

Domestic Technical Standards and Specifications

Version 1.3 2020



TABLE OF CONTENTS

GLOSSARY OF KEY TERMS	4
KEY ACRONYMS	6
PURPOSE OF THIS DOCUMENT AND RECENT CHANGES	7
DISCLAIMER	8
HOW TO USE THIS DOCUMENT: IDENTIFYING RELEVANT SECTIONS	9
1 INTRODUCTION TO THE PROGRAMMES	10
2 GENERAL REQUIREMENTS	13
2.1 BUILDING REGULATIONS	13
2.2 GUARANTEES	13
2.3 GENERAL WORKS REQUIREMENTS	13
2.4 GENERAL CONTRACTOR REQUIREMENTS	14
2.5 PROVISION OF EVIDENCE FOR BER ASSESSORS	14
2.6 U-VALUE CALCULATIONS: FURTHER INFORMATION	15
3 HEALTH AND SAFETY REQUIREMENTS	15
3.1 SPECIAL PRECAUTIONS	16
3.2 IMPORTANT GUIDANCE NOTES FOR ELECTRICAL WORKS	17
4 VENTILATION	19
4.1 CONDENSATION AND MOISTURE RISK	24
4.2 IMPROVING AIRTIGHTNESS	24
5 PLANNING AND PROTECTED STRUCTURES	25
6 SPECIFIC MEASURES – COMPETENCY AND STANDARDS	26
6.1 CAVITY WALL INSULATION	27
6.2 EXTERNAL WALL INSULATION	29
6.3 INTERNAL WALL INSULATION	34
6.4 ROOF INSULATION - CEILING LEVEL	37
6.5 ROOF INSULATION - RAFTER LEVEL ATTIC INSULATION (WARM ROOF) AND FLAT ROOF CEILINGS	
43	
6.6 FLOOR INSULATION	45
6.7 FULLY INTEGRATED HEATING CONTROLS	49
6.8 HIGH EFFICIENCY BOILERS	55
6.9 HEAT PUMP SYSTEMS	58
6.10 BIOMASS BOILERS (WITH/WITHOUT THERMAL STORAGE)	67
6.11 SOLAR WATER HEATING	70
6.12 DRAUGHT PROOFING	73
6.13 WINDOW REPLACEMENT	76
6.14 EXTERNAL DOOR REPLACEMENT	78
6.15 WINDOW GLAZING ENVELOPE REPLACEMENT	80
6.16 WINDOW GLAZING LOW E-FILM	82
6.17 ENTRY LEVEL HEATING CONTROLS	84
6.18 ENTRY LEVEL HEATING CONTROLS WITH REMOTE ACCESS	86
6.19 FULLY INTEGRATED HEATING CONTROLS WITH REMOTE ACCESS	88
6.20 SOLID MULTI-FUEL STOVES (INCLUDING BIOMASS)	95
6.21 GAS FIRED ROOM HEATER	98
6.22 MECHANICALLY-ASSISTED POWERED CLEANSE AND FLUSH (POWER FLUSHING) OF HEATING	
SYSTEM	99

6.23	MECHANICALLY-ASSISTED POWERED CLEANSE AND FLUSH (POWERFLUSHING) OF HEATING SYSTEM AND INSTALLATION OF MAGNETIC FILTRATION SYSTEM TO EXISTING HEATING SYSTEM	101
6.24	CHIMNEY DRAUGHT LIMITER.....	103
6.25	BOILER SERVICE.....	104
6.26	LED DOMESTIC LIGHTING	105
6.27	HOME ENERGY REPORTS.....	106
6.28	ELECTRICITY ENERGY MONITORS AND SHOWER ENERGY MONITORS	107
6.29	HIGH HEAT RETENTION ELECTRIC STORAGE HEATERS.....	108
6.30	SOLAR PHOTOVOLTAIC (PV) SYSTEMS.....	108
6.31	MECHANICAL EXTRACT VENTILATION AND MECHANICAL VENTILATION WITH HEAT RECOVERY	
109		
6.32	HIGH HEAT RETENTION CYLINDERS.....	117
6.33	ELECTRIC VEHICLE CHARGERS	119
APPENDIX 1: REFERENCE DOCUMENTS		120
APPENDIX 2: SUMMARY TABLE OF COMPETENCIES AND STANDARDS.....		127
APPENDIX 3: ESB NETWORKS GUIDANCE DOCUMENTS.....		142
APPENDIX 4: OUTLINE OF CHANGES SINCE LAST PUBLISHED CODE OF PRACTICE.....		150

Glossary of Key Terms

Agrément: the National Standards Authority of Ireland (NSAI) issues Certificates for certain products and installers. NSAI was formerly known as the Irish Agrément Board. This document details requirements for Agrément Certification where relevant.

Background ventilation: supply of fresh air and control pollutant and water vapour levels. This can be provided through natural or mechanical means. Natural background ventilation is normally provided through a closable wall vent or trickle vents located in the window frames.

Boiler Interlock: this is not a physical device, but is an arrangement of the system controls (room thermostats, programmable room thermostats, cylinder thermostats, Programmers and time switches) to ensure that the boiler only fires when there is a demand for heat.

Contractor: Individual or company carrying out energy upgrade measures supported by one or more of the Programmes referenced in this document.

Cylinder Thermostat: a thermostat fixed to the hot water cylinder. It tells the boiler not to fire when there is enough hot water in the cylinder.

Ductwork: a system or network of ducts. A duct is a tube or passageway in a building or machine allowing for air, liquid, cables, etc. to pass through.

Earthing / Bonding: is the electrical connection of all exposed metallic building elements, e.g. pipework, to prevent electric shock from one of these elements in the event of an electrical fault. Earthing / bonding must be carried out in accordance with the applicable National Rules for Electrical Installations.

F-gas: On 4th July 2009 it became a legal requirement for all businesses that install, maintain or service stationary refrigeration, stationary fire protection systems and extinguishers, air conditioning and heat Pump equipment containing or designed to contain F-Gas refrigerants to obtain an F-Gas company certificate.

Legionella: Legionella is bacteria that grows best in warm water, such as the water temperatures found in domestic heating systems. Heating systems must be designed to prevent a build-up of legionella. The bacteria are dormant below 20°C and do not survive above 60°C.

Load/weather compensation: adjusts the temperature at which the heating system operates based on demand and/or weather conditions.

Mechanical Extract Vent: allows for the rapid removal of water vapour and other pollutants from the dwelling using an electrically driven fan. These are typically installed in wet rooms.

Motorised valve: electrically controlled valves used in central heating systems to control the flow of heated water.

Permanent Vent: this is required to supply air to an open flued combustion appliance such as a stove, gas fire, open fire etc. Open flued appliance means that the appliance is drawing air from the room in which it is located. For this reason, the room requires a non-closable vent for safe use of the appliance.

Pressure Relief / Release Valve: a valve used to limit the build-up of excessive pressure in a heating system. The pressure is relieved by allowing the over-pressurised water to flow from a discharge pipe out of the system.

Programme: One of a number of SEAI programmes as detailed in Section 1 of this document.

RECI: Registered Electrical Contractors of Ireland, a national statutory body governing registered electrical Contractors who carry out and certify electrical work.

Remote Fire Valve: this valve is installed on an oil supply line as a safety precaution. If a fire occurs near the boiler this valve will close, preventing more oil flowing to the fire.

Room Thermostat: a thermostat in a central heating zone (normally positioned on the wall). It tells the boiler not to fire when the desired temperature has been reached in the heated space.

Space and Hot Water Zones: allow the user to separately heat different areas of the home e.g. upstairs and downstairs or living areas and sleeping areas. The hot water zone only heats hot water for use with showers, baths, sinks etc.

Space Heating: refers to heating physical space and volume, for example the rooms in the home

Thermostatic Mixing Valve (TMV): this valve is installed on the outlet of the hot water cylinder. This device mixes cold water with the hot water from the cylinder to produce a lower temperature hot water “mix”, which can safely be used in taps and showers.

Thermostatic Radiator Valve (TRV): radiator valve including an air temperature sensor. TRVs control the heat output from the radiator by adjusting water flow.

U-value: a measure of thermal efficiency of fabric, doors or windows. It is the rate at which heat passes through a building component or structure e.g. roof or wall. A lower number indicates better insulating properties. It is expressed in units of Watts per square metre per degree of air temperature difference (W/m^2K). U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443.

Utility room: A room typically used for laundry purposes, usually containing a sink, washing machine, tumble drier or similar equipment and not entered solely from outside the building.

Vapour Barrier: this is a continuous layer of impermeable material, the provision of which limits the risk of interstitial condensation.

Wet room: a room where moisture is created through cooking, showering, drying clothes etc., e.g. kitchens, utility rooms, bathrooms.

Key Acronyms

ACA	Architectural Conservation Area
BEH	Better Energy Homes Programme
BER	Building Energy Rating
BEWH	Better Energy Warmer Homes Programme, or the Warmer Homes Scheme (WHS)
BRE	Building Research Establishment
CIBSE	Chartered Institution of Building Services Engineers
CRU	Commission for Regulation of Utilities
CWST	Cold Water Storage tank
DEAP	Dwelling Energy Assessment Procedure
DGF	Decorative Gas Fire
DHPLG	Department of Housing, Planning and Local Government
DHW	Domestic Hot Water
DPC	Damp Proof Course
DPM	Damp Proof Membrane
DR	Deep Retrofit Pilot Programme
EEOS	Energy Efficiency Obligation Scheme
EHPA	European Heat Pump Association
EPA	Environmental Protection Agency
ETICS	External Thermal Insulating Composite Systems
FETAC	Further Education and Training Awards Council (now part of QQI)
GSI	Geological Survey Ireland
HARP	Home-heating Appliance Register of Performance
HLI	Heat Loss Indicator
HPAI	Heat Pump Association of Ireland
IDHEE	Institute of Domestic Heating and Environmental Engineers
LED	Light Emitting Diode lamp
LPG	Liquefied Petroleum Gas
MCS	Microgeneration Certification Scheme
MPRN	Meter Point Reference Number
MVHR	Mechanical Ventilation with Heat Recovery
NPWS	National Parks and Wildlife Service
NSAI	National Standards Authority of Ireland
OFTEC	Oil Firing Technical Association
QADP	Quality Assurance and Disciplinary Procedure
QQI	Quality and Qualifications Ireland
RECI	Register of Electrical Contractors of Ireland
RGII	Register of Gas Installers of Ireland
RPS	Record of Protected Structures
SCOP	Seasonal Coefficient of Performance
SEAI	Sustainable Energy Authority of Ireland
SPF	Seasonal Performance Factor
TGD	Technical Guidance Document
TMV	Thermostatic Mixing Valve
TRV	Thermostatic Radiator Valve
WEP	Window Energy Performance
WW	Warmth and Wellbeing Pilot Programme

Purpose of this Document and recent changes

This document is a reference for Contractors carrying out dwelling energy upgrade works supported by SEAI’s Better Energy Homes, Better Energy Warmer Homes, Deep Retrofit, Warmth and Wellbeing, Better Energy Finance, Energy Efficiency Obligation Scheme and Better Energy Communities Programmes (the “Programme”). It sets out the general competence, standards and specifications that Contractors should possess, and adhere to, in carrying out works supported by the Programmes. Homeowners may also need to refer to this document when works are being carried out.

The title, content and structure of the document has been changed from the previous version “Better Energy Programmes Contractors Code of Practice and Standards and Specifications Guidelines Version 7.3 2018”. The content has been updated to focus on the Domestic Technical Standards and Specifications. For most matters related to other aspects of grant works, such as their conduct and practices, Contractors and other stakeholders should refer to Programme-specific documentation and terms and conditions.

Version	Date	Description of changes since the last version
1	19/03/2019	See above and in Appendix 4
1.1	21/08/2019	<ul style="list-style-type: none"> - Revised efficiency requirements for Heat Pump Systems in Section 6.9.3; - Addition of information note on the newly introduced Part L requirements for Internal and External Wall Insulation in Sections 6.2 and 6.3; - Re-introduction of reference to “Internal Wall Insulation in existing housing – a guide for specifiers and contractors” (CE17/GPG138) published by the Energy Saving Trust in Section 6.3; - Improvements in wording and correction of spelling.
1.2	14/11/2019	<ul style="list-style-type: none"> - Reinstatement of sentence mistakenly removed from “Better Energy Programmes Contractors Code of Practice and Standards and Specifications Guidelines Version 7.3 2018” on Cavity wall insulation and clarification on NSAI Agrément Certification for installers - Clarifications and corrections on heating controls measures
1.3	28/08/2020	<ul style="list-style-type: none"> - Additions to section 6.7 Fully Integrated Heating Controls and to section 6.19 Fully Integrated Heating Controls with Remote Access: <ul style="list-style-type: none"> - “Note on installation of wireless heating control equipment” - “Alternative zoning without pipework separation” - Clarification on location of wireless thermostats

Disclaimer

For all works detailed in this document and for each Programme, Contractors must carry out works in accordance with this Domestic Technical Standards and Specifications (DTSS) document, regardless of whether or not they are required to register with SEAI for a given Programme. Contractor registration is a mandatory requirement to carry out grant works on some Programmes. Details of registration requirements can be found in Programme-specific terms and conditions and guidelines.

The information contained in this DTSS does not purport to be legal, professional or commercial advice or a definitive interpretation of any law.

While every care has been taken to provide accurate, complete, reliable and effective information on standards in this DTSS, SEAI gives no guarantees, undertakings or warranties in this regard. SEAI accepts no liability for the content or accuracy, completeness, reliability or effectiveness of the information provided herein or for any loss or damage caused arising directly or indirectly in connection with reliance on the use of such information.

