Ireland is currently undergoing a housing crisis, hence the requirement of 33,000 new builds per year, with some estimates placing this figure at somewhere between 50,000-62,000 homes built per year in order to meet the shortfall of housing.

A current sample of high targets of relevance to the skills and future skills profile of construction workers across the construction value chain in Ireland include:

- 33,000 new builds annually over a 7-year period to 2030
- Retrofit 434,000 houses over the same period (500,000 was the original figure but some have been completed)
- General repair and maintenance of the same stock over the same period

For Retrofits, there is a requirement of a B2 BER rating (100>B2<150 kWh/m²/year) for all deep renovations in Ireland as of 2019, and a NZEB requirement for all new build housing. These requirements for new build and retrofit are very ambitious and will lead to greenhouse gas emissions reductions over the period, however, require significant more skill, work and time to accomplish, especially in retrofit.

There are also initiatives (such as the Housing for All plan) from the government to drastically ramp up the retrofit and new build markets to meet the demand for housing in Ireland, however the situation is complicated by timing and the fact that many government departments are involved in the setting of these targets, for example the Department of Housing, Sustainable Energy Authority of Ireland and Department of Environment, Climate and Communications in retrofitting 500,000 homes by 2030, of which 25% should be completed by 2025.

It is estimated that over 50,000 new entrants into professional, managerial, skilled, and semi-skilled roles in construction will be required over the period 2023-2030. A combination of existing workers in the industry e.g. so called ‘wet trades’ (plasterers, block layers), reskilling to meet requirements e.g., BIM, MMC and new entrants into the sectors will contribute to reaching this figure.

The National Skills Bulletin 2020 highlights the following construction roles:

Construction Occupations	Construction related technicians.	Other construction trades
Civil engineers & construction project managers	Building and civil engineering technicians	Steel erectors Roofers, roof tilers and slaters
Civil engineers Construction project managers and related professionals	Architectural and town planning technicians	Glaziers, window fabricators and fitters
Production managers and directors in construction	Draughtspersons	Construction and building trades
Architects & town planners, architectural technologists, & surveyors	Bricklayers & plasterers	Floorers and wall tilers
Architects / town planners / Chartered architectural technologists	Bricklayers and masons	Construction and building trades supervisors
Quantity surveyors / Chartered surveyors	Plasterers	Construction operatives & elementary
	Plumbers and heating and ventilating engineers	Scaffolders, staggers and riggers
	Carpenters & joiners	Elementary construction occupations
	Painters & decorators	Road construction operatives Rail construction and maintenance operatives
		Construction operatives

Professions identified as requiring further numbers according to the same report include waste disposal managers, construction managers, project managers, structural engineers, architects, quantity and building surveyors, planners, architectural technologists, conservation professionals, environmental professionals and architectural technicians. While on the trades side, electricians, pipefitters, bricklayers, plumbers, carpenters, plasterers/wall tilers and painters were identified as requiring further numbers. Modern methods of construction will mean that trades and professions will have to be agile to meet new requirements and educational systems will need to meet this through updated content and life long learning.

The education and training system and the construction industry itself suffered periods of closure in both 2020 and 2021 as a result of the pandemic. As an apprenticeship consists of 7 phases, combining both on-the-job and off-the-job training, these closures created significant *delays* for the education and training system and hence the pipeline, in processing the apprentices through each of the phases. There are continuing discussions between the relevant stakeholders on how best to expedite this process and it is not yet possible to make accurate projections of the impact of these closures on the completion rate.

Traditional ‘wet trades’ such as plasters, block layer and painters have declined without much, if any, impact on building productivity rates. There is increasing evidence from building sites that off-site construction and of the use of timber frames is becoming more popular. For example, for large estate building, roofing frames are often being delivered to the site fully constructed, while much of the frame of timber houses is built off-site. The sponsorship of apprentices in the wood manufacturing and finishing trade has increased in recent years and these developments may be a contributing factor.

Housing Crisis

Statistics on Irish government housing policy are equally challenging such as 33,000 new homes to be provided each year from 2021 to 2030. Employment in construction peaked in 2007 at 240,000 persons directly employed, in comparison to the lowest figure in 2012 of 81,300, a decline of 66% because of the downturn during the global financial crisis of 2008. Growth resumed in the economy between 2012 and 2019 and the construction sector grew by 80% in the same period as noted in the Build 2022: *Construction Sector Performance and Capacity report.

Profile

The most recent CSO Labour Force Survey data shows that the number of persons in employment increased across most economic sectors in the year 2022, most notably in construction. The number of persons directly employed in construction at the end of Q3 2022 was 171,000, with Skilled Trades being the highest occupational group at 97,800. Of the 171,000 employed, 15,700 or just over 9% were female - this figure needs to increase if Ireland is to meet its targets. A further 50,000 approximately are employed in industries which serve the construction sector, such as architectural practices, engineering consultancies, legal and financial sectors, and agencies.

Population

The number of persons aged 15-24 years old increased from 619,800 in quarter 3 2019 to 652,900 in quarter 3 2022 (Eurostat). While population growth exceeded the employment and labour force growth for those aged 20-24 years, the reverse was the case for 15–19-year-olds, with employment growth far exceeding population growth. The figure below shows that the greater participation of the youth population was driven by a real increase in employment and the labour force by the 15–19-year-old age cohort over this three-year period. In the same period, 7,200 young people were employed in the construction sector, which made up one third of the total increase (+34.1%) in employment in the sector (+21,100).

Figure 4. Change in the labour force, employment and population aged 15-24 years, Q3 2019 - Q3 2022



Source: SLMRU analysis of Eurostat data

METHODOLOGY

There are a number of prominent and well recognised government reports published and available publicly which focus on the skills shortage in the construction sector in Ireland. These have been reviewed and analysed for the purpose of this report.

The CSO's (Central Statistics Office) Quarterly Labour Force Survey (LFS) - which is widely regarded as the most accurate and timely quantification of the skills of the labour force in Ireland. Secondly, the annual publication from the Department of the Environment 'Construction Review and Outlook' has been discontinued. This has been a useful addition to the volume of data on activity and employment in the Irish construction industry. Unfortunately, at the time of writing this report (March 2023) the census results for 2022 were still unavailable. Skills forecasts are strongly influenced by mandatory targets and legislation around Housing for All and Climate Action targets. Often it seems that these targets can be in competition with each other.

In keeping with the methodology of the John McGrath report, *'The total forecasts are derived by multiplying the employment figures by occupation in the base year of 2019 by the projected increase in the number of new house completions and the projected increase in the number of houses retrofitted to the equivalent of a B2 BER standard for each year of the period 2023-2030 inclusive'*. Of course, the commercial and public ambitions in this period must also be considered here and gets complicated due to often a lack of published and comparable data.

The rate applied to the forecast is based on the rates used by CEDEFOP in its most recent forecast of total job-openings in Ireland over the period 2018-2030. There are many advantages to using the CEDEFOP replacement rate for Ireland. Firstly, the rate is based on analyses conducted by some of the most reputable institutions involved in projecting skills demand, including Cambridge Econometrics and the University of Warwick.

