



NATIONAL SKILLS SPECIFICATION
NEARLY ZERO ENERGY BUILDING

VENTILATION



Foreword for the
National Skills Specification for Nearly Zero Energy Buildings,

Waterford and Wexford Educational Training Board (WWETB)

by

Mr. Damien English, T.D.

Minister for State - Housing and Urban Renewal.

As a Government we are committed to responding to climate change through our policies and legislation. The implementation of Nearly Zero Energy Buildings (NZEB) is a key action for the built environment in contributing to Ireland's Low Carbon Transition and Mitigation Plan. This requires a change in how we live. In Ireland, approximately 40% of total energy produced is used in the building sector. Whilst we are a small country we can play a leadership role and one significant area we are doing this in is NZEB.

Having advanced our performance standards for new dwellings over the last 10 years for which we have received international recognition, we are now addressing the significant challenge to improve existing dwellings by introducing a minimum standard for major renovations i.e. cost optimal level. To turn these high performance standards into reality on site we need a highly skilled construction workforce with a good understanding of the principles of energy efficiency, and the roles and responsibilities of interacting trades.

The delivery of our housing and climate action targets is dependent on having a properly trained workforce with the right skills and training in place. Thanks to Waterford and Wexford Education and Training Board (WWETB), in partnership with key stakeholders, a programme to deliver Nearly Zero Energy Building Construction skills to existing tradespersons and professionals in the construction sector has been developed. Key stakeholders in this highly collaborative initiative have included the Department of Education and Skills, Department of Housing, Planning and Local Government, the Department of Communication, Climate Action and Environment, the Sustainable Energy Authority of Ireland, SOLAS, the National Standards Authority of Ireland, the Irish Green Building Council, the Construction Industry Federation, Connect Trade Union, Limerick Institute of Technology, Carlow Institute of Technology and Waterford Institute of Technology.

These courses come at a time when skills are becoming an important resource in Ireland's ability to deliver housing. There will be a significant demand for these NZEB skills, given that all new buildings in Europe must be NZEB by the 31st Dec 2020. In Ireland, all new buildings which start construction in 2019 are required to meet the NZEB standards as set down in Part L of the Building Regulations. This is also a key measure in Ireland's Climate Action Plan and is identified in Action 50 of the plan to skill-up current contractors/other industry players in deep retrofit, NZEB and new technology installations.

Ireland is committed to Climate Action and is showing international leadership in the area of new Nearly Zero Energy Buildings. The United Nations Economic Commission for Europe are supportive of the development of this programme and Ireland looks forward to cooperation with the UNECE on this programme and in other areas related to the sharing of information in the development of Nearly Zero Energy Buildings at an international level.

This collaboration with UNECE will enable Ireland to show leadership internationally in addressing climate change and to share the lessons and skills we are learning with both the developed and developing world. This initiative will support Ireland's contribution to the UN Sustainable Development Goals by training people and supporting a skilled workforce.

I wish Waterford and Wexford Education and Training Board well with this first of its kind initiative and look forward to meeting the craft workers who avail of this training across all of the trades covered. This will make a valuable contribution to the delivery of sustainable and quality housing in Ireland. It is a key action for the Built Environment in contributing to Ireland's role in addressing Climate Change and supports the implementation of Action 50 of the Climate Action Plan to Skill-up current contractors/other industry players in deep retrofit, NZEB and new technology installations. To those who are taking part in this training, I wish you all well and I'm sure it will be of great benefit to you in your future careers in the construction industry.



Damien English, T.D.

Minister for State,
Department of Housing and Urban Renewal

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Mr. John Halligan, T.D

Minister of State for Training, Skills, Innovation, Research and Development

The National Skills Strategy set a clear direction for lifelong skills development and for a workforce that is flexible, adaptable and capable of dealing with the challenges and opportunities posed by the major forces influencing the world of work. The challenge of tackling climate change, growing the use of renewable energy and improving the energy efficiency of homes, businesses and public services are having a significant influence in workplaces and working lives across sectors and regions.

Thanks to a highly collaborative project led by WWETB and supported by a broad range of stakeholders including; the Department of Education and Skills, Department of Housing, Planning and Local Government, the Department of Communication, Climate Action and Environment, the Sustainable Energy Authority of Ireland, SOLAS, the National Standards Authority of Ireland, the Irish Green Building Council, the Construction Industry Federation, Connect Trade Union, Limerick Institute of Technology, Carlow Institute of Technology and Waterford Institute of Technology, the first NZEB skills specifications have been produced - one of the first internationally for crafts persons in the construction sector. These courses come at a time when skills are becoming an important resource in Ireland's ability to deliver housing.

Not only will there be interest in these NZEB skills specifications nationally, I understand there is also international interest and many other countries wish to learn from Ireland's experience in this area. The United Nations Economic Commission for Europe (UNECE) is committed to working with the relevant authorities and stakeholders to develop an International Centre of Excellence in High Performing Buildings in Wexford. This national skills specification will form a cornerstone of that collaborative project at both a national and international level."