The provision of goods and/or services by Contractors to customers of these Programmes is entirely a matter between the Contractor and the customer. SEAI accepts no liability or responsibility, whether for breach of contract, breach of duty, negligence, health and safety violations or otherwise, in respect of any dispute, claim or cause of action arising out of, or in relation to, any product, equipment, work, system or installation supplied or carried out by the installer or Contractor under the Programmes. The Contractor is entirely responsible for all such matters.

The information contained in this guidance note may be updated from time to time. SEAI accepts no responsibility for keeping the information up to date or any liability whatsoever for any failure to do so.

Where SEAI provides links to external websites, these are provided for convenience only and such provision does not constitute an endorsement of any company, product, process or content. Please note that SEAI has no control over external websites and assumes no responsibility or liability for same.

How to Use this Document: Identifying Relevant Sections

Some sections of the DTSS will be more relevant to Contractors than others, however, it is the responsibility of all Contractors to familiarise themselves with the requirements and standards herein. It will **always** be necessary to read and understand several sections as outlined below:

- Section 1 describes each of the SEAI Programmes covered by this document. Table 1 outlines the measures covered by each Programme.
- Section 2 describes general requirements and standards applicable to all Contractors and provides details for products and installations across multiple measures.
- Section 3 gives an overview of relevant health and safety considerations for all Contractors.
- Section 4 details ventilation requirements and is applicable for several of the measures covered by this document (e.g. measures including installation of insulation, windows, doors, stoves, air tightness upgrades, ventilation systems, heating systems). The exact measures to which this section applies are detailed therein. All Contractors carrying out measures specified in Section 4 must have a thorough understanding of this section.
- Section 5 outlines planning issues and protected structures. Implementation of some measures may be prohibited/restricted by the guidance in this section.
- Section 6 is the most detailed section and sets out the requirements for Contractors, products/systems and installations for each measure. **Contractors must have a thorough understanding of the parts of Section 6 describing the measures they will be installing.**
- Appendix I and II summarise the relevant standards and references for the measures detailed in Section 6 and are a useful means for Contractors to check that they are adhering to the correct standards/references. However, following these appendices alone does not preclude the requirement to adhere to the relevant sections outlined above.

SEAI advise all Contractors to carefully read and adhere to the guidance in Sections 1, 2, 3, 4 and 5 mentioned above and follow the guidance in relevant subsections under Section 6 for the measures they are carrying out.

1 Introduction to the Programmes

The Sustainable Energy Authority of Ireland (SEAI) is Ireland's national energy authority with a mission to promote and assist the development of sustainable energy and was established by the Government pursuant to the Sustainable Energy Act 2002. The Better Energy suite of Programmes includes domestic works under the following:

1. Better Energy Homes
2. Better Energy Warmer Homes
3. Warmth and Well Being Pilot
4. Deep Retrofit Pilot
5. Energy Efficiency Obligation Scheme
6. Better Energy Finance
7. Better Energy Communities
8. Solar Electricity Grant
9. Electric Vehicle Home Charger Grant

The measures supported by the Programmes listed above are outlined in Table 1. Contractors carrying out works on dwellings funded by these Programmes must adhere to the regulations, standards and requirements for installers, products and installation detailed in Section 6 of this document.

Specific eligibility requirements for dwellings (e.g. dwelling age) and Contractors (e.g. Contractor Registration) are detailed on the SEAI website for the Programme. Links to the webpage for each Programme are provided below.

Better Energy Homes Programme

The Better Energy Homes (BEH) Programme provides financial support to customers for a defined range of technologies and materials to improve the overall energy efficiency of their home. The customer must select a Contractor or Contractors from a list of Registered Contractors, published and maintained by SEAI, to carry out the measures supported and defined by the Programme. Following completion of the works, the customer can claim fixed grants relating to these measures.

The BEH Programme provides grants to homeowners who invest in the energy efficiency improvement measures shown in Table 1 in the BEH column. The Programme is detailed further on the [SEAI website](#). There is also a Code of Practice for Contractors providing services on the BEH Programme that should be read in conjunction with the DTSS.

Better Energy Warmer Homes Programme

The Better Energy Warmer Homes (BEWH) Programme, also known as the Warmer Homes Scheme (WHS), administered by SEAI, funds energy efficiency improvements in the homes of people in receipt of certain welfare payments. These measures make the homes more comfortable, healthier and more cost effective to run.

Table 1 lists the measures funded by the BEWH Programme in the WHS column. The Programme and its eligibility criteria are detailed further on the [SEAI website](#).

Warmth and Wellbeing Programme

The Better Energy Warmth and Wellbeing (WW) Pilot Programme funds homes occupied by residents referred by the Health Service Executive (HSE) based on criteria such as health, age, fuel allowance, location and occupancy. It provides free, energy efficiency upgrades to eligible homes to reduce energy usage while making the home warmer and cosier to live in. The upgrade also benefits overall health and wellbeing of occupants, especially during colder weather.

Table 1 lists the measures funded by the WW Programme under the “WW” column. The Programme is detailed further on the [SEAI website](#).

Deep Retrofit Programme

The Deep Retrofit (DR) Programme is a multi-annual pilot investigating the challenges and opportunities of retrofitting existing dwellings. It supports a range of dwelling types with a view to understanding implications of large-scale development, regulatory impacts, multiple co-benefits of retrofit and innovative approaches to investment. Applications must be from organisations with the capacity and ability to deliver deep retrofit to multiple dwellings. Applications must aim for the use of renewable energy solutions and target a minimum BER grade of A3.

Table 1 lists the measures funded by the DR Programme under the “DR” column.

Better Energy Finance, Communities and Energy Efficiency Obligation Scheme

The Programmes Communities, Better Energy Finance (BEF) and Energy Efficiency Obligation Scheme (EEOS), are grouped together in this DTSS as they share the same measures and requirements for those measures.

The **EEOS** Programme places obligations on energy suppliers and distributors to deliver energy savings. Companies who sell large amounts of energy are known as Obligated Parties and they have targets under the scheme. Obligated Parties offer supports to make homes and businesses more energy efficient. For every unit of energy saved through these projects, they achieve energy credits towards their targets. The property owner must give written consent to the Obligated Party agreeing to assign energy credits to them.

The **Communities** Programme supports new approaches to achieving energy efficiency in Irish communities. Upgrades can take place across building types to reduce energy use and costs throughout the community. The Programme delivers energy savings to homeowners, communities, and private sector organisations. All projects are community oriented with a cross-sectoral approach. Domestic and non-domestic locations are **partially** funded by the Communities Programme.

The **BEF** Programme aims to identify market-based solutions as an alternative to direct Exchequer funding. This leveraging of alternative funding helps to encourage consumers to invest in energy efficiency improvements.

The measures covered by BEF, Communities and the EEOS are detailed in Table 1 below. The requirements for implementation of these measures under all Programmes are detailed in Section 6. There is further detail on each of these Programmes on the SEAI website: www.seai.ie.

Click on the section number in Table 1 to go directly to the relevant part of Section 6 detailing requirements for each measure.

Measure		BEH	WHS	WW	DR	Communities	BEF / EEOS
6.1	Cavity Wall Insulation	✓	✓	✓	✓	✓	✓
6.2	External Wall Insulation	✓	✓	✓	✓	✓	✓
6.3	Internal Wall Insulation	✓	✓	✓	✓	✓	✓
6.4	Ceiling Level Attic Insulation	✓	✓	✓	✓	✓	✓
6.5	Rafter level attic insulation (warm roof) and flat roof ceilings	✓			✓	✓	✓
6.6	Floor Insulation				✓	✓	✓
6.7	Fully Integrated Heating Controls	✓	✓	✓	✓	✓	✓
6.8	High Efficiency Boilers		✓	✓			
6.9	Heat Pumps Systems	✓			✓	✓	✓
6.10	Biomass Boilers (with/without thermal storage)				✓	✓	✓
6.11	Solar Water Heating System	✓			✓	✓	✓
6.12	Draught proofing		✓	✓	✓		
6.13	Window Replacement		✓	✓	✓	✓	✓
6.14	External Door Replacement			✓	✓	✓	✓
6.15	Window glazing envelope Replacement					✓	✓
6.16	Window glazing low e film						✓
6.17	Entry level Heating controls					✓	✓
6.18	Entry level Heating controls with remote access					✓	✓
6.19	Fully Integrated Heating controls with remote access					✓	✓
6.20	Solid Multi-Fuel Stoves (including Biomass)				✓	✓	✓
6.21	Gas Fired Room Heater						✓
6.22	Mechanically-assisted powered cleanse and flush (power flushing) of Heating system		✓	✓	✓	✓	✓
6.23	Mechanically-assisted powered cleanse and flush (power flushing) of Heating system and Installation of magnetic filtration system to existing heating system				✓	✓	✓
6.24	Chimney draught limiter						✓
6.25	Boiler Service						✓
6.26	LED domestic lighting		✓	✓	✓	✓	✓
6.27	Home energy reporting						✓
6.28	Electricity Energy Monitor				✓	✓	✓
6.28	Shower Energy Monitor						✓
6.29	High heat retention electric storage heater						✓
6.30	Solar Photovoltaic (PV) Systems				✓	✓	✓ ¹
6.31	MV +MVHR		✓	✓	✓	✓	✓

¹ EEOS does not allow credits for PV installations, but where PV is installed as part of a wider system, it must be installed to the requirements referenced in this Code of Practice.

6.32	High heat retention cylinders						✓
6.33	Electric vehicle chargers						

Table 1: Measures covered by SEAI funding Programmes

2 General Requirements

This document makes use of the terms ‘must’, ‘shall’ and ‘should’ when prescribing requirements and procedures. In this document:

- the terms “must”, “shall”, “required”, “requirements” are for mandatory conditions to be complied with in full when implementing measures described in this document unless otherwise stated in the text describing the condition;
- terms such as “should” and “recommended” are for conditions that are intended to be complied with when carrying out measures, unless reasonable justification can be given as to why the recommendation was not carried out;
- The requirements of the NSAI’s Standard Recommendation S.R. 54:2014, which are referenced throughout this document, are **to be considered mandatory** unless explicitly stated otherwise.

For any Programme exceptions, see the individual Code of Practice or other Programme documentation. Sections 4, 5 and 6 detail the Contractor, product and installation standards and specifications required for the measures covered by this document. Appendix 2 summarises these standards and specifications.

2.1 Building Regulations

The contractor must always adhere to the most recent amendment to and version of building regulations at all times. There is extensive detail in the Technical Guidance Documents and Building Regulations on the [DHPLG website](#). For works outlined in this document the relevant sections include Part A, Part B, Part C, Part D, Part F, Part G, Part J, Part K, Part L and Part M.

2.2 Guarantees

A manufacturer, system supplier and/or Contractor guarantee must be issued to the customer. The provision of goods and/or services by Contractors to customers of these Programmes is entirely a matter between the Contractor and the customer. SEAI does not provide any warranty or guarantee concerning the completeness, effectiveness, reliability, accuracy or otherwise of the standards referenced in this document or any work carried out on foot of such standards. This does not affect your statutory rights.

2.3 General Works Requirements

Works are required to meet the overall objective of the SEAI Programmes, which is to achieve energy and carbon savings.

In general, all products used must be new, fit for purpose, improve the energy efficiency of the building and have no detrimental impact on the structure, viability, quality or safety of the property. All products must meet applicable product standards and regulations, and any additional requirements detailed in this document. Adherence to applicable standards is required in relation to the materials used and their installation.

The works must not compromise the ventilation, air quality, humidity (and the potential for condensation) and quality of living environment in the home. Consideration must be given to the potential impact on the living environment in the home resulting from any measures installed under

the Programmes. The Contractor must avoid making any detrimental changes to the living environment and, where required, recommend to the customer any measures necessary to ensure there is no detrimental change to the living environment because of the works. (See Section 4)

In general, all works should be carried out in accordance with the specifications in this DTSS, and best practice and technical guidance documents outlined herein¹, which include, but are not limited to:

- S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings*
- Building Regulations Technical Guidance Documents (Latest updates of Part L, Part B, Part C, Part D, Part F, Part J, Part M in particular).
- The System Supplier/ Product Manufacturer Guidelines
- NSAI Agrément certificates www.nsai.ie
- Irish, British or European Standards Guides

Most of the technical guidance documents and standards derive from the following sources:

- The Department of Housing, Planning and Local Government (DHPLG) which publishes Building Regulations and associated Technical Guidance documents: www.housing.gov.ie
- The Sustainable Energy Authority of Ireland (SEAI) www.seai.ie
- The National Standards Authority of Ireland (NSAI) www.nsai.ie
- The UK Energy Saving Trust www.energysavingtrust.org.uk
- The UK Building Research Establishment www.bre.co.uk
- All British Standards (annotated B.S.) are on <http://shop.bsigroup.com>
- All Irish Standards (annotated I.S.) are on <https://shop.standards.ie>
- Commission for Regulation of Utilities www.cru.ie
- Chartered Institution of Building Services Engineers www.cibse.org

2.4 General Contractor Requirements

For all Programmes covered by this DTSS, works must be carried out by competent personnel, appropriately trained for each element of works being carried out.

The specific competency standards relating to each of the measures supported by all Programmes are detailed further in this document, for each energy efficiency measure.

Further requirements for Contractors (*e.g.* registration) are included in Programme-specific documentation.