Additionally, the CEDEFOP forecast for Ireland anticipates that the Irish building industry will expand significantly over the period 2018-2030 (i.e., 4.5% p.a.). Thirdly, the rates are specific to occupation groups and to levels of education. This allows for a high degree of accuracy in computing the replacement rate for each construction occupation. It is difficult to precisely predict the number and type of skills required to deliver the Government's targets on new housing and retrofitting. The assumptions underpinning the forecasts on house building presented in the John McGrath report are considered plausible because they are based on recent data on house commencements and completions, planning permissions, the number of houses under construction, and employer sentiment. Furthermore, recent data on house completions are consistent with projections from the forecasting model for earlier years.

16 sample Irish construction profiles are described in the following chapter outlining their current and potential benefit to meeting the skills challenge.

Presentation of your national occupational profiles

[Supported by Generation Apprenticeship April 2023](#)

Occupational Profile No1: Carpenters and joiners

No1 Occupational Profile	Name: Carpenters and joiners
National Code	Carpentry and joinery EQF L5 (Ireland L6)
Description	<p>The Trade of Carpentry & Joinery is very wide and varied, it encompasses most of the skills required by the Wood Trades. The skills required of the Carpenter & Joiner are not confined to those required to work in wood but also include skills in the use of metals, plastics, and fabrics. The Carpenter & Joiner is also required to work in a cross section of domains within the overall trade. The following are some examples:</p> <p>Joinery Shop: This section of the occupation requires the Carpenter & Joiner to engage in setting out the production and assembly of items of joinery which include stairs, doors, windows, and built-in furniture.</p> <p>Site Work: Site work is the construction of buildings or houses which require 1st fixing, formwork roofs and 2nd fixing. This section is split into two categories, constructing/civil engineering contracts.</p> <p>Maintenance: Maintenance work requires the Carpenter & Joiner to carry out a variety of tasks in general maintenance and upkeep of public and private buildings, e.g., shops and factories.</p>
Core skills	<p>Construction of upper floors</p> <ul style="list-style-type: none"> • Construction of flat roofs • Construction of pitched roofs • Construction of hip roofs • Construction of pitching roofs (trussed) • Construction of load and non-load bearing partitions • Fabrication and erection of formwork for walls, columns, floors, stairs <p>Construction and hanging of the following:</p> <ul style="list-style-type: none"> • Framed and sheeted doors • Panelled doors • Flush doors • Construction and installation of internal and external door frames • Construction and installation of windows • Carrying out 1st and 2nd fixing on buildings <p>Operation of the following powered hand tools:</p> <ul style="list-style-type: none"> • Saw, planer, drill, router, screwdriver, ballistic gun, router, sander, jig saw
Optional skills	<ul style="list-style-type: none"> • Construction of moulds • Construction of centres for arches • Construction of specialist type joinery

	<ul style="list-style-type: none"> • Construction of fittings • Setting out buildings • Site levelling <ul style="list-style-type: none"> • Green roofs • Installation of solar panels
Upgrading of skills	<ul style="list-style-type: none"> • Use and care of hand tools • Interpreting drawings • Measurement • Setting out • Marking out • Planning (production) • Calculations • Work practice • Use of manufactured boards • Fixings • Ironmongery • Basic wood joints • K/D fittings • Setting up and operation of machines for specific operation

Occupational Profile No2: Electricians and electrical fitters

No 2 Occupational Profile	Name: Electricians and electrical fitters
National Code	QQI level 6
Description	<p>The work of an Electrician ranges from wiring of domestic houses, offices, and retail units to more complex systems involving instrumentation, process control and maintenance in industrial plants, hospitals, and power stations.</p> <p>The electrical craftsperson is concerned with the installation, commissioning, testing and maintenance of electrical wiring systems and services; electrical plant and control equipment; process monitoring and control systems. Modern process plant includes electrical, electro-mechanical, electropneumatic, electronic and microprocessor-based systems.</p> <p>In order to function effectively and efficiently, the electrical craftsperson must have a broad base of technical knowledge complementary to information gathering and analytical skills. The ability to interpret technical data and the proper use of test instruments is critical for effective system maintenance, fault diagnosis and rectification, and the installation/calibration of sensors, transmitting and controlling devices. This craftsperson must maintain</p>

	<p>effective communications with colleagues, clients, and equipment suppliers.</p> <p>Proper maintenance and updating of job related and equipment-related documentation is critical. All work undertaken by electrical craftsperson's is subject to statutory regulations governing the safety of personnel, plant, premises and the environment.</p>
Core skills	<ul style="list-style-type: none"> • Selection, procurement, safe use of, and storage of craft-related tools, equipment and materials • Selection and utilisation of fixing devices • Assessment, interpretation and implementation of ETCI wiring regulations, installation inspection and testing procedures • Utilisation of electrical test instruments • Installation of steel conduit wiring systems • Installation of plastic conduit wiring systems • Installation of steel trunking cable systems • Installation of plastic trunking cable systems • Installation of cable tray and ladder systems • Installation of industrial cable systems • Installation of sub-distribution boards and protective devices • Installation and maintenance of lighting, heating and motive power systems and controls • Installation and testing of overcurrent and earth leakage protection systems • Installation of earthing and bonding systems • Interpretation of circuit schematics and architectural drawings which incorporate IEC symbols • Interpretation of technical data and manufacturing standards • Interpretation of equipment assembly, disassembly and adjustment procedures • Completion and updating of job-related documentation <p>Integrated curriculum includes maths, science, theory, drawing and computer applications</p>
Optional skills	<ul style="list-style-type: none"> • System fault analysis skills • Interpretation of electrical/electronic schematic diagrams • Interpretation of flow, function, and ladder charts • Soldering and desoldering skills • Testing, removal and replacement of electronic components/PCBs • Installation and programming of PLC systems • Installation and calibration of sensors and transducers • Installation of electro-pneumatic systems • Installation of data communication cable systems
Upgrading of skills	Heat pump installation and maintenance, HVAC

Occupational Profile No3: Elementary construction occupations

No3 Occupational Profile	Name: Elementary construction occupations
National Code	...Insert here the code of the profile if exists considering your country
Description	<p>Construction Skills Certification Scheme (CSCS) programmes provide for the training, assessment, certification and registration of non-craft operatives, providing the knowledge and skills needed for occupations within the construction sector.</p> <p>The scheme was developed following detailed consultation with social partners (Construction Industry Federation and ICTU), the Health and Safety Authority and specialist working groups to identify the training</p>