Education and training institutions have a long track record of working with the construction industry, both in training those entering the sector at the start of their working lives and, increasingly, in supporting skills development within the construction workforce. As the sector adapts to meet the challenges and the significant opportunities of providing high performing homes and buildings and improving the energy performance of our existing building stock, the education and training sector are there to support them. The development of this programme also supports Ireland's Climate Action targets and is key measure in Action 50 of the Climate Action Plan. Consistency in training delivery and the framing of training standards will underpin our success in this area.

I would like to congratulate Waterford and Wexford Education and Training Board and their partners in the development of this training programme which is being delivered at a critical time to meet Ireland's housing needs and climate action challenge.



Mr. John Halligan, T.D

Minister of State for Training, Skills, Innovation, Research and Development



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1. INTRODUCTION

On behalf of Waterford and Wexford Education and Training Board (WWETB), I am very pleased that we are playing our part in enhancing the skill-set of the national construction workforce in relation to Nearly Zero Energy Buildings (NZEB). WWETB Training Services have a proud and well-recognised tradition of being to the fore nationally in training craft apprentices and Wexford County Council has been exemplary in developing high performance energy efficient housing. It was from this initial partnership that the momentum for NZEB Skills Training emerged and this was heightened by the national imperative to develop National Skills Training response to meet the upcoming challenges. In addition, the WWETB Strategy Statement 2018-2022 prioritises collaborations and innovative training developments such as NZEB.

Minister for State for Housing and Urban Renewal, Mr. Damien English, T.D., in his foreword to this document has listed the wide range of participants who worked together with WWETB to produce the first National NZEB Skills Specifications in Ireland and we cannot thank them enough for their commitment and enthusiasm for the project. In addition, I wish to thank SOLAS who financially supported us, and without whose help this project could not have progressed to this stage. I would like to, also, acknowledge the Department of Education and Skills for their on-going support of WWETB. We are very proud to have played a leadership role in this development and we will now proceed to ensure the widest possible access to this learning is available to upskill the construction industry in NZEB. It is very gratifying that the United Nations Economic Commission for Europe (UNECE) have shown such interest in the project and we will continue to work with them in the potential development of a National Centre of Excellence in High Performance Buildings in Co. Wexford

These developed documents have now been converted to the curriculum to meet the requirement of the NZEB Skills Specifications and the process will continue to develop and adapt appropriate training programmes and manuals. This will enable training to commence at the WWETB National NZEB Training Centre in Enniscorthy. It is our hope that these National Skills Specifications and subsequent training programmes will ensure that the construction industry is well prepared to meet the legislative requirement whereby 31st of December 2020 all new buildings must meet the Nearly Zero Energy Building standard.

The National Skill Specifications have been developed in the following areas: NZEB Fundamentals, NZEB for Electricians, Bricklayers, Plasterers, Carpenters, Plumbers, and Site Supervisors, This broad range of training opportunities will enable all involved in the construction industry to continue to be at the cutting edge in supporting Ireland's Low Carbon Transition and Mitigation Plan. We, in WWETB, look forward to working with the construction industry and all our other partners in this area to ensure the provision of these most relevant training opportunities in NZEB available anywhere globally.



Kevin Lewis

Chief Executive

Waterford and Wexford Education and Training Board (WWETB)

2. NZEB PRINCIPLES

Understand the principles of NZEB.

KNOWLEDGE

- Define the acronym 'NZEB.
- Explain the importance of achieving NZEB.
- Explain where NZEB come from.
- Describe the improvement the NZEB regulation has on previous Part L Regulations.
- Explain how Part L of the Building Regulations impacts Part F.
- Describe Part F of the Building Regulation.
- Outline what is considered within Part F?
- Describe what changes have been made to the current Part F document?
- Introduction of quality assurance.
- Outline what other Technical Guidance Documents need to be considered Part B, Part D, Part E, Part J.

3. VENTILATION FLOW RATE DESIGN

Understand ventilation flow rate design.

KNOWLEDGE

- Define the term air permeability.
- Describe what the benefits of airtightness are.
- Describe the red line test.
- Outline the evolution of air permeability standards in Ireland.
- Identify airtightness strategies – materials to use and materials to avoid.
- Explain how air permeability is measured.
- Explain the regulation relating to blower door testing.
- Understand leak detection methodologies (smoke test vs thermographic imaging).
- Explain each term used in Part F and the "Installation and Commissioning of Ventilation Systems for Dwellings" guide.
- Explain where ventilation is accounted for in DEAP and the inputs required.
- Differentiate between the different ventilation strategies.
- Understand the compliance with Building Regulations, Part B – Fire Safety.
- Understand the compliance with Building Regulations, Part D – Materials and Workmanship.
- Understand the compliance with Building Regulations, Part E – Sound (sound attenuates etc).
- Understand the compliance with Building Regulations, Part J – Heat Production Appliances (Comparison between Part F vent and Part J vent – how to spot the difference).
- Explain the ventilation flowrate design calculation methodology used for natural ventilation.