2.5 Provision of evidence for BER Assessors

In many cases (and as it is mandatory for the Programmes), the customer will have a post-works Building Energy Rating (BER) carried out on the dwelling by a registered BER Assessor. The BER will not reflect the benefits of the energy efficiency measures carried out by Contractors if the BER Assessor cannot prove retrofit works were carried out. In general, BER Assessors must use pessimistic default values where insufficient evidence is available from their BER site survey or from acceptable documentation. The DEAP methodology, particularly the [DEAP Survey Guide and DEAP Manual](#), details the requirements for proof of dwelling energy efficiency upgrades.

As an example, if an existing attic is insulated, the BER Assessor requires all details of the insulation installed on the invoice so they can derive an accurate U-value calculation (they may also need to verify thickness and area of insulation installed on site). The insulation product, thickness, quantity, dwelling address and date of installation must be shown on the receipt. It is not enough for the BER Assessor to simply use a U-value stated by a Contractor or architect without verifying the U-value is calculated according to the relevant standards and guidance in the DEAP Methodology. U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – *Conventions for U-value calculations*.

As another example, the BER Assessor must rely on pessimistic default efficiency values for heating systems if they cannot identify the newly installed heating system against a certified data source such as:

- The HARP database for high-efficiency boilers;
- For heat pumps, Eco-design technical data and designer sign-off with heat emitter details;
- Other sources as specified in the DEAP methodology and this document.

2.6 U-value calculations: Further Information

Calculation of the correct U-value is essential in determining if U-value targets specified in Section 6 have been met. Prior to commencing insulation work, consult with the insulation product manufacturer or supplier to establish the best product to use for the given construction type to achieve the required U-value.

Thermal transmittance (U-value) relates to a building component or structure, and is a measure of the rate at which heat passes through that component or structure as calculated when there is a temperature difference of 1 degree in the internal and external air temperature (W/m^2K).

Detailed examples of U-value calculations can be found in Appendix A of the Building Regulations TGD to Part L. TGD L and Annexes A, B and C of S.R. 54 also give indicative values that can help determine the likely depth and type of required insulation. These indicative values are not considered acceptable proof of U-value in an actual retrofitted dwelling.

Once you have identified the Thermal Conductivity (W/mK) of a material and the thickness of the material, a U-value can be calculated. When more than one material is being used (*e.g.* as in a common wall construction which might have insulation, block and render – each with different thermal conductivities), the overall U-value is calculated based on the total of all the resistances of the combined materials. The resistance of a material is the inverse of the U-value. See BR 443 – *Conventions for U-value calculations* and the DEAP Manual for applicable data sources, standards and calculation methods.

3 Health and Safety Requirements

It is the sole responsibility of the Contractor to comply with all relevant Health and Safety legislation, regulations and guidelines and to ensure that their staff and/or subcontractors are appropriately trained to operate to these standards.

The HSA (Health and Safety Authority) provides links to relevant regulations, legislation and guidance on its website:

- [Safety, Health and Welfare at Work Act 2005](#)
- [Safety, Health and Welfare at Work \(General Application\) Regulations 2007](#)

- [Safety, Health and Welfare at Work \(Construction\) Regulations 2013](#)
- [Further information for the construction sector](#)
- [Further information for small businesses](#)
- [Further information for working at height](#)

3.1 Special Precautions

Special precautions must be taken in relation to the following issues:

- **Radon**

Where work will compromise a radon barrier, appropriate preventative measures must be implemented to address the issue. The Building Regulations *Technical Guidance Document C* and the DHPLG publication *Radon in Existing Buildings – Corrective Options* should be consulted. For further information refer to:

https://www.epa.ie/pubs/reports/radiation/RPII_Radon_Existing_Buildings_Corrective_Options_2002.pdf

- **Asbestos**

Grant works must not start or proceed if they disturb Asbestos Containing Materials (ACM). It is the homeowner's responsibility to check for and get ACMs removed. Any ACMs identified must be removed by a competent contractor in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) **prior to the grant works**. Works must not be started unless removal in accordance with health and safety regulations has been completed. For further information on this refer to:

<http://www.hsa.ie/eng/Topics/Asbestos/>

- **Carbon Monoxide**

Carbon Monoxide alarms provide a warning to householders in the event of a dangerous build-up of CO (Carbon Monoxide). In some cases, installing a Carbon Monoxide alarms is legally required (see Part J of the Building Regulations). Carbon Monoxide alarms must comply with the EN 50291 standard. Carbon Monoxide alarms are no substitute for regular inspection and maintenance of appliances, vents, flues and chimneys. For further information on this refer to www.carbonmonoxide.ie.

- **Pest control and wildlife**

Contractors shall be aware of the potential for rodent infestation within the building fabric and shall take all necessary precautions to protect themselves and their employees against the risk of disease (e.g. Weil's disease) when carrying out the works. If there is evidence of rodent or any other pest infestation the Contractor shall advise the customer accordingly. For further information related to rodent control refer to:

<https://www.hse.ie/eng/services/publications/environmentalhealth/rodent-control-for-householders.pdf>.

If there is evidence of species of wildlife, e.g. bats or bat roosts, present in the attic space to be insulated, the Contractor should consult with the National Parks and Wildlife Service (NPWS) for advice on how to proceed. For further information on this refer to:

<https://www.npws.ie/licences/disturbance/bats-or-otters> and www.npws.ie.

- **Cutting Polystyrene**

When using polystyrene insulation materials, it is essential that any cutting of polystyrene blocks with saws is done in a properly enclosed area (surrounded by mesh or indoors) to

prevent the release of polystyrene debris into the local environment. Use of hot wire cutting is preferred as it is cleaner and produces less waste.

3.2 Important guidance notes for Electrical works

All electrical works must be in full compliance with the applicable National Rules for Electrical Installations¹. Where existing Earthing and Bonding is not in accordance to the applicable National Rules for Electrical Installations, it must be rectified to meet this standard **before grant works are started**.

Where existing Earthing and Bonding are not in accordance to the applicable National Rules for Electrical Installations, these must be rectified to meet this standard **before grant works are started**.

The following requirements are essential for any electrical works being carried out for measures detailed in this document, particularly installation of heating systems, controls, lighting and monitoring:

- All electrical works must be in full compliance with the applicable National Rules for Electrical Installations (currently ET 101:2008 ETCI rules).
- Earthing and Bonding must be in accordance with ET 101:2008 Chapter 54 (544 Equipotential bonding conductors) and Annex 63B (Guidelines for certification for alterations to existing installations).
- Annex 63B must be taken into consideration to comply with ETCI rules the following note from ET 101:2008:
As referred to in Annex 63B "Before commencing new work, the installer should assess the existing installation to ensure that it will not impair the safety of the proposed new work, and likewise, the new work will not impair the safety of the existing installation. Should the installer become aware of any defect in any part of the installation that would impair the safety of the new work, the client must be informed in writing thereof. No new work should commence until these defects have been made good."
- If the earthing/bonding is less than 6mm² then either:
 - (a) an 'Electrical safety notice to the homeowner' must be issued to notify the homeowner that their current wiring installation is not to current ETCI rules and **work cannot commence on the installation** until the wiring is rectified to current ETCI rules, OR
 - (b) the bonding must be rectified to current ETCI rules by a competent suitably qualified person **before works are started**.
- Work may commence on a heating system with earthing/bonding of 6mm² and above². However, when earthing/bonding is less than 10mm² the heating installer must issue an 'Electrical safety notice to the homeowner' to notify them that their current wiring installation is not to current ETCI rules.
- Where bonding arrangements are found not to be in accordance with the current ETCI National Rules, the consumer shall be informed in writing of the situation and advised to have the electrical installation checked and rectified by a competent person. In such circumstances, the 'Electrical safety notice to the homeowner' can be issued to a Homeowner when an electrical

¹ ETCI ET101:2008 are the currently applicable national rules. These are to be replaced by IS 10101, currently at draft stage.

² Depending on the Programme requirements. Some Programmes may require that the earthing/bonding wires are upgraded to 10mm². Please check Programme-specific documentation.

installation is not to current ETCI regulations. The 'Electrical safety notice to the Homeowner' is available at the following link:

https://www.seai.ie/resources/publications/Electrical_Safety_Notice_to_Homeowners_2017.pdf

4 Ventilation

Proper ventilation of a home is necessary to ensure:

- Adequate fresh air for a healthy and comfortable environment for the occupants
- Adequate air supply for safe operation of certain fuel-burning appliance types
- Minimal condensation risk
- Avoidance of radon accumulation
- Avoidance of accumulation of other indoor air pollutants¹

This section of the DTSS is directly referenced by the measures shown in Table 2.

Measure	
6.1	Cavity Wall Insulation
6.2	External Wall Insulation
6.3	Internal Wall Insulation
6.4	Ceiling Level Attic Insulation
6.5	Rafter level attic insulation (warm roof) and flat roof ceilings
6.6	Floor Insulation
6.12	Draught proofing
6.13	Window Replacement
6.14	External Door Replacement
6.15	Window glazing envelope Replacement
6.16	Window glazing low e film
6.20	Solid Multi-Fuel Stoves (including Biomass)
6.21	Gas fired room Heater
6.24	Chimney draught limiter
6.31	Mechanical Extract Ventilation and Mechanical Ventilation with Heat Recovery

Table 2: Measures referencing "Ventilation" Section

Ventilation Types

Uncontrolled (and unintended) air infiltration – through the porosity of the building structure or through poor detailing or poor workmanship of openings such as doors and windows. This provides ventilation on an arbitrary basis and is generally insufficient for ensuring occupant safety, health and comfort. This type of ventilation is not considered energy efficient.

Purposeful ventilation provision – which may be either:

- partially/fully controlled e.g. MVHR, humidistat actuated extract fans, Demand Controlled Ventilation (DCV), closable wall vents or trickle vents
- uncontrolled e.g. permanent wall vents

It is essential to maintain any proper pre-existing ventilation provisions by making all reasonable effort when carrying out works.

¹ The World Health Organisation publishes guidelines for indoor air quality and information on biological, chemical and combustion indoor air pollutants.

Ventilation should be always considered at the planning and execution stages when improvements to the thermal envelope and/or windows are made. These improvements will reduce heat loss and lead to higher internal temperatures within a building. With a higher temperature, the internal air can hold a significant amount of additional water vapour. Furthermore, as improvements in energy performance of the thermal envelope result in increased airtightness, ventilation provisions must ensure adequate air changes per hour. Air leakage paths should be minimised to help reduce interstitial condensation.

In undertaking the works, and based on the findings of an initial assessment of the home, the Contractor must:

1. Ensure that the works being undertaken will not compromise the existing necessary ventilation provisions in the home to the detriment of the air quality and/or living environment therein.
2. Inform the homeowner where it is noted that the existing necessary ventilation provisions have already been adversely affected by actions of the homeowner or other parties.
3. Inform the homeowner of any aspects of ventilation considered to be inadequate or potentially unsafe (particularly with rooms containing fuel-burning appliances). Guidance on background ventilation is provided in Part F TGD and permanent ventilation for heat-producing appliances in Part J TGD.
4. Inform the Homeowner that levels of the radioactive gas, radon, can be increased where existing ventilation is not adequate or where works may increase the airtightness of the home. Guidance on whether the home is in a High Radon Area and how to test a home for radon is available on the Environmental Protection Agency's website: www.epa.ie or Free Phone 1800 300 600.
5. Make appropriate recommendations in writing to the homeowner in respect of 2 and 3 above. It is then the responsibility of the homeowner to rectify these issues, with or without involving the Contractor, before works can commence.

These points are aimed at ensuring that the Contractor takes all reasonable action to ensure that proper ventilation provisions are installed in the home and that the homeowner is made aware of the proper operation and maintenance of such provisions.

External Wall Insulation

In addition to points 1 to 4 above, Contractors should be aware that the installation of wall insulation will increase the airtightness of the building. This reduces unintended ventilation in the form of uncontrolled air leakage or draughts in the home. This effect is likely to be most pronounced in the case of external wall insulation systems. However, the primary focus should remain on following points 1 to 4 above relating to installed ventilation provisions.

Therefore, in accordance with the training given by the Agrément ETICS (External Thermal Insulating Composite Systems) Certificate Holder, and where necessary, in consultation with them, the Contractor should consider the likely effect of the installation on the home's ventilation and recommend appropriate options/solutions for the homeowner.

Assessment of Ventilation Provision

Provision should be made for existing wall ventilators to be maintained and/or suitable new ventilation provided as needed. If there are no wall vents or these are insufficient, the homeowner should be informed in writing. Depending on the measure installed, the same applies for attic ventilation, sub-floor ventilation or other ventilation provisions.

Reference NSAI S.R. 54:2014: *Code of practice for the energy efficient retrofit of dwellings*, Section 10.2.1.1 for the choice of appropriate ventilation systems.

Ventilation System Design Considerations:

- Background ventilation – allow for the provision of sleeved wall ventilator or trickle window/door ventilators. (Ref: NSAI S.R. 54:2014 clause 10.2.2.1.1 - Table 30 as shown below).
- Intermittent extract ventilation – all wet rooms should be fitted with mechanical extract ventilation (Ref: NSAI S.R. 54:2014 clause 10.2.2.1.1 - Table 31 as shown below)
Recirculating cooker-hoods are not recognised as extract ventilation.
- Intermittent fan control – use of timers, manual switches, occupancy and humidity sensors where applicable.
- Fans and ductwork – ducting should be insulated to prevent condensation to a minimum of 25mm of mineral wool.
- Purge ventilation is the removal of pollutants and water vapour through openings such as doors/windows and mechanical extract ventilation in wet rooms.

For all of the above reference NSAI S.R. 54:2014: Sections 10.2.2.1.1 – 10.2.2.1.3.