	<p>needs and occupational standards required for a range of occupations in the construction sector.</p> <p>The Construction Regulations require that certain construction workers carrying out safety critical tasks must complete Construction Skills Certification Scheme (CSCS) training.</p> <p>On successful completion of this training, persons are given a CSCS card. These cards demonstrate that the worker has received training in the relevant skills.</p> <p>The task requiring CSCS training are as follows:</p> <ul style="list-style-type: none"> - Scaffolding - basic - Scaffolding - advanced - Mobile tower scaffold - where the employee has not been trained in either Scaffolding Basic or Scaffolding Advanced - Tower crane operation - Self erecting tower crane operation - where the employee has not been trained in Tower crane operation - Slings/Signalling (This involves slinging of loads on lifting equipment and signalling plant drivers regarding the placing of loads) - Tractor/Dozer operation - Mobile crane operation - Crawler crane operation - Articulated dumper operation - Site dumper operation - 180 degree excavator operation - Mini-digger operation - 360 degree excavator operation - Roof and wall cladding/sheeting - Built-up roof felting - Signing, lighting and guarding on roads - Assisting in the implementation of health and safety at roadworks - Locating under-ground services - Shotfiring
<p>Core skills</p>	<p>Quarries Skills Certification Scheme (QSCS)</p> <p>The Quarries Skills Certification Scheme (QSCS) programmes are for non-craft operatives in the quarrying sector.</p> <p>If you wish to attend a QSCS Programme you must meet certain criteria for the specific skills category related to the SOLAS registration card. More information is available from one of the QSCS Approved Training Organisation.</p> <p>Safe Pass</p> <p>Safe Pass is a one-day health and safety awareness programme. The aim of the programme is to improve your knowledge and awareness of</p>

	<p>health and safety standards and practices in the construction industry. During the day, you'll cover the following learning units:</p> <ul style="list-style-type: none"> - Introduction of Site Safety - Legislation and Site Safety - Site Accident Reporting - Introduction to Risk Assessment - Risk Assessment for Electricity - Risk Assessment for Excavations - Risk Assessment for Heights - Behaviour-Based Safety - Site Safety and Construction Equipment - Site Safety and Construction Vehicles - Personal Health and Welfare - Noise and Vibration - Personal Protective Equipment
<p>Optional skills</p>	<ul style="list-style-type: none"> - 180° Excavator - Telescopic Handler - Tractor/Dozer - Mobile Crane - 360° Excavator - Slinger/Signaller - Articulated Dumper - Crawler Crane - Mini Excavator - Self Erect Tower Crane - Site Dumper - Tower Crane
<p>Upgrading of skills</p>	<ul style="list-style-type: none"> - Roof and Wall Sheeting/Cladding - Built-Up Roof Felting - Bituminous - Built-Up Roof Felting - Single Ply Roofing Systems

Occupational Profile No4: Plumbing

No4 Occupational Profile Name: Plumbing	
National Code	Plumbing EQF L5 (Ireland L6)
Description	Plumbing work involves the installation and maintenance of plumbing, heating and mechanical services on domestic, commercial and industrial projects, including houses, schools, hospitals, office blocks, apartment blocks, factories as well as pharmaceutical, chemical, food/drink processing facilities. These installations comprise of a wide range of services including pipefitting, welding, soldering on central heating systems, air handling systems, solar heating, hot and cold water supplies, sanitary appliances and sanitation systems, gas pipelines and appliances, compressed air, fire control, steam, chilled water systems and process pipework.
Core skills	<p>Use of plumbing tools and materials</p> <ul style="list-style-type: none"> • Pipe fitting • Pipe bending • Inspection and testing of pipework • Fault diagnosis • Design/installation of central heating systems including: <ul style="list-style-type: none"> •solid fuel •gas •oil fired boilers •flues and ventilation •fuel storage and distribution Design/installation of plumbing systems including: <ul style="list-style-type: none"> •mains water supply •water treatment •domestic and multi-storey hot and cold water supply •storage tanks, cylinders, calorifiers •sanitary appliances and discharge pipework and systems <p>Installation of:</p> <ul style="list-style-type: none"> •gas appliances •fire fighting systems
Optional skills	<p>Installation of:</p> <ul style="list-style-type: none"> •underfloor heating •solar heating •steam heating •compressed air systems •vacuum systems •biomass heating •ground source heat pump heating •greywater systems • Commissioning and servicing: <ul style="list-style-type: none"> •boosted cold water systems •unvented hot water systems •boilers •burners

	<ul style="list-style-type: none"> •gas appliances •pumps <p>Knowledge of:</p> <ul style="list-style-type: none"> •heating controls •air handling units and air conditioning systems •industrial and process gases and liquids
Upgrading of skills	<p>Heat pump installation and maintenance</p> <p>Mechanical Ventilation</p> <p>Heating Controls</p> <p>Ventilation Controls</p> <p>Control Strategy</p>

Occupational Profile No5: Architects

No5 Occupational Profile Name: Architects	
National Code	NQF Level 8 / Level 9
Description	Architects design buildings such as homes, offices, schools, hospitals, churches, hotels, train stations and skyscrapers as well as private buildings. They work to ensure buildings are functional, safe and suit the needs of the people who use them, as well as aesthetically pleasing. In its broadest sense, the term architect refers to a person who translates a user's practical and stylistic requirements into a functional built environment. (GradIreland)
Core skills	<ul style="list-style-type: none"> - Building Design - Building Modelling - Building and Construction - Aptitude for mathematics. - Problem-solving - Excellent analytical skills. - Decision-making - IT skills (e.g., BIM, CAD) - Project management - Teamwork - Written and verbal communication - Cultural Context OF Buildings - Structures & Environmental Science
Optional skills	<ul style="list-style-type: none"> - Sustainability & Conservation - Research - Acoustics in the Built Environment - Building Life cycle Costing, Life Cycle Analysis - Whole life carbon
Upgrading of skills	<ul style="list-style-type: none"> - Circular Economy - Digitisation - Decarbonisation - Renewables specification

Occupational Profile No6: Civil Engineer

No6 Occupational Profile Name: Civil Engineer	
National Code	Level 7
Description	<p>Civil engineers design the physical infrastructure that surrounds us. Roads, bridges, airports, railways, and other significant construction projects are built and maintained with the input of civil engineers. Civil engineers will take on a wide range of responsibilities to ensure that large scale projects are delivered. These range from assessing the feasibility and challenges presented by proposed projects all the way to designing the project itself and selecting and managing the resources used and maintaining the infrastructure on delivery. This means they are often coordinating between the work of many other specialists, ensuring that the electrical engineers, mechanical engineers, and construction contractors working on a construction project are on track.</p>
Core skills	<ul style="list-style-type: none"> - Building Design - Building Modelling - Building and Construction - Building Services (Water, Electrical, Mechanical) - Aptitude for mathematics. - Problem-solving - Excellent analytical skills. - Decision-making - Project management - Teamwork - Written and verbal communication
Optional skills	<p>Specialisation can be in:</p> <ul style="list-style-type: none"> - Structural - Planning - Management
Upgrading of skills	<p>With over 400 engineering courses offered across undergraduate and postgraduate level, there are no shortage of entry routes to a career in engineering. Most of these courses focus on a specific field of engineering and at postgraduate level the degree of specialisation becomes greater. Many undergraduate engineering programs offer a general entry option, allowing students to study a range of topics and plan on their area of focus later, with the benefit of direct experience.</p>