- Explain the ventilation flowrate design calculation methodology used for CMEV.
- Explain the ventilation flowrate design calculation methodology used for MVHR.

KNOW HOW & SKILLS

- Examine airtightness strategies/materials being used.
- Identify the 50 pascal of pressure.
- Identify leak detection.
- Carry out Thermographic camera leak detection.
- Apply the ventilation flowrate design calculation methodology to naturally ventilated houses.
- Apply the ventilation flowrate design calculation methodology to CMEV houses.
- Apply the ventilation flowrate design calculation methodology to MVHR houses.

4. VENTILATION INSTALLATION

Understand ventilation installation.

KNOWLEDGE

- Understand natural ventilation.
- Understand continuous mechanical extract ventilation.
- Describe the mechanical ventilation with heat recovery system – including bypass function.
- Understand decentralised ventilation.
- Describe the exhaust air heat pump system.
- Identify the ventilation strategies utilised in apartments (different ductwork layout to avoid crossover, single sided ventilation).
- Explain where ventilation is accounted for in DEAP and the inputs required.
- Identify the comparison between different ventilation strategies.
- Outline the theory explaining condensation and thermal bridging risk at intake and exhaust ducts.
- Describe the methods of addressing condensation and thermal bridge risk at intake and exhaust ducts.
- Describe the importance of identifying the need to insulate supply or extract ducts (in houses that have unit located in attic, or where some ducts pass through an unheated space).
- Explain how ductwork insulation is accounted for in DEAP.
- Identify the comparison between flexible, semi rigid and ridged ductwork (circular and rectangular).
- Identify the comparison between different diffuser types for supply and extract.
- Describe how to deal with cooker hoods in mechanically ventilated buildings.
- Describe the importance in making sure the installation of rectangular ducts connections are airtight using best practise techniques.
- Identify the ducts which have a high risk of condensation/thermal bridging.
- Describe best practice installation.

- Explain the DCV function.
- Identify good and bad installation of various ventilation systems.
- Identify good and bad practice for the installation of various ventilation systems.
- Identify the appropriate equipment and equipment calibration to be used for ventilation measurements and explain how it works.
- Explain the regulation relating to appropriate equipment and equipment calibration.
- Identify the important points to note for ventilation installation in the 'Installation and Commissioning of Ventilation Systems for Dwellings' guide from the Department of Housing.

KNOW HOW & SKILLS

- Install rectangular ducts.
- Examine existing MVHR unit and the new MVHR unit.
- Change the filters of the MVHR unit and the new MVHR unit.
- Demonstrate the correct use of equipment and equipment calibration used for ventilation measurements.
- Understand the process for the installation of semi ridged ducts, and diffusers.
- Insulate intake and exhaust ducts and condensate drain in multiple wall types using best practise techniques.

5. VENTILATION COMMISSIONING

Understand Building Services: Space Heating and Domestic Hot Water, Controlled Ventilation, Lighting ICT and Smart Technology.

KNOWLEDGE

- Identify the important points to note for ventilation commissioning in the Installation and Commissioning of Ventilation Systems for Dwellings' guide from the Department of Housing.
- Describe the process for the commissioning of natural ventilation system.

KNOW HOW & SKILLS

- Understand how to commission a natural ventilation system.
- Understand how to commission a CMEV system.
- Understand how to commission a MVHR system.
- Understand how to complete the commissioning sheets.

6. COMMUNICATION & USER INFORMATION

Understand communication and user information.

KNOWLEDGE

- Explain the importance of ensuring good communication between all trades on the site as part of an overall 'system-thinking' approach to achieve NZEB compliant dwellings. In particular, communication with those trades which regularly make penetrations through the airtight and insulation layers (including electricians and plumbers) is especially critical.
- Demonstrate collaborative teamwork and "system thinking" on-site with all trades.
- List key aspects that require excellent communication on-site, especially the strategies being used for airtightness, vapour control, continuous insulation and thermal bridging to achieve NZEB compliant dwellings.
- Outline the key sequences that must be followed in order to meet the airtightness targets and communicate these to the foreman/supervisor and all relevant trades.
- Understand the details specified in construction drawings with respect to thermal bridging, air tightness and window positioning and not to reduce their effectiveness.
- Describe what information needs to be provided to the homeowner to ensure that the building is operated and maintained to its optimum, including special emphasis on energy efficiency.
- Explain the importance of continuing professional development CPD, (continuous training) and association with relevant national quality assurance standards.
- Understand where CPD and future accredited trainings can be obtained in relation to the NZEB standards.



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NATIONAL DEVELOPMENT PLAN



An Roinn Tithíochta,
Pleanála agus Rialtais Áitiúil
Department of Housing,
Planning and Local Government



An Roinn Oideachais
agus Scileanna
Department of
Education and Skills



Roinn Cumarsáide, Gníomhaíthe
ar son na hAeráide & Comhshaoil
Department of Communications,
Climate Action & Environment

SOLAS

An tSeirbhís Oideachais Léarnúil agus Scileanna
Further Education and Training Authority