SR 54 must be followed, but in some Programmes where SEAI provides a higher level of funding, SEAI mandates ventilation measures that are only advisory in SR 54. This is further specified in Programme-specific documentation (Code of Practice or equivalent for WHS, WW, DRand Communities).

Table 30 from S.R. 54:2014 - Guidance for the provision of ventilation for retrofit works with air permeability levels greater than 5 m³/hr/m²:

Retrofit Works		Existing Dwelling Condition		
		A. No existing background ventilation in some or all habitable rooms and no extract ventilation in wet rooms	B. Existing purpose provided background ventilation in each habitable room. No extract ventilation provided in wet rooms	C. Existing purpose provided background ventilation in each habitable room. Extract ventilation provided in wet rooms
1	Internal/External/Cavity Insulation for Walls	Background ventilation should be provided to rooms without background ventilation in accordance with Column 2, Table 31	No requirement to upgrade background ventilation	
2	Replacement of Windows	It is advised to provide extract ventilation in wet rooms in accordance with Column 3, Table 31	It is advised to provide extract ventilation in wet rooms in accordance with Column 3, Table 31	No requirement to provide further ventilation
3	Sealing/insulating of timber suspended floors	Where evidence of inadequate ventilation exists (e.g. mould, condensation) - extract ventilation should be provided to all wet rooms in accordance with Column 3, Table 31	Where evidence of inadequate ventilation exists (e.g. mould, condensation) - extract ventilation should be provided to all wet rooms in accordance with Column 3, Table 31	
4	Two or more of the above measures done in combination or separately	Background and extract ventilation should be provided in accordance with Table 31	No requirement to upgrade background ventilation Extract ventilation should be provided to all wet rooms in accordance with Table 31	No requirement to provide further ventilation
NOTE Covered/Damaged covers on ventilators should be replaced with equivalent or better. Deficiencies or faults in ventilator grills or fans should be rectified and returned to intended working condition.				
NOTE Where ventilation exists and severe conditions of condensation or mould growth have developed, specialist advise should be sought.				

Background ventilators should be located to avoid draughts and at a height of approximately 2.1m to 2.2m above floor level. All background ventilators should be tested to EN 13141-1 and installed to manufacturer’s instructions.

Where any of the guidance detailed in Table 30 above is not adhered to by the Contractor, the Contractor must retain, in writing, the reasoning for not adhering to Table 30. When in doubt, Contractors must contact the SEAI Technical Team¹ to verify the correct approach and retain the answer in writing. Always follow Agrément requirements, where applicable, for any measure being installed.

Table 31 from S.R. 54:2014 - Minimum levels of background and extract ventilation as specified in Table 30

Room usage	Minimum background ventilation (mm ²) ^d	Intermittent extract fan rating (l/s)
Habitable room	6 500	Not required
Kitchen^a	6 500	60 (reduced to 30 for suitably sited extracting cooker hood)
Utility room^a	6 500	30
Bath or shower room^b	Not required	15
WC (only)^c	Not required	6
a) Where the room has no external wall, a floor area of less than 6,5 m ² and background ventilation cannot be provided then extraction fan to operate with a 15 minute overrun etc. b) Where the room has no external wall and background and purge ventilation cannot be provided then the extraction fan should operate with a 15 minute overrun etc. c) Where a window opening for purge ventilation exists then the window alone may be relied upon to provide extract ventilation. d) Ventilation area as stated above is free area. Equivalent area is measured in accordance with the method specified in I.S. EN 13141-1: 2004. The above values should be multiplied by 0,8 to obtain equivalent areas.		

¹ See the “Contact Us” section on the SEAI [Contractor Supports page](#).

Ventilating an airtight dwelling (achieve an air permeability below 5m³/hr/m²)

Reference NSAI S.R. 54:2014: Clause 10.2.1.2 for a checklist to achieve air permeability below 5m³/hr/m². The ventilation requirements are detailed in Table 32 for airtight dwellings.

Table 32 from S.R. 54:2014 - Minimum levels of background and intermittent extract ventilation when the air permeability is expected to be below 5 m³/hr/m²:

Room usage	Minimum background ventilation (mm ²) ^{c,d}	Intermittent extract fan rating (l/s)
Habitable room	7 000	Not required
Kitchen ^a	3 500	60 (reduced to 30 for suitably sited extracting cooker hood)
Utility room ^a	3 500	30
Bath or shower room ^a	3 500	15
WC (only) ^b	3 500	6

a) Where the room has no external wall, then extraction fan to operate with a 15 minute overrun etc.
 b) Where a window opening for purge ventilation exists, then the window alone can be relied upon to provide extract ventilation.
 c) Ventilation area as stated above is free area. Equivalent area is measured in accordance with the method specified in I.S. EN 13141-1: 2004. The above values should be multiplied by 0,8 to obtain equivalent areas.
 d) The minimum total equivalent area of background ventilators providing general ventilation should be 42 000 mm² with an additional 7 000 mm² for each additional 10 m² floor area above the first 70 m² of floor area measured. For single storey dwellings situated at ground level or on any storey up to four storeys, an additional 7 000 mm² per dwelling should be provided. The minimum level of background ventilation recommended for each room is unlikely to provide the total background ventilation required for the dwelling as a whole.

Permanent Ventilation is any means of permanent non-adjustable vents, opening directly to the external air. Vents for heat-producing appliances such as gas appliances are considered permanent as they are in a fixed position and **are not closable**. Ref: NSAI S.R. 54:2014 Table 35: Guidance for the provision of adequate supply of air for combustion products:

Retrofit Works	A. No existing supply of air in room containing a fixed open flued appliance.	B. Adequate supply of air provided in each room containing a fixed open flued appliance.
1. Wall insulation, window replacement or sealing/ Insulation of suspended floors carried out BUT NO new open flued appliance fitted.	Permanent ventilation should be provided in the room containing the appliance, (see note).	No requirement to upgrade permanent ventilation. Recommended to ensure ventilation is unblocked, in good condition and permanently open.
2. New open flued or flueless appliance fitted.	This work falls within the Building Regulations Part J- Heat Producing Appliances. See TGD J for further guidance.	This work falls within the Building Regulations Part J - Heat Producing Appliances. See TGD J for further guidance.
3. Provision of new balanced flue appliance.	This work falls within the Building Regulations Part J- Heat Producing Appliances. See TGD J for further guidance.	This work falls within the Building Regulations Part J - Heat Producing Appliances. See TGD J for further guidance.

NOTE This permanent ventilation will also suffice for Background ventilation, see clause 10.

Introducing mechanical extraction may cause spillage of combustion products where an open-flued (non-room sealed) heat-producing appliance exists. Spillage occurs when the extraction rate of the fan causes a depressurisation in the room containing the heat-producing appliance, which in turn may reverse the flow of air containing the combustion gases through the appliance's flue. The ventilation

system should be designed to ensure the likelihood of spillage occurring is reduced to an absolute minimum. This is achievable by:

1. Ensuring that enough fresh air is continuously and permanently available in the room where the heat-producing appliance is located.
2. The relevant installation Standards for the fuel/product type should be followed.

All new permanent ventilators should be tested to EN 13141-1 and installed to manufacturer's instructions.

4.1 Condensation and moisture risk

In cases where moisture flow is being evaluated in a building and for condensation risk assessments, see Section 4.5 of NSAI S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, as well as the following standards referenced in S.R. 54:

- BS 5250:2011 – Code of practice for control of condensation in buildings
- I.S. EN ISO 13788:2012 – *Hygrothermal Performance of Building Components and Building Elements – Internal Surface Temperature to Avoid Critical Surface Humidity and Interstitial Condensation – Calculation Methods*
- I.S. EN 15026:2007 – *Hygrothermal Performance of Building Components and Building Elements – Assessment of Moisture Transfer by Numerical Simulation*

4.2 Improving airtightness

In some cases, and depending on the Programme, an airtightness test on the dwelling may be required. The following is a non-exhaustive list of examples where an airtightness test is recommended:

- Where the dwelling has draught-proofing measures installed (e.g. as per Section **6.12**), an airtightness test is the most accurate way to reflect the reduced leakage in a post-works BER. Without the airtightness test results, pessimistic default values must be used by the BER Assessor, resulting in a less favourable BER rating.
- An airtightness test may be carried out before works to identify leakages and/or to identify the most appropriate ventilation strategy for the dwelling.
- If a heat pump grant is being sought, an airtightness test may be necessary in order to achieve the required Heat Loss Indicator as per Section 6.9.2, particularly if fabric measures are likely to improve airtightness.
- If the dwelling has had measures carried out that are likely to improve airtightness, such that Internal Air Quality (IAQ) may suffer, then an airtightness test can help identify the likelihood of inadequate uncontrolled ventilation and the resulting need for a mechanical ventilation system. See Section 4.7 of S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*.
- If mechanical ventilation measures such as those detailed in Section **6.31** are being carried out, then the dwelling airtightness should be improved. This ensures that mechanical ventilation systems are more efficient and more effective.
- When in doubt as to whether an airtightness test should be carried out on the home, check with SEAI's Technical Team¹.

Airtightness test results are only considered valid by SEAI if carried out by an NSAI registered airtightness tester ² or equivalent.

¹ See the "Contact Us" section on the SEAI [Contractor Supports page](#).

² As listed here: <https://www.nsai.ie/certification/agreement-certification/air-tightness-testing/>

5 Planning and Protected Structures

In some cases, installation of measures may be subject to specific planning controls, as in the case of Protected Structures. This is where the property is on the Local Authority Record of Protected Structures (RPS), or is proposed to be added to this or is in an Architectural Conservation Area (ACA).

Where a property is on the RPS, is in an ACA, or the installation of any measures supported by SEAI may require approval from the Local Authority, the Contractor shall satisfy himself that all necessary approvals have been obtained from the relevant planning authority before commencing the works.

Works carried out may require specialist knowledge on the part of the Contractor because of a potential effect on the character of the building and the architectural heritage value of the element being changed.

For further information related to planning and Architectural Conservation refer to:

<http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/Planning/FileDownload%2C1595%2Cen.pdf>

Similarly, certain works may change the external character of a conventional property, not on the RPS, to such an extent that approval may need to be sought from the Local Authority. For example, installation of external insulation and alteration of the front profile of a property in certain cases. Any alterations that affect glazing and doors could similarly require permission from the relevant Local Authorities.

6 Specific Measures – Competency and Standards

The following sections detail the competency and standards expected by SEAI for each of the specific measures to be supported. A summary list of guides and standards referred to are detailed in Appendix 1 and each measure is summarised in Appendix 2. Generally, all measures are intended to apply to the whole house.

Where this document prescribes Standards/ Specifications of products/systems or Certification requirements for Contractors, the manufacturer, supplier or Contractor may participate in the Programmes by clearly demonstrating full equivalence to those requirements. When pursuing this equivalence route, it is vitally important that the supplier or Contractor make contact with the SEAI Technical Team¹, demonstrating equivalence to SEAI's satisfaction. This must be done **before** any works are undertaken with the subject system or by the subject Contractor. Failure to first secure written confirmation from SEAI of said equivalence may result in revocation of a homeowner's grant approval, and possible sanction for the Contractor in accordance with the Programme's Terms and Conditions and QADP.

Nothing in the above guidance allows SEAI to subvert legislation, regulations, procedures or institutional arrangements by having SEAI act beyond its statutory remit.

¹ See the "Contact Us" section on the SEAI [Contractor Supports page](#).

6.1 Cavity Wall Insulation

Contractor Competency

Cavity wall insulation Contractors must be approved by the NSAI Agrément scheme. Contractors carrying out Cavity wall insulation works must be on the directory “NSAI Agrément Registered Blown Cavity Wall Installation Companies” and must carry out the installation to the standards required by this approval and certification.

Product Standards and Specification

Materials used in the insulation of a cavity wall must be certified by the NSAI Agrément.

Cavity Wall Insulation must be installed to fill the full depth of the cavity. In as much as is physically and economically feasible, this must achieve a U-value¹ of 0.35 W/m²K or better for external walls. Minimum cavity depths apply depending on the product as per NSAI Agrément, and residual cavity depths must never be less than 40 mm.

Grants for wall insulation are given on the basis of a whole-house solution. Please refer to the specific Programme requirements and terms and conditions in cases where:

- A whole-house solution is not physically and/or economically feasible;
- A mixed measure approach is required (i.e. cavity, internal and/or external wall insulation)

Installation Standards and Specifications

- a. All cavity wall insulation must be installed in accordance with the specifications laid out by the system supplier and in accordance with the relevant system’s NSAI Agrément certificate and clause 7.3.4 of S.R. 54:2014.
- b. The insulation material must be suitable as per clause 7.3.4.2.5 and 7.3.4.2.6 of S.R. 54:2014
- c. Please refer to manufacturer’s instructions and the system’s NSAI Agrément certificate before proceeding with works in cold weather. Low temperatures may affect the adhesive used to bond cavity beads together and this may compromise the integrity of the cavity wall insulation.
- d. The suitability of insulation depends mainly on the local exposure to driving rain and the condition of the existing construction. Cavity wall insulation is certified for use in masonry walls up to 12m in height subject to the conditions in the product certificate. The exposure of the walls to wind-driven rain should be assessed and related to any restriction on the type of cavity fill being considered.
NOTE System certificates provide maps identifying exposure zones and specify conditions where full fill cavity insulation can be used.
- e. The walls must be surveyed before the installation by a trained surveyor on behalf of the approved Contractor. A report from a complete survey, including a borescope survey is required as per NSAI Agrément certificate and must be provided to the customer. This is to ascertain the suitability of the property for the recommended insulation system. Additional guidance on installation considerations is detailed in clause 7.3.4.3 of S.R. 54:2014.
- f. Any defects recorded in the survey, which may affect the performance of the insulation system when installed, should be notified to, and rectified by, the customer with or without involving the Contractor before installation work commences.
- g. Installation must be carried out by the system supplier or manufacturer or a Contractor approved by the system supplier/manufacturer. Approved Contractors must carry out a full survey of the property and comply with the system installation procedure specified by the system

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - *Conventions for U-value calculations*. See Section 2.6 of this document for further details.

supplier/manufacture. At least one member of an installation team must carry an identity card issued by the system supplier/manufacture.