Occupational Profile No7: Painters and decorators

No7 Occupational Profile	Name: Painters and decorators
National Code	Painting and decorating EQF L5 (Ireland L6)
Description	<p>The work of a Painter and Decorator is concerned with both new build and retrofit.</p> <p>The renovation and restoration of period buildings, the decoration and preservation of new and existing structures, the decoration of public buildings and private dwellings, sign work, the application of wall hangings, the production of imitative and decorative arts, the application of decorative and industrial coatings including spray painting, the ability to advise on colour selection, film, TV, theatre, and display painting. The repainting of hospitals, kitchens, breweries, bakeries, food processing plants, to comply with Government regulations. Crafts persons are generally employed by a main Painting and Decorating contractor, a Building Contractor or are in a Maintenance capacity in undertakings such as factories, hospitals, chemical plants, councils and local authorities. The bulk of Painting and Decorating work takes place in the area of redecoration.</p>
Core skills	<ul style="list-style-type: none"> • Surface preparation • Priming and sealing • Mixing and applying undercoating and finishes • Mixing and applying ground colours • Applying clear finishes, dyes, stains and glazes • Wallcovering • Glazing and reglazing • Elementary signwriting and stencilling • Stripping • Reading drawings and specifications • Brush graining • Rag rolling • Texture work • Storage and use of tools and materials • Housekeeping and appearance • Basic power tools • Ladders, planks and scaffolding • Measurements • Application of emulsions • Specific safety
Optional skills	<p>Reading drawings and specifications</p> <ul style="list-style-type: none"> • Measuring and estimating • Plumbing and levelling • Using ladders, planks, and scaffolding • Safety regulations • Costing materials
Upgrading of skills	<p>Using initiative</p> <ul style="list-style-type: none"> • Co-operating with others on the job • Problem solving • Planning and organising • Working alone • Customer relation

Occupational Profile No8: Plasterers

No8 Occupational Profile	Name: Plasterers
National Code	Plastering EQF L5 (Ireland L6)
Description	<p>The work of a plasterer includes the application of plaster to internal and external wall surfaces and ceilings, to produce a seamless fine finished surface.</p> <p>Plastering also involves the application of protective and decorative coats of cement based material and similar material to external surfaces of buildings.</p> <p>A plasterer's work includes the preparation of surfaces by fastening metal or plasterboard to form a key or background for plastering.</p> <p>Individual craft persons often specialise in particular skills such as mould work, slating and tiling, suspended ceilings, and metal systems</p>
Core skills	<p>At the end of the apprenticeship, the craftsperson will be able to demonstrate competence in the following skills:</p> <ul style="list-style-type: none"> • Preparation of backgrounds • Scudding • Rendering and floating sand/cement • Floating lightweight/plasters • Cutting and fixing plasterboards • Fixing metal beads using expanded metal • Skimming walls and ceilings • Dotting and screeding • Floating with soft screeds • Fixing rules for reveals/plinths and quoin stones • Plastering piers, beams, and curved surfaces • Dry lining, taping joints • Cutting and fixing fibrous plaster • Plaster moulding • Squaring and margining of reveals • Floating and skimming • Erecting scaffolding • Safety • Use of metal system
Optional skills	<ul style="list-style-type: none"> • Measuring/setting out • Use of tools • Care of tools • Ordering materials • Safety • Costing/estimating • Reading and producing drawings • Plumbing, ranging and use of level • Knowledge of materials
Upgrading of skills	Planning work

	<ul style="list-style-type: none"> • Organising work • Ability to work independently and as part of a team • Using own initiative in problem solving • Ability to gather information • Ability to adapt to changing work practices and conditions • Interview technique
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Occupational Profile No9: Bricklayers and masons

No9 Occupational Profile	Name: Bricklayers and masons
National Code	Brick and stone laying EQF L5 (Ireland L6)
Description	Bricklayers lay bricks, pre-cut stone, and concrete blocks in mortar. They construct, extend and repair domestic and commercial buildings, and other structures such as foundations, walls, chimneys, or decorative masonry work. Bricklaying offers a real sense of achievement.
Core skills	<ul style="list-style-type: none"> Cavity walls in brick and block Cellular block walls Door and window openings Piers Soldier courses Chimney breasts and stacks Timber frame construction. Setting Capping and copings Lintels and sills Laying damp proof courses Producing joint finishes Identifying various types of scaffolding Maintaining safe scaffolding practices
Optional skills	<ul style="list-style-type: none"> Reading and producing drawings Calculations: costing projects and estimating materials Measuring and setting-out Transferring levels Plumbing, ranging and levelling using spirit level Use and care of tools Knowledge of building materials Safety
Upgrading of skills	<ul style="list-style-type: none"> • Planning and organising work • Problem solving • Using initiative • Good verbal communications • Adaptability to changing work practices and conditions • Working as part of a team

Occupational Profile No10: Mobile machine drivers and operatives

No10 Occupational Profile	Name: Mobile machine drivers and operatives
National Code	
Description	The crane training course aims to provide skills training in rigging, loads, lifting procedures and developing good communication skills dealing with ground crews, using hand signals and voice communication. The Crane course enables experienced Mobile Crane operators to gain their crane licence / certification.
Core skills	<ul style="list-style-type: none"> Construction Site Safety Awareness Health and Safety Legislation Safely operate and control a mobile crane Lift and place a variety of loads Check, inspect and maintain a mobile crane for efficient use under construction site conditions Hand signals and communication Demonstrate the knowledge and safe use of different types of lifting gear Change mobile crane configuration to suit altered jib lengths
Optional skills	Health and safety
Upgrading of skills	Will be vital for new builds and modern methods of construction

Occupational Profile No11: Roofers, tilers and slaters

No11 Occupational Profile Name: Roofers, tilers, and slaters	
National Code	<p>People interested in Roofing, cladding & slate work as a career enter from a number of allied trades roles: carpentry, stone work, and construction. Training may occur on the job on a construction site or through specific training with a roofing contractor after directly applying.</p> <ul style="list-style-type: none"> - Key skills certs - Manual Handling - Working at Height / MEWP (Mobile elevated work platform) - Scaffolding - Safepass
Description	<p>Roof slating and tiling involves carrying out skilled work, using roofing products on construction sites, or on existing buildings to create complete roof coverings.</p>
Core skills	<p>Inspect problem roofs to determine the best repair procedures. Remove snow, water, or debris from roofs prior to applying roofing materials. Set up scaffolding to provide safe access to roofs. Estimate materials and labour required to complete roofing jobs. Cement or nail flashing strips of metal or shingle over joints to make them watertight. Install partially overlapping layers of material over roof insulation surfaces, using chalk lines, gauges on shingling hatchets, or lines on shingles. Cut felt, shingles, or strips of flashing to fit angles formed by walls, vents, or intersecting roof surfaces. Apply plastic coatings, membranes, fiberglass, or felt over sloped roofs before applying shingles. Install, repair, or replace single-ply roofing systems, using waterproof sheet materials such as modified plastics, elastomeric, or other asphaltic compositions. Attach roofing paper to roofs in overlapping strips to form bases for other materials.</p>
Optional skills	<p>Installation of solar panels, green roofs, biodiversity enhancement </p>
Upgrading of skills	<p>Described as a job in demand by the Irish government, Overall employment numbers were unchanged between 2020 and 2021 and remained below preCOVID-19 levels. The Recruitment Agency Survey identified issues with sourcing curtain wallers, steel fixers/erectors and fitters/glaziers. The older age profile for this occupation (with 38% aged 55 years and older) may also create additional replacement demand in future years.</p> <p>Any increase in commercial construction activity will also see demand for these occupations, while renewable energy targets may create</p>

additional demand for roofers in relation to the installation of solar panels, although this may require re/up-skilling for some. Although there are signs of demand for these roles, albeit potentially small in number, no shortages are evident to date.

Occupational Profile No12: Architectural and town planning technicians

No12 Occupational Profile	Name: Architectural and town planning technicians
National Code	<p>NFQ Level 7</p> <p>Accredited by The Chartered Institute of Architectural Technologists (CIAT) and The Royal Institute of the Architects of Ireland (RIAI).</p> <p>A studio-based technical design course with dedicated studio space for students of each year.</p> <p>Students will acquire proficiency in Graphics, Computer Aided Design (CAD), Revit and Building Information Modelling (BIM).</p> <p>Students complete an integrated research and design project based on a field study. Previous international field trips included visits to Bilbao, Barcelona and Milan.</p> <p>Annual end-of-year industry showcase event for final year students.</p> <p>Exit Award: Higher Certificate in Science in Architectural Technology (NFQ Level 6) after Year 2.</p>
Description	<p>The Architectural Technologist usually works as part of the Architect's team, with particular responsibility for the preparation of production information such as working drawings, schedules and specifications. They also work on site surveys, administrative procedures to do with building regulations, fire safety certificates, planning applications, the building contract, etc.. Some technologists develop specialisations in particular areas, such as specification writing, technology, materials, regulations, BIM, for example.</p> <p>Most Architectural Technologists work for private Architectural practices or in the Architectural departments of Government Departments, Local Authorities or Semi-State Agencies. But there are also job opportunities with building contractors, manufacturers or suppliers of building products and materials, in private Architectural Technology practice, architectural graphics and model-making.</p>

	As with Architecture, career possibilities are very much dependent on the state of the economy. In a booming economy there is a shortage of Architectural Technologists. When it is depressed the building industry is soon affected. But the situation could change between now and the time you qualify.
Core skills	Subjects covered in most courses include building technology, materials, structures, building services, surveying, architectural history, graphics, computer applications, costs and contracts. Much of your time will be spent on project work, site visits and practical work.
Optional skills	<p>Research and propose detailed constructional and technological solutions for new builds, extensions and refurbishment of existing and historic buildings</p> <p>Work within a contemporary technical environment using BIM technologies such as energy analysis and building services integration using software such as Revit Building Design Suite</p> <p>Develop technical solutions from sketch design stage through to working drawings and prepare and coordinate tender documents</p>
Upgrading of skills	BIM, circular economy, decarbonisation

Occupational Profile No13: Quantity Surveyor

No13 Profile

Advanced Quantity Surveyor

National Code	Level 9
Description	<p>Calculates the cost of building projects, taking into account labour, materials, taxes and maintenance costs. Advises on the costs of developing all types of buildings and infrastructure. Provides professional project management and construction cost expertise to clients on a range of public and private construction projects. This will be run as an apprenticeship programme with intake dates July to September 2023. It is currently run through TUs as a degree programme.</p>
Core skills	<p>A Quantity Surveyor calculates the cost of building projects, taking into account labour, materials, taxes and maintenance costs.</p> <p>Typical tasks for a quantity surveyor or construction economist include:</p> <ul style="list-style-type: none">• Researching and preparing construction budgets for a range of construction and construction related projects• Planning the costs of each phase of the project to ensure value for money and also sustainability in terms of the overall project• Advising both contractors and state agencies on costing related matters for various construction projects• Advising on choosing contractors and procurement processes• Administering the costs during the project for both contractor and other related parties, such as the client• Negotiation and dispute resolution• Taxation and funding advice
Optional skills	<p>Quantity surveyors need to be able to interpret technical drawings and architects' plans. They also need negotiating skills and initiative to make their own decisions. They must have good communication skills and be able to work as part of a team.</p> <p>They need a wide knowledge of construction law, health and safety issues, building methods and time scales, and the costs of materials.</p>

Upgrading of skills

Local and central government quantity surveyors also control expenditure on ongoing programmes, making the best use of budgets and balancing maintenance against new construction work. They must make sure that all design decisions are made at the start of the project to ensure good value is obtained for money spent. There are 2 kinds of quantity surveyor - one who carries out work on behalf of an organisation and one who works for a construction company.

Commercial quantity surveyors are employed by building and civil engineering contractors. They prepare bids for construction work, and make sure that work is completed on time and to the required standard and that the contractor makes a profit. They assess the effect of any changes to the project or disruption in work and discuss it with the client's quantity surveyor.

Commercial quantity surveyors are usually based on construction sites and may need to move around the country for projects.

Occupational Profile No14: Auctioneering and property services

No13 Occupational Profile	Auctioneering and property services
National Code	QQI Level 6
Description	The Licensed Property Services Provider values residential and commercial property and land for the purposes of sale, probate, family law, development, or governmental initiatives. • He/She negotiates the sale of residential, commercial property and land either by private treaty or by auction tender. • He/She lets residential, commercial property and land. The Property Services Provider manages residential or commercial property. • He/She markets residential and commercial property and land for the purpose of sale or letting.
Core skills	<ul style="list-style-type: none"> • Explain the structure of the property industry including its relationship between agent, vendor and buyer, financial institutions and developers; the main types of agencies and the weaknesses and strengths of each type • List the different valuation methods used in the industry and determine which method is best suited to the purpose of the valuation and to the type of property being valued • Describe the rules and code of conduct governing ethical and professional behaviour as set down by the Property Services Regulatory Authority (PSRA) and the relevant professional bodies in the industry • Identify good practice for maintaining detailed records and office administration for applicant qualification • Describe the key concepts, strategies and tools of service marketing and explain how to influence and successfully negotiate the sale of property and land • Demonstrate a clear understanding of the legislative framework within which the industry operates • Explain the principles of economic theory and their application to the property market • Describe the principles of building construction • Explain how to let property and land in compliance with current legislation • Discuss the structure and role of the property management company
Optional skills	Employ professional judgement to qualify and recommend the most suitable buyer to a client • Communicate in a positive, engaging, energetic and passionate manner with clients, potential clients, members of the public • Be punctual, reliable, diligent and respectful and act with integrity towards clients, peers and colleagues at all times • Display a willingness to learn new skills, solve problems and work as part of a team • Show thoroughness and attention to detail in all aspects of the work of a Property Service Provider • Show awareness of the huge role personal appearance, grooming and dress plays in generating trust and confidence among clients and colleagues
Upgrading of skills	Life cycle costing, whole life carbon, digital logbook Auctioneering and Estate Agency firms Property Letting companies Property Management companies