- h.** Cavity filling with expanded polystyrene should not be undertaken where PVC-sheathed electrical cables are passing through the cavity and are not protected within electrical conduits.
- i.** If the cavity is uncapped, it must be closed at the top of the wall and at the top of any opening. There are several different methods for capping of existing walls, which should be agreed before works are started. Cavity brushes should be installed at party walls to ensure bead does not migrate between properties.
- j.** All ventilation requirements must be met (see Section 4). Gas, oil and solid fuel appliances must be correctly ventilated as per applicable regulations. Ventilation openings must be checked to ensure there are no obstructions due to the insulant. All flues must also be checked for obstructions using an appropriate test (e.g. smoke test). See Section 4.
- k.** The NSAI Agrément Certificate and supplier guarantee must be issued to the homeowner. Certification is valid once the conditions outlined in the certificate are met.
- l.** Contractors should indicate to the customer the methods they intend to use to ensure the successful insulation of the full extent of the cavity wall.
- m.** It should be noted that timber frame homes cannot be cavity insulated.

6.2 External Wall Insulation

Contractor Requirements and Competency

Contractors installing external wall insulation must be approved as installers by the manufacturers of the product being installed. Contractors for external wall insulation must also be NSAI Agrément registered External Insulation installers and must carry out the installation to the standards required by the NSAI Agrément Approval Scheme for Installers of External Thermal Insulating Composite Systems (ETICS).

Product Standards and Specification

The external wall insulation system must be certified by the NSAI Agrément or equivalent. This measure must only be installed on the wall types specified in the NSAI Agrément certificate.

The objective of this measure is to install materials that will achieve a satisfactory level of performance in the home. Thus, External Wall Insulation must, in as much as is physically and economically feasible, achieve a U-value¹ of 0.27 W/m²K or better for external walls.

External Wall Insulation works started after the 1st November 2019 will require compliance with the **“Major Renovation” section of Part L of the Building Regulations**, where more than 25 % of the surface of the building envelope undergoes renovation.

Installation Standards and Specifications

- a. All external wall insulation and associated works should be installed in accordance with the manufacturer’s specifications and NSAI’s S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*.
- b. Where the system supplier/manufacturer operates an Approved Contractor programme, the Contractor must carry appropriate identification stating they are an Approved Contractor. The Contractor shall be NSAI ETICS registered before carrying out work.
- c. The Contractor must always comply with the requirements of the system supplier specifications.
- d. The insulation panels should be stored on a firm, clean, dry and level base, off the ground. Panels should be protected from prolonged exposure to sunlight by storing opened packs under cover in dry conditions or by re-covering with opaque polyethylene sheeting.
- e. When handling the insulation boards, care must be taken to avoid damage and contact with solvents or bitumen products. The boards must not be exposed to open flame or other ignition sources.
- f. Any metal laths, renders, paints, texture synthetic finish coatings and sealants should be stored in accordance with the manufacturer’s instructions in a dry environment at the required temperatures.
- g. A pre-installation survey of the property should be carried out to determine suitability for treatment and any repairs or modifications necessary to the building structure before application of the insulation system.
- h. External wall insulation may be restricted where the dwelling faces onto public footpaths. Relevant Local Authorities should be consulted where the installation affects the width of the public footpath. Owners of neighbouring properties should be consulted where the installation of external wall insulation encroaches on their property.
- i. The survey should also include tests conducted on the walls of the property to determine the pull-out resistance of the proposed mechanical fixings for the appropriate substrate. An

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - *Conventions for U-value calculations*. See Section 2.6 of this document for further detail.

assessment is carried out and a recommendation is made on the type and number of fixings required

- j.** A specification is prepared for each elevation of the building indicating:
- Where required, additional corner mesh and reinforcement;
 - Detailing around windows, doors and at eaves;
 - Exact position of the damp-proof course (DPC);
 - Exact position of expansion joints;
 - Any required alterations to plumbing including rainwater downpipes and gulley traps.
 - Areas where flexible sealants must be used;
 - Where required, the position of fire barriers.
- k.** Modifications of downpipes, soil and vent pipes, pipe extensions, meter locations and other services should be as detailed in the design specification. All pipework should be relocated as required to accommodate the insulation.
- l.** Fixings to the external fabric need reinforcement to resist movement that may affect joints on soil, rainwater, gas and water pipes. Satellite dishes are subject to wind load that may cause indenting into the insulation with the potential for failure of the waterproof render. A treated timber ground to the depth specified by the system certificate should be installed.
- m.** Any causes of dampness such as leaking gutters or downpipes must be repaired before starting grant works. Where there is evidence of rising damp, remediation measures must be carried out prior to grant works commencing.
- n.** The condition of the exterior of the wall should be assessed. Surfaces should be sound, clean and free from any loose material. Render finishes should be in good condition. Pebbledash (wet and dry dash) does not provide an even surface for the adhesive to bond to and should be adequately prepared or removed. All necessary repairs to the property's structure must be completed and dry before the installation of the insulation.
- o.** The flatness of surfaces must be checked. This may be achieved using a straight edge spanning the storey height. Local areas may be assessed using a straight edge spanning 1 metre. Any excessive irregularities must be made good before installation.
- p.** If the existing wall surface is covered with a render, the bond between the background and render should be adequate. Otherwise, it must be removed and reinstated with a sufficient bond.
- q.** Where appropriate, external plumbing, including rainwater downpipes and gulley traps, must be removed and alterations made to underground drainage before installation of the system, to accommodate repositioning on the finished face of the system.
- r.** The external insulation system is applied in accordance with the current installation instructions of the system supplier/manufacturer.
- s.** As per S.R. 54, external insulation should not be used with unfilled cavities. The cavity should be fully filled either as part of the construction or as part of the retrofit measures where external insulation is used. This has been included by NSAI in the ETICS scheme since 9th January 2017.
- t.** Starter track and base beads, typically at DPC level, should be accurately aligned to provide a horizontal base profile and should be secured to the external wall. The first row of insulation boards is positioned on the base profile.
- u.** The insulation boards must be firmly pressed to the wall and mechanically fixed in place with a fixing arrangement as per the relevant approval documentation. Care must be taken to ensure that the boards are butted tightly together. Surface alignment should be checked as work proceeds. Any gaps at joints should be sealed, *e.g.* using basecoat material. Gaps of larger than 3mm should be filled with slivers of insulation or spray foam. Surface irregularities must be removed by planing with a rasp over the whole surface.
- v.** The key thermal bridge junctions for external wall insulation may be addressed as follows:
- When eliminating ground floor thermal bridges, this may require placement of suitable external insulation to footpath level. Further thermal improvements may be

- achieved by bringing insulation below ground level and may require removal of footpaths;
- Sills may require specific detailing to avoid thermal bridging;
 - External wall insulation should abut the roof insulation to form a continuous layer; otherwise, a thermal bridge may occur. To eliminate the cold bridge at the wall roof junction removal of the soffit may be required.
- w. The insulation should be returned into reveals, sills and jambs in accordance with the approval documentation. To fit around doors and windows, insulation boards may be cut with a sharp knife or a fine-toothed saw only. All junctions between external wall insulation and existing window frames should be adequately sealed to prevent the ingress of moisture. The insulation should overlap at the corners and fit without gaps. Where clearance is limited, strips of approved insulation should be installed to suit available margins. If required, purpose-made window sills may be installed at this point. They should prevent water ingress as per NSAI Agrément or equivalent certificate. For additional guidance, see *Acceptable Construction Details* on the DHPLG website.
- x. Before applying base and finish coats, all necessary protective measures such as taping off existing window frames and covering of glass should be in place.
- y. In sunny weather, work should commence on the shady side of the building and be continued following the sun to prevent the rendering drying out too rapidly.
- z. When the basecoat is applied to the insulation boards, the reinforcing mesh is embedded into the basecoat before it dries. The mesh should be fully embedded in the basecoat and be free of any creases. Additional mesh may be required at corners and openings.
- aa. Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.
- bb. The undercoat and finishes should be applied within the permitted temperature range and should be protected from rapid drying. Drying should take 24 hours in favourable conditions.
- cc. All rendering shall be applied in accordance with IS EN 13914-1 and BS 8000-0.
- dd. Movement joints should be provided in accordance with the system supplier's technical specifications.
- ee. Where there is a risk of insulant exposure, e.g. window reveals, eaves, etc., the system must be protected by an adequate overhang or by an adequately sealed, purpose-made flashing.
- ff. When replacing windows and doors, they may be relocated towards the external face of the existing structure to reduce thermal bridging but always should be supported by the structure. Details should be in accordance with approved certification.
- gg. On completion of the insulation, all external fittings shall be fixed as per applicable per NSAI Agrément cert or equivalent.
- hh. The NSAI Agrément Certificate and system supplier guarantee must be issued to the homeowner. Certification is valid once the conditions outlined in the certificate are met. When using polystyrene insulation materials, it is essential that any cutting of polystyrene blocks with saws is done in a properly enclosed area (surrounded by mesh or indoors) to prevent the release of polystyrene debris into the local environment. Use of hot wire cutting is preferred as it is cleaner and produces less waste.
- ii. Installation of external wall insulation can be affected during particularly cold weather as the adhesive used may not bond during cold spells thereby reducing the integrity of the insulation. Refer to manufacturer's instructions and the system's NSAI Agrément certificate in relation to this issue.
- jj. There are no external insulation systems certified by NSAI for use with timber frame or steel frame construction. External insulation of timber frame or steel frame walls is not eligible for SEAI grants or energy credits.

External Wall Insulation and Electrical Installations

For Health and Safety reasons, external wall insulation must not be installed over electricity wires/cables or other electrical fixtures.

Where installers encounter the following situations, they must ensure that ESB Networks are contacted well in advance of any proposed works to arrange for the necessary alterations:

(a) ESB Networks service cable clipped directly to the surface of a wall or roof soffit

DO NOT REMOVE OR TOUCH THE CABLES. ESB Networks service crew will unclip the service safely allowing the Contractor to install the external wall insulation and various renderings as required. The Contractor should supply and fit uPVC electrical trunking suitable for external use. In most cases, 50mm X 50mm will be the size required. Adequate fixings must be applied to cater for this trunking and its contents *i.e.* the service cable. Where expanded polystyrene is used it must not come in direct contact with the PVC insulated cables at any point in the service cables route, due to a chemical reaction that occurs between PVC and expanded polystyrene. Note uPVC used for the trunking is unaffected by direct contact.

(b) ESB Networks overhead service 'aerial wires' anchored to wall (e.g. gable end wall)

DO NOT REMOVE OR TOUCH THE AERIAL WIRES/CABLES. ESB Networks service crew will fit a modified bracket and replace the aerial wires with covered wires where required. This standard bracket must be mounted on the original wall to cater for the mechanical stress levels.

Please also refer to Appendix 3 for the following ESB Networks documents giving more comprehensive guidance:

ESB – External Wall Insulation Guidance Bulletin and Drawings in Appendix 3 of this document

To contact ESB Networks Call 1850 372 757

ESB Networks External Meter Cabinet

DO NOT REMOVE OR TOUCH THE CABLES. The meter cabinet cannot be moved without disturbing the cables already connected. In most situations, the cabinet should remain in its original location and will be modified by the Contractor to seal the recess created by the fitting of the insulation and to allow for the fitting of a new door. An acceptable solution is to fit an extension to the existing cabinet by removing the door and cutting away the back from a new cabinet. The new cabinet is then placed in the recess with the sidewalls of the new and old cabinets overlapping. Accurate fitting is essential to “seal off” the wall insulation from the inner cabinet. These meter cabinets are manufactured to a specific standard to give protection in the event of fire. Do not use alternative materials to modify the meter cabinet.

Please also refer to **Appendix 3** for the following ESB Networks documents, giving more comprehensive guidance:

ESB – **External Wall Insulation Guidance Bulletin and Drawings in Appendix 3** of this document

To contact ESB Networks Call **1850 372 757**

External Wall Insulation and Natural Gas Supply

Gas Networks Ireland (previously called Bord Gáis Networks) have issued a technical bulletin, outlining the options open to Contractors applying external wall insulation to domestic homes with Natural Gas installations as well as guidance on ventilation and fluing.

The technical bulletin is published here:

https://www.seai.ie/resources/publications/Bord_Gais_External_Wall_Insulation_Guidelines_July2017.pdf

Where Contractors have specific queries in relation to gas installations then they should contact Gas Networks Ireland directly on **1850 200694**

Under some grant Programmes, thermal bridging must be addressed as part of the grant works. This may require installation of the EWI at least 150mm below floor level. Please check your specific Programme requirements for this and refer to Annex H of NSAI S.R. 54 for construction details.

6.3 Internal Wall Insulation

Contractor Competency

Internal wall insulation Contractors must be competent to install same and must complete the work to the standard set out in *S.R.54 Code of Practice for Energy Efficient Retrofit of dwellings* published by the NSAI and to the guidance in *Internal Wall Insulation in existing housing – a guide for specifiers and contractors (CE17/GPG138)* published by the Energy Saving Trust. Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list or certification by the manufacturer. Insulation must be installed in accordance with NSAI (or equivalent) Agrément certificate and by suitably qualified people. Before commencing internal dry-lining works, the Customer must be made aware of the effect on room sizes, services and decoration.