Occupational Profile No15: Site foreperson

No14 Occupational Profile Site foreperson	
National Code	
Description	Foremen are experienced construction workers who are responsible for supervising work on a site, guiding other construction operatives, ensuring standards are met and coordinating the carrying out of tasks. Site Foremen possess a variety of technical skills, specialist knowledge and are adept at managing day to day operations.
Core skills	<ul style="list-style-type: none"> • Knowledge of materials, methods, tools in the construction or repair of houses or other buildings • Knowledge of business and management principles involved in strategic management and resource allocation, human resources, modelling, leadership, production methods, coordination of people and resources. • Knowledge of practical application of engineering, science and technology
Optional skills	Coordination Management Active listening Monitoring Public speaking
Upgrading of skills	BIM, digitization, drone use, AI, robotics, digital twin, circular economy principles <ul style="list-style-type: none"> • Building and Retrofitting Challenges • Retrofitting Incentives and Opportunities • Energy and Carbon Reduction Options

Occupational Profile No16: Refrigeration and Air Conditioning Technician

National Code	The overall duration of this apprenticeship is a minimum of 4 years provided all phases are successfully completed. On successful completion of the programme the learner is awarded a Level 6 Advanced Certificate Craft – Refrigeration and Air Conditioning.
Description	Working as a refrigeration and air conditioning craftsperson you will be required to install, maintain and repair all types of refrigeration and air-conditioning equipment and systems. A refrigeration and air conditioning craftsperson can work in industries such as domestic, marine, commercial and industrial. Required to install, maintain and repair items such as household, hospital, hotel and shop refrigerators, display cabinets, deep freezers, cooling plants, cold rooms and refrigerated transport.

Core skills	<ul style="list-style-type: none"> – Install, service and maintain a broad range of high, medium and low temperature refrigeration equipment – Install, service and maintain air conditioning systems and associated parts – Knowledge of welding, plumbing and electrical work – Inspect and test systems and diagnose faults – Interpret drawings and diagrams – Perform routine maintenance and repairs – Use tools or machinery to fabricate industrial components.
Optional skills	Plan and organise • Communicate effectively • Solve problems • Work independently and as part of a team • Show a positive attitude • Recognise the need for good customer relations • Demonstrate good work practices including time keeping, tidiness, responsibility, quality awareness and safety awareness

Occupational Profile No17: Wind Turbine Maintenance Technician

National Code	<p>On completion of this three-year apprenticeship, one will become a fully qualified wind turbine maintenance technician, with an NFQ Level 6 Advanced Certificate in Industrial Wind Turbine Engineering.</p> <p>One may then choose to work as a qualified wind turbine maintenance technician in any company that operates and maintains commercial wind turbines. You may also use the qualification to progress within the sector and/or to higher education programmes. As a wind turbine maintenance technician one will undertake a range of tasks associated with the maintenance of large-scale commercial wind turbines.</p> <p>The wind turbine maintenance technician applies their broad base of technical knowledge and skills to carry out planned and unplanned maintenance on wind turbines. You will safely and effectively inspect, maintain, repair and replace systems and components.</p>
Description	<ul style="list-style-type: none"> • Maintain electrical, mechanical, gearbox and hydraulic systems of wind turbines • Maintain, test, remove and replace wind turbine components • Demonstrate the correct use of gearbox inspection equipment and reporting software • Interpret technical drawings • Interpret and implement wiring regulations • Demonstrate fault analysis, location and diagnosis on various components and systems.
Core skills	Complete and work in accordance with work-based risk assessments and method statements. • Demonstrate safe working practices, implementing identified control procedures for all work including all lock-out tag-out procedures. • Demonstrate the interpretation and implementation of wiring regulations; installation, inspection and testing procedures. • Demonstrate the correct use of electrical and

	<p>hydraulic test instruments. • Understand and utilise Scada and relevant communication protocols in line with business procedures and guidelines to achieve the best result. • Demonstrate the ability to maintain, test, remove and replace wind turbine components. • Demonstrate fault analysis, location and diagnosis on various components and systems. • Demonstrate the correct use of gearbox inspection equipment and reporting software. • Demonstrate correct use of Laser Alignment equipment. • Demonstrate safe use and storage of craft-related tools, equipment and materials. • Complete and update job related reports and IT systems. • Complete and interpret technical drawings, including orthographic projection, schematics, and freehand sketching. • Demonstrate workshop tasks including marking out, drilling, tapping, reaming, riveting, fastening, thermal processes, fabrication etc. • Use cameras and upload / share / email photographic records.</p>
Optional skills	<p>Selection and correct use of tools and equipment. • Work and communicate effectively as part of a team to achieve the best results for customers in the business. • Demonstrate adaptability in the completion of electrical / electronic / mechanical / hydraulic tasks. • Ability to work on your own independent initiative. • Demonstrate strong analytical and problem solving skills, using all gathered information to solve problems. • Demonstrate effective planning skills preparing materials, equipment and tools in preparation for tasks. • Identify quality systems and regulatory requirements relevant to the role. • Demonstrate a strong grasp of the English language and demonstrates an ability to understand technical terms and concepts. • Demonstrate an ability to interpret written requirements and technical specifications for maintenance activities, and implements reporting requirements of maintenance records. • Effective use of ICT and digital equipment relevant to the role</p>

*Insert each table accordingly

Depicting your country: What is the national context concerning construction?

Following the financial crisis of 2007/2008, the volume of construction output contracted by 37% and did not resume positive growth until 2013. There was a sharp increase in housebuilding in 2017 to over 14,000 and the increase has continued every year resulting in just over 21,000 house completions in 2019. However, the volume of house building plateaued at 20,000 in 2020 and 2021 due in large part to the pandemic.

Employment in construction peaked in 2007 at 240,000 persons directly employed, in comparison to the lowest figure in 2012 of 81,300, a decline of 66% because of the downturn during the global financial crisis of 2008. Growth resumed in the economy between 2012 and 2019 and the construction sector grew by 80% in the same period as noted in the *Build 2022: Construction Sector Performance and Capacity* report.

The most recent CSO Labour Force Survey data shows that the number of persons in employment increased across most economic sectors in the year 2022, most notably in construction. The number of persons directly employed in construction at the end of Q3 2022 was 171,000, with Skilled Trades being the highest occupational group at 97,800. Of the 171,000 employed, 15,700 or just over 9% were female - this figure needs to increase if Ireland are to meet its targets. A further 50,000 approximately are employed in industries which serve the construction sector, such as architectural practices, engineering consultancies, legal and financial sectors, and agencies.

The *National Skills Bulletin (SOLAS 2022)* notes that in 2021 approximately 133,700 persons (95% male) were employed in the selected construction occupations, representing 5.6% of the national workforce. The strongest rate of employment growth was observed for bricklayers and plasterers (11.1%) during the period. The 25-54 age group accounted for the majority of persons employed, at 70%. The share aged 55 and over (21%) was slightly above the national average of 19%

According to the *SOLAS National Skills Bulletin 2022*, 6 occupations relevant to the industry, were identified as being in short supply or potential short supply in 2022. These were plumbers, carpenters, electricians, civil engineers, and project managers.

Public investment remains an important stabiliser for construction demand and employment. Based on the strategic investment priorities in the National Development Plan, public capital investment of almost €165 billion will be committed between 2021 – 2030. According to the *Build 2022: Construction Sector Performance and Capacity Report*, analysis shows that this investment will support approximately 80,000 direct and indirect construction jobs. The report also observed that approximately half of the 2021 construction workforce is over 45 years old, so it is crucial that the sector has the necessary pipeline of skills to account for replacing the existing workforce. This pipeline is produced through the apprenticeship system for construction trades and through higher education for constructions professionals.

In 2021 there were a total of 4,944 new construction apprentice registrations which was the highest level of registrations since 2007. In 2022 the number was 4,504, a slight decrease due to uncertainty in the current climate, but it is forecasted to increase again between 2023 and 2025

and these increases will be required to meet additional demands arising from Government ambitions.

Emerging Occupational Profiles

Trends in the Sector

The composition of employment across the construction sector has been changing in recent years reflecting the emerging technological developments, which are transforming the way in which the sector is innovating into the future. There are fast changing technological and environmental factors, such as the increasing importance of Building Information Modelling (BIM), off-site construction, and the additional upskilling needed to enhance the sector's response to the effects of climate change on the built environment. Change in the sector is being driven by the need to improve competitiveness, to address climate change and environmental challenges, and the need for dramatically improved sustainability.

The construction sector knows only too well that the cyclical nature of the industry can lead to extreme fluctuations in employment at any given point in time based on the underlying economy. It is likely that additional employment will be needed in the short term as the sector returns to growth post Covid-19 and public capital investment ramps up with the National Development Plan 2030.

Emerging Data and Trends within the Green Building Sector

The construction and built environment account for 37% of Ireland's carbon emissions, the same as agriculture¹. This is made up of about 23% operational emissions associated with the energy used to heat, cool and light buildings, with the remaining 14% being accounted for by embodied carbon. Embodied emissions result from quarrying, transporting, and manufacturing building materials, in addition to constructing buildings and infrastructure. The construction industry is also responsible for 48% of all waste, 50% of all extracted raw materials and about a third of all water use².

Multiple policies are being developed at national and European level to tackle these issues ranging from the government's Climate Action Plan 2021 to the EU's revision of the Energy Performance Building Directive (EPBD). Ireland has also committed to reducing its carbon emissions to zero by no later than 2050 and to reduce by 51% compared to a 2018 baseline by 2030.

Decarbonising Ireland's built environment will have significant implications for construction-related skills, with new occupations growing in size (e.g. retrofit coordinators or advisors), and more importantly with impacts on the skill mix of a range of occupations.

In addition, important pathways programmes are being put in place from VET centre level (ETBs) to TU level, so that schools leavers do not need to go through the application system for TUs but can start a course in a VET centre and proceed through in-house arrangements to Degree or Masters etc at a TU.

DASBE the Digital academy for Sustainability in the Built Environment have a conducted a horizon scanning exercise (Unpublished, Scahill, et al 2023) specially to assess which skills or skillsets are required for future construction regarding energy efficiency, circular economy, and digitisation.

The following findings can summarise that piece of work:

1. Energy efficiency policy is well developed however significant shortages have been identified in the areas of NZEB design, heat-pump design, and commissioning, retrofit design and analysis and building service engineering.
2. Programmes that provide qualifications in construction digitalisation are also well represented with many HEIs providing programmes on BIM (and REVIT), visualisation, project management, construction analytics and building energy performance and modelling. Less common are programmes that focus on more recent technologies such as VR (Virtual Reality) AR (Augmented Reality), smart technologies and systems, and the application of 3D printing, laser scanning, scan to BIM and drone technology.
3. In terms of the circular economy there are very few programmes in the country and current provision in relation to the construction sector is very small and mainly linked to C&D waste management. Opportunities exist here for provision and EU Horizon funded programmes such as BUSGoCircular are innovating in this space.
4. In terms of cross cutting themes, digitalisation was identified as having significant potential in both the areas of energy efficiency (through improved data capture, modelling and design, and robotics), and the circular economy (through data capture and processing, digital inventories, and material passports). New training for VET, HE and CPD are expected before the end of the year (2023) through TUS from an innovative Horizon funded project called HumanTech, which focused on technology enabled construction work e.g., robotics, drones, BIM, exoskeleton suits, wearables.

Opportunities exist in:

Energy Efficiency: Retrofit and Building Services Engineering, Heat-pump and renewable energy systems design and installation, smart building controls.

Circular Economy: Familiarising the industry with the principles of the circular economy and demonstrating how they can be applied across the sector and not just in relation to waste management (circularity and end of life), whole life carbon, life cycle analysis.

Digitalisation: Augmented Reality, Virtual Reality, Extended Reality, Artificial Intelligence, the Industrial Internet of Things, scan to BIM, applying BIM in the 3, 4, 5 and 6 D spaces and the use of Drone Technology and robotics.

The current lack of skilled workers across the sector will ultimately affect the rate at which the industry can adopt new technologies. The adoption of these is essential for the healthy development of a lean efficient construction industry.

Skills for Zero carbon, Irish Government 2021

This report was developed in the context of the need to urgently accelerate the transition to a Zero Carbon Economy, as reflected in the binding targets for emissions reduction over the next decade, and ultimately, carbon neutrality by 2050. In Ireland this will be driven by the government's Climate Action Plan and the Climate Action and Low Carbon Development Act, which seeks to achieve steep reductions in Ireland's carbon emissions by 2030.

The Expert Group on Future Skills Needs report outlines recommendations for consideration with regard to the overall delivery of the Climate Action Plan in that 10-year timeframe, in areas it identifies as representing "Zero Carbon" activities:

- 5GW of offshore and up to 8GW of onshore wind energy generation, 1.5-2.5GW of solar energy generation, the energy efficient retrofit of 500,000 homes to a minimum B2 BER, the installation of 600,000 heat pumps, and the target of having 840,000 electric cars, and 95,000 commercial vehicles, on Irish roads.