Product Standards and Specification

Materials used in the internal insulation of a wall must be certified by the NSAI Agrément or equivalent.

The objective of this measure is to install materials that will achieve a satisfactory level of performance in the home. Thus, Internal Wall Insulation must, in as much as is physically and economically feasible, achieve a U-value¹ of 0.27 W/m²K for external walls.

There may be some locations where a U-value of **0.27 W/m²K** is not achievable due to space restrictions (e.g. minimum stair space). At these locations, the internal insulation systems must achieve a maximum U-value less than 0.6 W/m²K.

Internal Wall Insulation works started after the 1st November 2019 will require compliance with the **“Major Renovation” section of Part L of the Building Regulations**, where more than 25 % of the surface of the building envelope undergoes renovation.

Installation Standards and Specifications²

- a. All internal wall insulation installation and associated works should be carried out in accordance with the manufacturer’s specifications and NSAI’s S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*.
- b. Measures used to achieve the internal insulation of walls can include composite insulated dry-lining boards or any other approved system where insulation achieves a full coverage of insulation across the wall.
- c. Internal wall insulation solutions typically include:
 - Applying composite insulated dry-lining boards directly to the wall using mechanical fixings or plaster dabs.
 - Applying battens to the wall, insulating between the battens with composite insulated dry-lining boards.
- d. The wall/ceiling must be surveyed to assess its flatness and suitability for the system.
- e. The internal wall insulation fixing method depends on the existing internal wall construction:

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - Conventions for U-value calculations. See Section 2.6 of this document for further detail.

² If the dwelling was built before 1940, you may wish to consult a conservation architect for advice, particularly for stone walls, single leaf or composite construction. Heritage buildings require special retrofitting considerations and modern methods of insulation may not be appropriate. The following document provides useful guidance on insulation of older buildings:

https://www.seai.ie/resources/publications/Energy_Efficiency_in_Traditional_Buildings.pdf.

- Where the masonry wall is plastered directly, any of the internal wall insulation solutions described may be used. Any wallpaper, skirting, picture rails, gloss paint and projecting window boards should be removed. The wall surface should be clean and dust free. Where the existing wall is painted, the manufacturers do not recommend the use of plaster dabs.
 - For existing plasterboard on dabs, it is not possible to assess whether the dabs can support the additional weight of the composite insulated dry-lining boards. Therefore, the plasterboard and dabs should be removed to provide a smooth substrate. Where the block wall finish is unplastered and therefore, potentially porous resulting in poor airtightness, a parging coat of plaster should be applied, to improve the airtightness of the final works.
 - For existing plasterboard on battens, the condition of battens should be investigated. Where they are found to be in a serviceable condition, the battens may be retained, and the new internal wall insulation fixed directly to them through the existing plasterboard. Where the battens are not in a serviceable condition, the plasterboard and battens should be removed entirely. Where insulation exists, it should be removed and replaced with insulation to an appropriate U-value.
- f. When removing existing plaster, the exposed surface of the wall should be pointed/cement washed to seal any holes/cracks.
- g. Where existing plaster is to remain, all cracks should be filled, and any loose sections should be removed and made good. When removing plaster, the exposed surface of the wall should be pointed/cement washed to seal any holes/cracks. Where the existing wall surface is level and smooth, the thermal laminate board may also be fixed directly to the wall surface.
- h. The interior wall surface should be structurally sound and free from dampness. Any repairs should be carried out ahead of the installation, and walls should be allowed to dry out before commencing the works. Any existing structural or dampness problems should be resolved before applying any insulation.
- i. Provision should be made for the fixing of heavy items such as kitchen cupboards, or items that will have a level of force applied, such as banisters and grab rails.
- j. In areas where there is not enough space to allow for the application of internal wall insulation (for example, width of the staircase or corridor should not be reduced to less than minimum requirements outlined in the Building Regulations) it may be necessary to install a reduced depth of insulation and increase the level elsewhere to compensate for this reduced performance. Alternatively, the use of insulation with a lower thermal conductivity may be used to maintain the width in these areas.
- k. Composite insulated dry-lining boards should be installed in accordance with good dry-lining practice and the manufacturer's instructions.
- l. A vapour control layer must be included in the insulation system. Where the vapour control layer is an integral part of the insulated dry-lining board, careful attention must be given to the sealing of joints.
- m. Where any services such as pipes or cables are present in the wall or mounted on the wall, these should be extended or replaced. They should extend through the full depth of the proposed insulation layer and finish with enough excess for fixing or working. Where radiators cannot be re-positioned to an internal wall or be floor mounted, a ply or OSB timber plate should be fixed to the wall surface. It should be secured through the thermal laminate into the existing masonry or timber battens.
- n. The location of potential service penetrations in the insulation should be determined by offering up the composite insulated dry-lining board. Slots should not be formed in insulated dry-lining board to accommodate service penetrations. A hole should be drilled through the insulated dry-lining board, slightly larger than the diameter of the service pipe or cable and the service should be slotted through the hole.

- o.** When mechanically fixing insulated dry-lining boards to the wall using battens, the metal fixings through the battens should penetrate at least 35mm into the masonry. Fixings through boards must penetrate at least 25mm into the batten.
- p.** The procedure for fitting internal wall insulation to the internal face of the wall, mechanically or using plaster dabs, should be followed from clause 7.3.3 in SR 54:2014.
- q.** Window and door reveals can be sources of condensation and mould if not insulated correctly, but where the amount of visible window frame is too small the full thickness of the insulated dry-lining cannot be applied. Where this is the case an insulated window lining board (e.g. expanded PVC) can be used. The lining should not restrict ventilators or opening mechanisms. It may be necessary to remove the existing plaster to accommodate an adequate thickness of insulation within the limited space available.
- r.** Where there is no other option but to run electrical cables within the insulation component of the insulation board, the cables must be enclosed in an appropriate conduit, e.g. rigid PVC, as per the National Rules of the Electro-Technical Council of Ireland (ET101: 2008).
- s.** Avoid contact between PVC-insulated wiring and polystyrene insulation, e.g. run wires through flexible cable protection tubes.
- t.** All gaps in an internal wall insulation solution should be sealed, as any air passing through joints or junctions with floors and ceilings will flow behind the insulation. This may diminish the thermal efficiency of the insulation and lead to interstitial condensation. The insulation system should be sealed around all doors, windows and other openings. Any penetrations of the insulated dry-lining board must also be sealed e.g. light switches, sockets etc. Where the manufacturer supplies or advises the use of a plasterboard primer this must be applied.
- u.** Where a radiator cannot be re-positioned to an internal wall or be floor mounted, a ply or OSB timber plate should be secured to the wall surface through the thermal laminate into the existing masonry.

6.4 Roof Insulation - Ceiling Level

Contractor Requirements and Competency

Roof insulation Contractors must be competent to complete the installation. The Contractor must complete the work as set out in *S.R.54 Code of Practice for Energy Efficient Retrofit of dwellings* published by the NSAI. Contractors must install the insulation in accordance with this guidance and Technical Guides supplied by the material manufacturer. Roof insulation contractors should have completed a FETAC level 5 or equivalent in attic insulation installation.

Product Standards and Specification

Materials used in the insulation of an attic at ceiling level must be manufactured to a relevant Irish, British or European Standard. When using novel insulating materials (e.g. Sheep's wool, Hemp, Cellulosic Fibre), proof of quality control in product manufacture must be demonstrated in the Declaration of Works.

The target maximum U-value¹ for attics insulated at ceiling level is, in as much as is physically and economically feasible, 0.16 W/m²K. For conventional fibrous materials (e.g. glass wool, mineral wool), a thickness of 300 mm is typically required to meet the U value requirement.

NSAI Agrément-certified products must be used where there is a certified product of that type (e.g. NSAI certified spray foam products must be used).

Installation Standards and Specifications

- a. All attic insulation installation and associated works should be carried out in accordance with the manufacturer's specifications and NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*.
- b. Attic Insulation should be installed using materials approved by an Irish, British or European Standard for attic insulation and installed in accordance with the relevant Irish, British or European Standards, where available.
- c. If there is evidence of bats or bat roosts present in the attic space being insulated, the Contractor should consult with the Bat Conservation Ireland at www.Batconservationireland.org for advice on how to proceed. All bat and bat roosts are protected under EU and Irish legislation. For further information on this refer to www.npws.ie.
- d. Where practicable, all areas of the ceiling must be insulated to the same depth.
- e. Mineral wool and other compactable insulation materials should not be compressed as this decreases its effectiveness considerably.
- f. The Contractor must maintain a gap at eaves compliant with the standards SR 54 to ensure adequate ventilation via appropriate ventilation openings (see Section 4). Where appropriate ventilation openings are not already present in the home a soffit vent and eaves ventilation tray or similar appropriate measure must be installed.
- g. Unless a breathable sarking membrane is present, the insulation should be kept at least 50mm from the membrane.
- h. Long-term exposure to interstitial condensation within a roof space can lead to structural roof timbers rotting. It is essential that a cold roof space is adequately ventilated and the transfer of moisture from below is limited by:

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - *Conventions for U-value calculations*. See Section 2.6 of this document for further detail.

- Installing a vapour control layer at ceiling level to reduce moisture transfer is recommended where reasonably possible.
 - Prevent moisture from entering the roof space by ensuring that loft hatches are properly draught proofed and sealed.
 - Fitting wet rooms with a suitable ventilation system to extract moisture at source. This is in addition to window/wall vents where applicable.
 - Provide roof ventilation through side eaves or through ventilation tiles in the slope of the roof.
- i. Insulation at ceiling level should be installed to avoid gaps. This can be done by:
- The insulation laid between the ceiling joists should be no more than 25mm above or below the ceiling joists. A gap larger than this could lead to a thermal bypass, as a continuous gap could be formed (from eaves to eaves) within the layers of insulation as detailed in SR 54.
 - The next layer of insulation should be placed across the joists and tucked into the eaves ensuring access to eaves ventilation
- j. High-performance insulation should be placed between or above the timber joists where a storage platform or access walkway is proposed. There are two choices when maintaining a high level of insulation under any flooring or storage space, where flooring is needed or is being retained:
- Install floor joists on the existing joists at right angles to allow the required thickness of insulation being laid, with the floor installed above this.
 - Use a solid, closed-cell insulation with a much lower thermal conductivity and install a floor covering on top of this. This results in a lower height of the final floor surface.
- k. It is essential that any heavy-duty cables (*e.g.* for cookers and showers) are not covered by the insulation material and should instead be left on top of the new insulation, provided there is enough slack to do so. Where this is not possible, a gap of at least 75mm should be left either side of the (heavy duty) cables for their entire length within the attic area.
- l. The insulation material shall be retained at a minimum of 75mm from all electrical apparatus penetrating the ceiling, for example, recessed lighting fittings. Where necessary a permanent physical restraint shall be used.
- m. Recessed down-lights should be protected so the insulation does not cover them and that they are adequately ventilated. Use of a purpose-made recessed lighting housing is recommended. The Contractor must advise the Customer of the need to keep the recessed lights clear of insulation. The purpose made recessed down-light covers installed must be tested to BS EN 60598-1 *Luminaires. General requirements and tests*
- n. The Contractor should give special consideration to those who are elderly or disabled who may not be able to remove stored items in the attic space themselves. The Contractor should, where considered appropriate, provide the customer with a quotation for the removal and replacement of the stored items to facilitate installation of the insulation material.
- o. The Contractor should identify any form of water penetration in the attic. Attic insulation should not be installed if the roof or pipework is leaking.
- p. All attic and roof insulation should meet wall insulation to minimise /eliminate thermal bridges as per Appendix H of SR 54, as far as this is technically and economically feasible. See Programme-specific documentation for requirements.
- q. All pipework and water storage vessels should be insulated. See Section 6.4.2 Insulation of pipework and water storage tanks for further details.
- r. In every roof space where cold water tanks or other fitted appliances occur, the Contractor must construct a permanent boarded walkway from the roof access hatch to any areas that may require routine inspection or maintenance such as the tank ball valve position and / or the appliance location. The boarded access walkway shall be constructed of minimum dimensions of 50x50mm softwood battens laid across rafters, notched over pipes and cable crossings, said battens to be securely screw fixed in place to rafters. 19mm thickness by

450mm wide flooring grade chipboard to be fixed to battens base with screws. This walkway should be supported above the first layer of insulation to prevent any compaction of insulation below the walkway.

6.4.1 Attic Hatch

The Contractor must insulate the roof access hatch to the same thermal value as the main attic. Insulation must be securely fixed to the attic hatch. Where attic access ladders are fixed to the hatch, insulating hoods or a lightweight insulating box should be used where possible.

The Contractor must draught proof attic hatches:

- Draught strip shall be fitted to all sides of the attic hatch.
- Non-hinged attic hatch covers shall be fitted with a securing catch at each side (*i.e.* a minimum of two catches), to achieve the required compression.
- All hinged attic hatch covers shall have at least one securing latch fitted to the attic hatch framework on the opposite side to the hinges, to achieve the compression required.
- Attic access covers not located within a surrounding framework and simply covering a ceiling aperture from above shall be fitted with a rebate seal and a minimum of two catches shall be fitted. Where the aperture is covered from below, the perimeter of the access, it must be fitted with a rebate seal. A semi-permanent means of holding the cover against the seal shall be provided.
- Some attic hatches (*e.g.* with an attached attic access ladder) may be difficult to draught proof. Care should be taken where spring-loaded “push-push” catches are present. Where draught proofing can be applied without a problem, this should be done as detailed below.
- Where non-wooden attic hatches are found, they must be fitted with suitable securing catches, unless the method adopted would cause damage to the attic hatch or frame.