The report advises on the nature and quantity of the skills required by these Zero Carbon sectors over the next decade and will help inform the broader response put in place in order to deliver on the targets set for renewable energy generation, built environment energy efficiency and sustainable transport. See the following table taken from that report:

Table 3.10: Profiles of niche/emerging occupations in the residential retrofit sector

Occupation	Description	Entry Route
BER Assessor*	Residential BER Assessors carry out Building Energy Rating assessments for clients, and provide advice as to retrofit requirements.	In order to become a registered Domestic BER Assessor, candidates require an NFQ Advanced/Higher Certificate in construction studies (or similar) or a recognized equivalent, and are required to complete a BER training course to register with SEAI.
Retrofit Engineer / Designer*	Retrofit Engineers / Designers are responsible for planning and designing domestic retrofits. They carry out BER surveys and perform heat loss calculations to identify necessary works, prepare plans and drawings for contractors, and certify that works have been completed to the required safety and operational standards.	Retrofit Designers are generally architects, surveyors or engineers (with a Level 7/8 degree in Civil, Energy, Building Systems engineering or related disciplines), that have upskilled or specialised in energy renovation.
Retrofit Coordinator*	Retrofit Coordinators generally project manage the retrofit process on behalf of the client, and help to ensure that projects are safe, high quality and performing to their maximum potential. In some lower-risk projects, they may also fill other roles in the retrofit process.	Retrofit Coordinators generally have similar qualifications to Retrofit Engineers / Designers or Assessors, but should generally have the necessary experience or qualifications to project manage large projects.
Heat Pump installer	Heat Pump installers design, install, service and repair air-source and ground-source heat pump systems in domestic and commercial premises.	Heat Pump installers are generally fully-qualified plumbers who undertake additional training courses with an accredited training provider to become a SEAI registered installer. Additional short training courses are also often provided by equipment manufacturers.
Domestic Solar PV installer	Domestic PV Solar installers design and install domestic solar systems, often on rooftops.	Domestic PV installers are generally roofers or electrical professionals who undertake additional training courses to become a SEAI registered installer. Additional product specific short training courses are also often provided by equipment manufacturers.
Insulation Operatives	Insulation operatives install insulation by hand or by using machinery in order to reduce heat loss in buildings, including through internal (dry-lining), external, cavity wall, attic and underfloor insulation.	No academic qualifications are required, although operators of External and Cavity Wall Insulation equipment require certification from the NSAI. Training is typically provided on the job or in the FET sector.

*Adapted from 'The Retrofit Academy' (2021).

Synopsis

It is evident that there is a strong cross over between the energy efficiency fields and both digitisation and circular economy agendas and continued close collaboration between partners on how this can be achieved within programme development is important.

Applying circular economy principles in the construction industry in Ireland is still at an early stage, with few examples of projects where this has been applied. However, the necessity and importance of applying these principles in the sector is evidenced by the focus of current European legislation on the role of the CE and underlying principles for a sustainable future. There is an urgent need to adopt and apply these principles and it is expected that the up-coming national legislation will put mandatory requirements for compliance in place.

The potential of Digital Tools to leverage the data being collected on the Life cycle of materials could be hugely beneficial, with a view to developing a circular construction model. Digital transformation is a key component for sectoral success. Companies that do not evolve their business practices, staff, skills, and service offerings will cease to be competitive in a very changing marketplace. Increased disruption of job roles and tasks is highlighted by many reports which will require upskilling strategies for industry as well as the provision of a range of focused programmes and significant upskilling initiatives by

Higher Education, with the announcement of the Modern Methods of Construction centre in Mount Lucas.

The potential impact of digitisation will impact disproportionately on those with lower levels of educational attainments and therefore access to upskilling initiatives and training workshops should not be solely focused on training senior staff on the utilisation of digital tools. Although literacy continues to be an issue for education and cannot be overlooked in discussion about digital advancements.

The key requirements going forward will continue to be the provision of focused upskilling initiatives to address immediate industry needs and multi-disciplinary courses which contain both methodological skills (mathematics, computation, building-physics, manufacturing, structural mechanics, etc.) practical skills (air tightness, insulation etc) and technological skills (programming languages, software applications, and alike).

From our research and interviews as part of Construction Blueprint and other projects, projected and forecast new construction profiles and skills will include carbon accountants, modern methods of construction technicians, project managers etc green roofers, urban miner and others in BIM and AI. It is anticipated this will result in upskilling of current construction workers and workers from other industries (e.g., IT which has seen lay-offs in Ireland in recent months) which must be incentivised in order to consider an industry which traditionally has a reputation, not only of being physically demanding with long hours but also of being associated with regular and frequent boom / bust cycles. Education and awareness raising is required, not just in a formal sense but rather a cultural shift in Irish society and general attitudes to construction are required rapidly if we are going to collectively meet our climate action and housing targets.

The ultimate objective is to transition to a competitive, zero carbon, climate resilient and environmentally sustainable society and economy by 2050. To achieve this objective, Ireland will require a change in its overall emissions trajectory of the order of a '7 per cent decline each year from 2021-2030, transitioning to zero net carbon emissions by 2050'. Ireland is a small, open economy vulnerable to global trading conditions and similarly to climatic changes. The aging profile of our construction workforce will necessitate the encourage of greater participation in life long learning, the stacking of short and micro credentials and the encouragement of greater female participation into the construction and manufacturing workforce. Opportunities exist for entrants into the construction workforce from other areas of industry such as project managers, sales, marketing and accountants to name a sample. Traditional crafts such plastering and bricklaying will continue to have a place in retro fitting but for new builds, modern methods of construction are growing, as a shortage of skilled labour along with a need to reduce costs and expedite processes take precedence.

In summary the key is though the provision of *"..short training courses, upskilling or retraining"*

To conclude, the solution seems to lie in a mixture of education and training provision options; the Skills for Zero Carbon report set out the following:

For Heat Pump Installers for example, as the retrofit targets are expected to ramp-up fully by 2024, the training requirements also need to be frontloaded towards the first half of the

decade. The Annual New Entrant Requirement from 2021 to 2025 is 290, suggesting that training providers need to train almost 300 Heat Pump installers each year. However, assuming this training requirement is met in the 2021-2025 period, this would then fall to 73 after 2026. For some occupations, the opposite is also true.

Overall, these differences will pose logistical and resource challenges for education and training providers and need to be considered when offering recommendations. Where targets are frontloaded (i.e. training requirements are much higher in the mid-decade than the end-decade), this suggests that training providers should focus on short training courses, upskilling or retraining. Not only will this allow supply to be ramped up quickly compared to establishing new long-term courses, but it also reduces the risk that a significant expansion in long-term course capacity does not become redundant once demand reaches its peak. Where annual entry requirements are relatively even across the two time periods, or where it is higher in the end-decade period, this suggests that demand is going to ramp up more gradually over time, and that training supply should also do the same. This may make long-term solutions, such as establishing new courses or apprenticeships and increasing capacity, a more sustainable solution in these cases.

[Skills for Zero Carbon](#), Expert Group on Future Skills Needs, c/o Department of Enterprise, Trade and Employment, Government of Ireland 2021

The Demand for Renewable Energy, Residential Retrofit and Electric Vehicle Deployment Skills to 2030