6.4.2 Insulation of pipework and water storage tanks

Contractor Requirements and Competency

Contractors insulating pipework and water storage tanks must be competent to complete the installation. The Contractor must complete the work as set out in the guidance document BS 5970 *Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C* and BS 5422 *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C*.

Insulation of pipework and water storage tanks shall be installed in accordance with guidance and instructions supplied by the material manufacturer. Where a product is covered by an NSAI Agrément Certificate it must be installed in accordance with this certificate and by suitably qualified people.

All water pipework and water storage tanks should be insulated in unheated areas of the roof space when installing attic insulation. If pipework and/or water storage tanks are not sufficiently robust to withstand the installation of insulation, the pipework and/or water storage tanks should be replaced.

Product Standards and Specification

Materials for Insulation of pipework and water storage tanks must be manufactured to a relevant Irish, British or European Standard.

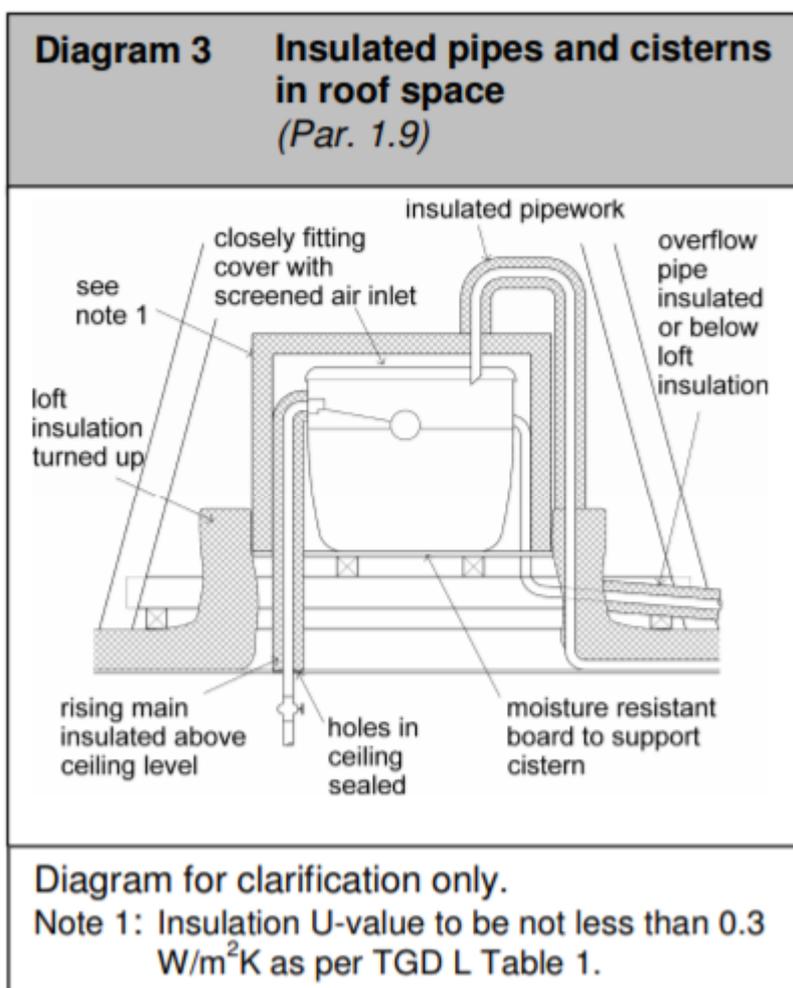
Installation Standards and Specifications

- a. The cold-water storage tank, service pipe and fittings and any associated cold-water pipes should be adequately protected against damage by frost.

- b. Pipework and water storage tanks should be insulated using materials approved by an Irish, British or European Standard for insulation of pipework and water storage tanks. The insulation should be installed in accordance with the relevant Irish, British or European Standards, where available.
- c. Pipework and water storage tanks should be insulated in accordance with BS 5970 *Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C* and BS 5422 *Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C*
- d. Manufacturer's instructions should be followed. The following are intended to be helpful guidelines.
- e. Insulation of pipework outside of the heated envelope of the building to protect against freezing for domestic cold-water services shall be as per 'Appendix Table 1' in TGD Part G of the Building Regulations:

Amd. No.	Text affected																																								
G(xi)	<p style="text-align: center;">Appendix Table 1</p> <p style="text-align: center;">Minimum insulation thickness (mm) to protect against freezing for domestic cold water systems (12 hour period)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Outside diameter (mm)</th> <th rowspan="2" style="text-align: center;">Inside diameter bore (mm)</th> <th colspan="5" style="text-align: center;">Extreme installation Inside the building but outside the envelope of the insulation</th> </tr> <tr> <th style="text-align: center;">$\lambda = 0.020$</th> <th style="text-align: center;">$\lambda = 0.025$</th> <th style="text-align: center;">$\lambda = 0.030$</th> <th style="text-align: center;">$\lambda = 0.035$</th> <th style="text-align: center;">$\lambda = 0.040$</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">15</td> <td style="text-align: center;">13.6</td> <td style="text-align: center;">23</td> <td style="text-align: center;">35</td> <td style="text-align: center;">53</td> <td style="text-align: center;">78</td> <td style="text-align: center;">113</td> </tr> <tr> <td style="text-align: center;">22</td> <td style="text-align: center;">20.2</td> <td style="text-align: center;">10</td> <td style="text-align: center;">14</td> <td style="text-align: center;">18</td> <td style="text-align: center;">23</td> <td style="text-align: center;">28</td> </tr> <tr> <td style="text-align: center;">28</td> <td style="text-align: center;">26.2</td> <td style="text-align: center;">7</td> <td style="text-align: center;">9</td> <td style="text-align: center;">11</td> <td style="text-align: center;">13</td> <td style="text-align: center;">16</td> </tr> <tr> <td style="text-align: center;">35</td> <td style="text-align: center;">32.6</td> <td style="text-align: center;">5</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">10</td> <td style="text-align: center;">11</td> </tr> </tbody> </table> <p>Initial water temperature: +2°C Minimum ambient temperature: -6°C Permitted ice formation: 50% Evaluation period: 12 hours.</p> <p>Note 1: Thicknesses given are calculated specifically against the criteria noted in the table. These thicknesses may not satisfy other design requirements</p> <p>Note 2: Some of the insulation thicknesses given are too large to be applied in practice. The purpose of including very high thicknesses is to demonstrate that the application of a material of the given thermal conductivity (λ) is not able to provide the degree of frost protection on the pipe size indicated under the design conditions. Therefore in order to increase the degree of frost protection it is necessary to increase the pipe size, select an insulation with a lower thermal conductivity or use some means of putting heat back into the system.</p>	Outside diameter (mm)	Inside diameter bore (mm)	Extreme installation Inside the building but outside the envelope of the insulation					$\lambda = 0.020$	$\lambda = 0.025$	$\lambda = 0.030$	$\lambda = 0.035$	$\lambda = 0.040$	15	13.6	23	35	53	78	113	22	20.2	10	14	18	23	28	28	26.2	7	9	11	13	16	35	32.6	5	7	8	10	11
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35	32.6	5	7	8	10	11																																			

- f. Further advice is available in the BRE '*Good Building Guide 40 – Protecting Pipes from Freezing*'.
- g. Insulation of cold-water storage tanks should be securely fixed to sides and top of water storage tanks. The lid of the cold-water storage tank shall be ridged. No gaps should be left between the insulation surrounding the cold-water storage tank. The cold-water storage tank access cover should be removable to allow minimum disturbance to insulation.
- h. Insulation should not be laid below water storage tanks in the roof space where the underside of the storage vessel is less than 300mm above the finished level of roof insulation. The insulation around the water storage vessel should continue down to the finished level of attic insulation to form a skirt around the water storage vessel. If the water storage vessel is greater than 300mm above the finished level of insulation the insulation should be installed below the vessel and the underside of the vessel should also be insulated.
- i. Further detail is given in the diagram below and TGD Part G of the Building Regulations.



- j. All pipework bend and joints should be fully insulated.
- k. Unless a breathable sarking membrane is present, the insulation should be retained at least 50mm from the membrane.

6.4.3 Woodworm Infestation in Attics

Woodworm can affect untreated timbers and is often present in dwellings over 10 – 15 years old. Woodworm can cause severe damage to building timbers if not identified and treated appropriately. Attics are at risk of woodworm infestation (e.g. due to storage of woodwork infested furniture in an attic). The woodworm beetles are attracted to the surrounding timbers in the attic. If woodworm contaminated timbers are covered by insulation, it is likely to increase the activity rate of the infestation due to increased warmth in the insulated timbers.

During the preliminary survey of the attic, Contractors should check for woodworm infestation, easily recognisable by small pinholes and the presence of a fine dust on the timbers. Remedial treatment of the timbers should be carried out prior to the insulation upgrade taking place.

6.5 Roof Insulation - Rafter level attic insulation (warm roof) and flat roof ceilings

Contractor Requirements and Competency

Roof insulation Contractors must be competent to complete the installation. The Contractor must complete the work as set out in *S.R.54 Code of Practice for Energy Efficient Retrofit of dwellings* published by the NSAI. Contractors must install the insulation in accordance with this DTSS and any technical guides supplied by the material manufacturer. Roof insulation Contractors should have completed a FETAC level 5 or equivalent in attic insulation installation. Where the manufacturer operates an “Approved Installer” list, the Contractor must demonstrate their inclusion on the list or certification by the manufacturer. Products must be installed in accordance with the NSAI Agrément certificate (or equivalent) and by suitably qualified people.

Product Standards and Specification

Materials used in the insulation of an attic at rafter level and in flat roof ceilings must be certified by the NSAI Agrément or equivalent.

The objective of this measure is to install materials that will achieve a satisfactory level of performance in the home. Thus, the target maximum U-value¹ for attics insulated at rafter level is, in as much as is physically and economically feasible, 0.20 W/m²K. The target maximum U-value for attics insulated at flat roof level is, in as much as is physically and economically feasible, 0.22 W/m²K.

The Contractor must ensure that, in the case of insulation, an optimal whole-surface solution is provided where physically and economically feasible. For example, when dealing with roof insulation, this comprises insulation of the whole surface of the ceiling / roof-space as appropriate.

Installation Standards and Specifications

- a. All attic and flat roof insulation installation and associated works should be carried out in accordance with the manufacturer’s specifications and NSAI’s S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings* – Sections 6.2 and 6.3 detail the approach to rafter insulation and flat roof (warm deck and cold deck) insulation.
- b. Careful detailing is required to avoid thermal loss due to thermal bridging and to maintain roof ventilation at the roof-wall junction particularly where the dwelling is also provided with wall insulation. All attic and roof insulation should meet wall insulation to minimise /eliminate thermal bridges as per Appendix H of SR 54, as far as this is technically and economically feasible. See Programme-specific documentation for requirements.
- c. Materials used in attic Insulation should be approved by an Irish, British or European standard for loft insulation.
- d. If there is evidence of bats or bat roosts present in the attic space being insulated, the Contractor should consult with the Bat Conservation Ireland at www.Batconservationireland.org for advice on how to proceed. All bat and bat roosts are protected under EU and Irish legislation. For further information on this refer to www.npws.ie.
- e. Attention should be given to ventilation and condensation requirements of the attic in relation to the materials used (see Section 5).
- f. The installed insulation must not impede cross-flow ventilation.
- g. Unless a breathable sarking membrane is present, the insulation should be retained at least 50mm from the membrane.

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - *Conventions for U-value calculations*. See Section 2.6 of this document for further detail.

- h.** When installing rigid insulation between the rafters or joists, the sheets should be cut accurately to leave no gaps around the edges. Where gaps occur, these should be filled with insulation or insulation foam. Similarly, any service penetrations, such as a soil stack, should be sealed adequately.
- i.** A constant coverage should be attained to avoid the risk of cold bridging. Cold bridging occurs where there is not a continuous covering across the inside (attic side) of the rafters or insulated flat roof. Where the coverage is not continuous it allows the rafter or joist itself to conduct heat out to the external or 'cold' environment, thus providing a 'cold bridge' through which heat can escape.
- j.** Unless the product has a built-in vapour control layer, a separate vapour control layer should be fitted between the insulation and any plasterboard, *i.e.* on the warm side of the insulation.
- k.** Insulation/vapour control layer joints should be fully sealed by a suitable tape. Where foil-backed insulation is used, foil taping all joints between the insulation slabs in each layer will fulfil the requirement for a vapour control layer;
- l.** The insulation material shall be retained at a minimum of 75mm from all electrical apparatus penetrating the insulation, for example, recessed lighting fittings. Where necessary a permanent physical restraint shall be used;
- m.** Downlighters should be provided with enough space to dissipate heat to prevent the lights themselves from overheating. Where the light fitting itself is airtight (to the roof) but the hood of the fitting is open to the room, then the hole for the recessed fitting should be cut into the ceiling accurately to prevent air movement from the room into the roof space. A void should be formed around the light fitting in the lowest insulation layer. Where the light fitting itself is not airtight (to the roof), or where it is not possible to make the ceiling airtight where the fitting is provided, then an airtight enclosure should be formed, or a service void provided on the warm side of the vapour control layer. Forming these spaces at regular intervals in the insulation layer reduces the overall effectiveness of the roof insulation. Where they are fitted, a layer of high-performance insulation should be installed above the recessed lights to compensate for the voids formed in the lowest layer to accommodate the recessed fittings. For sloped roofs where voids cannot be provided then recessed light fittings should not be installed in the sloping roof section unless a suitably deep service void is provided.
- n.** The purpose made recessed down-light covers installed must be tested to BS EN 60598-1 *Luminaires. General requirements and tests*
- o.** Whilst Contractors are in the roof space, they should identify any form of water penetration and attic insulation should not be installed if the roof is leaking.
- p.** Where rafter level insulation is used on a partial attic conversion, the vertical walls of the room should have insulation placed between the stud timbers (where not already existing) and across the face of the stud walls. Where there is unused attic space outside of the conversion, insulation should be applied at ceiling level to the standard detailed in 'Ceiling Level Insulation' above.
- q.** Services, such as cables/pipework, can be accommodated within a battened airspace, on the inside of the finished insulation. The depth is determined by the services provided.
- r.** When the insulation is applied at rafter level, attention must be taken so that there is continuity of insulation from rafter to wall. Please refer to NSAI's S.R. 54:2014 – Code of practice for the energy efficient retrofit of dwellings – Sections 6.2 and 6.3 for detailed drawings, and always adhere to the installation instructions on the NSAI Agrément Certificate for the relevant insulation product.

6.6 Floor Insulation

Contractor Requirements and Competency

Contractors installing floor insulation must be competent to complete the installation and must complete the work in accordance with S.R. 54 – 2014 (*Code of practice for the energy efficient retrofit of dwellings*). The following Best Practice Guides can be used as further reference:

- *Domestic floors: construction, insulation and damp-proofing* (GBG 28 Part 1) published by BRE
- *Insulating ground floors* (GBG 45), published by BRE

They must also be installed in accordance with any technical guides supplied by the material manufacturer. Products must be installed in accordance with the NSAI Agrément certificate (or equivalent) and by suitably qualified people.

SEAI expects documentary and photographic evidence of the installation of insulation to be available for inspection and for the purpose of BER assessments.

Where removal of a concrete floor slab is required, the services of a suitably qualified Chartered Structural Engineer must be secured to design and oversee the work.

In general, the Contractor should clearly outline to the homeowner the full implications of the scope of works proposed, including the potential impacts on:

- Services;
- Skirting;
- Doors and door heights;
- Room height (floor to ceiling);and
- The general environment during, and because of, the installation.

Product Standards and Specification

Materials used in the insulation of a suspended timber floor (*e.g.* glass fibre, rockwool, sheep's wool, expanded polystyrene, high-density foam, etc.) must be manufactured to a relevant Irish, British or European Standard. Materials used in the insulation of a concrete ground floor slab must be rigid insulation materials certified by the NSAI Agrément or equivalent.

Insulation used with a concrete floor slab must have enough load-bearing capacity to support the floor and its loading.

The target maximum U-value¹ for the insulation of floors, in as much as is physically and economically feasible, is:

- 0.36 W/m²K, or
- 0.15 W/m²K, where the refurbishment also includes the installation of underfloor heating

The installation of underfloor heating typically only applies to a floor with a concrete, ground-bearing floor slab and not to suspended timber floors. When incorporating underfloor heating into a suspended timber floor, a rigid insulation material certified by the NSAI Agrément or equivalent must be used. The guidance of the certificate holder should be sought on its use with underfloor heating.

This economic feasibility refers only to the economic performance of the installation itself. For example, in exceptional circumstances, a home may require significant additional modifications compared to a normal case. This could make the initial investment in the insulation solution inappropriate compared

¹ U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 - *Conventions for U-value calculations*. See Section 2.6 of this document for further detail.

to the benefit the Customer will get from the investment. Economic feasibility, in this case, does not refer to the ability of the Customer to fund their portion of the capital cost for a conventional installation. It is the responsibility of the Contractor to ensure that the optimum solution for each Customer is achieved, within the cost constraints and preference of each Customer.

Where the insulation material is made from polystyrene, electrical cables should be run in conduits to avoid direct contact between the polystyrene and the wiring. When polystyrene comes into direct contact with PVC cabling, it has the potential to cause material degradation of the PVC insulation, which may result in the wiring becoming unsafe. The Contractor should also seek guidance from the insulation manufacturer when using underfloor heating services with polystyrene insulation.

Installation Standards and Specifications – Suspended Timber Floor Insulation

- a. Retrofit of floor insulation must be in accordance with the guidelines as described in S.R. 54 – 2014 (*Code of practice for the energy efficient retrofit of dwellings*) Clause 9 – Floors and Table 30 – Guidance for the provision of ventilation for retrofit works.
- b. Suspended timber floor Insulation should be installed using materials approved by an Irish, British or European Standard for floor insulation and installed in accordance with the relevant Irish, British or European Standards, where available.
- c. The insulation materials should be stored in accordance with the manufacturer’s recommendations.
- d. When using rigid insulation panels, they should be stored on a firm, clean, dry and level base. If stored outdoors, they should be kept off the ground and protected from prolonged exposure to sunlight under cover in dry conditions or by covering with opaque polyethylene sheeting.
- e. Care must be taken to avoid damage and contact between rigid insulation panels and solvents or bitumen products. The panels must not be exposed to open flame or other ignition sources.
- f. Where practicable, all areas of the floor must be insulated to the same depth.
- g. Wool and other compactable insulation materials should not be compressed as this decreases its effectiveness considerably.
- h. Water supply pipes should be kept above the insulation, where possible. Where it is not possible, these pipes should be completely insulated where they are below the level of the floor insulation. See TGD Part G of Building Regulations for further details.
- i. The insulation material should be installed between the joists so there are no void spaces between the underside of the flooring and the insulation unless space is required for services. Loose-fill, spray-foam or quilt materials should be supported underneath by a thin sheet of plywood or a breathable membrane and rigid insulation materials should be supported on battens or similar. This allows the timber joists to breathe as well as prevent air movement above the insulation.
- j. Where an airtight membrane is used to support the insulation material, it should be turned up at the edges and sealed against the walls around the complete perimeter of the floor. Where a breathable membrane has not been used, one should be installed underneath the timber joists. The membrane should be turned up at the edges and sealed against the walls around the complete perimeter of the floor. Where fuel-burning appliances are located within a space, please ensure there are adequate ventilation openings (see Section 5).
- k. The space between the last joist and the wall should be filled with insulation to the full depth of the joist to minimise thermal bridging at the junction between the wall and the floor.
- l. It is essential to ensure that the external wall vents are not blocked in any way to ensure that the void beneath a suspended timber floor is adequately ventilated. The ventilating air must have a free path across the floor void. Where fuel-burning appliances are located within a space please allow for adequate ventilation openings (see Section 5).

Installation Standards and Specifications –Concrete Floor Insulation

This specification is applicable to ground supported concrete floors and suspended precast concrete floors. Where enough space is available for safe access, or a basement exists, fitting insulation to the underside of the slabs is an option. NOTE Caution should be taken to ensure that the area beneath a suspended ground floor is ventilated to prevent the build-up of condensation and hazardous soil gases, such as radon.

- a. Retrofit Floor insulation must be installed in accordance with the guidelines as described in S.R. 54 – 2014 (*Code of practice for the energy efficient retrofit of dwellings*) Clause 9 – Floors.
- b. Materials used in insulation of a concrete ground floor slab wall must be installed in accordance with specifications laid out by the system supplier's specifications and the system's NSAI Agrément (or equivalent) certificate.
- c. Where the excavation of an existing ground floor is required, remedial measures for the reduction of indoor concentrations of Radon are required.
- d. The ground floor slab must incorporate a damp-proof membrane (DPM). The DPM should be installed in accordance with the following British Standards:
 - *Protection of buildings against water from the ground* (CP 102:1973),
 - BS 8102:2009 *Code of practice for protection of below ground structures against water from the ground*, and
 - *Design and installation of damp-proof courses in masonry construction* (BS 8215:1991)
- e. The insulation works should not reduce the floor-to-ceiling height of the room to below 2.4m or the clear door heights to below 2.0m
- f. Storage of insulation materials:
 - The insulation panels should be stored on a firm, clean, dry and level base. When storing them outdoors, they should be kept off the ground and protected from prolonged exposure to sunlight under cover in dry conditions or by covering with opaque polyethylene sheeting. The insulation panels should be stored in accordance with the manufacturer's recommendations.
 - Care must be taken to avoid damage and contact with solvents or bitumen products. The boards must not be exposed to open flame or other ignition sources.
- g. Installation:
 - The insulation may be placed above or below the DPM/radon barrier and should have a high moisture resistance.
 - Where the insulation is laid on top of the DPM/radon barrier it should be laid on a well compacted hardcore that is sand-blinded to provide a level surface. The DPM/radon barrier should have overlapping joints. It should be well sealed and must be brought up the walls around the floor perimeter to meet the wall DPM/radon (for more information, see www.epa.ie).
 - The concrete floor slab should be fully dried out before the installation of the insulation material.
 - Insulation boards are cut to the required size and should be laid horizontally on the concrete slab with closely-butted, staggered cross-joints to ensure there are no gaps at joints.
 - The boards should be laid so all cut edges are at the perimeter of the floor or at some other feature, e.g. thresholds, access ducts, etc.
 - Spreader boards should be used to protect the insulation boards.
 - A thinner section of insulation should be placed vertically against the abutting wall around the perimeter of the floor area being insulated to prevent thermal bridging.
- h. Finishing:
 - If the DPM/radon barrier is placed below the insulation, the joints between insulation boards should be taped to prevent wet screed from entering when being

- poured. If the slab/screed is power-floated, the exposed edges of perimeter insulation should be protected during power-floating, e.g. by boards, or the areas close to the edge of the floor should be hand trowelled.
- If there is no DPM/radon barrier above the concrete floor a vapour control layer, e.g. polyethylene, should be placed between the insulation and the screed to protect moisture-sensitive finishes such as timber or timber-based flooring. This vapour control layer should be carried up along the edge of the screed. The screed should be allowed to dry before any floor finish is laid.
 - When installing a timber-based overlay on top of the insulation, the following measures must be taken in the installation process:
 - Overlays should be installed in accordance with PD CEN/TR 12872:2014 – *Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs*
 - Where the DPM/radon barrier is below the insulation, a vapour control layer must be installed between the insulation and the overlay boards. All joints in this vapour control layer must be sealed appropriately.
 - An expansion gap between overlay boards and perimeter walls or abutments must be provided at a rate of 2mm per meter run or a minimum of 10mm, whichever is greater.
 - A waterproof PVA adhesive should be applied to all joints before overlay boards are interlocked. Wedges should be inserted between the wall and floor to ensure the boards remain tightly locked together until the adhesive has set.
 - A suitable compressible filler must be used around the perimeter of the floor between the overlay boards and wall.
 - Overlay board protection should be considered in rooms where there is a likelihood of regular water spillage, e.g. in bathrooms, kitchens, etc.
 - When laying a cement-based floor screed on the insulation, it should be laid in accordance with BS 8204 (*Screeds, bases and in situ floorings*)
- i. Where possible, electrical conduits, gas and water pipes or other services should be contained in ducts or channels within the concrete slab. Where this is not possible, the non-electrical services may be accommodated within the insulation, provided they are securely fixed to the concrete slab. Electrical cables should be enclosed in a suitable conduit. With hot water pipes, the insulation must be cut back to maintain an air space.
 - j. See Section 3.2 for guidance on Radon. Post retrofit radon testing is recommended where extensive energy retrofit measures have been completed.

6.7 Fully Integrated Heating Controls

This section outlines the general Standards and Specifications for Contractors, products and installation methods for fully integrated heating controls.

Contractor Requirements and Competency

Heating controls must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. Contractors must be competent in the installation of the control system chosen, seek guidance and attend training from the manufacturer or supplier if required.

Product Standard and Specification

All heating control products must conform to the appropriate BS, EN or IS standard for that measure. As a minimum, the following Standards should be satisfied:

- EN 60730-1 *Automatic electrical controls for household and similar use. General requirements*
- EN 60730-2-7 *Automatic electrical controls for household and similar use Part 2-7: Particular Requirements for Timers and Time Switches*
- EN 215 *Thermostatic Radiator Valves. Requirements and Test Methods*

Installation Standard and Specification

All heating controls should be installed in accordance with the manufacturer's specifications. All works should be installed in accordance with NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, the DHPLG and SEAI Document *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*, CIBSE – *Domestic Heating Design Guide* and Energy Savings Trust Guidelines:

- GPG 302 *Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers (Energy Savings Trust and BRE)*
- CE29 *Domestic Heating by Oil: Boiler Systems – Guidance for Installers and Specifiers*
- CE30 *Domestic Heating by Gas: Boiler Systems – Guidance for Installers and Specifiers*

All works should be carried out in accordance with the applicable *National Rules for Electrical Installations* and BS 5449 – *Specification of Forced Air Circulation Hot Water Central Heating Systems for Domestic Purposes* (or equivalent Irish Standard) where applicable. Please refer to Section 3.2 Important guidance notes for Electrical works for details.

Attention should be given to good housekeeping and safety during installation. The Contractor must fully demonstrate every installed measure to the homeowner and provide a written set of operating instructions. Before leaving the home, the Contractor must ensure that the owner can correctly operate their upgraded heating system.

Note on installation of wireless heating control equipment:

Care should be taken before installing wireless equipment, to ensure that there is no interference from metal objects or building elements, other wireless or non-wireless electrical devices. Checks should be carried out to ensure that the signal strength is sufficient for the heating controls to operate correctly. Manufacturer's installation instructions and guidance must be followed.

Fully integrated heating controls must include the following items:

- Separate control of Space Heating and Domestic Hot Water (Two Zones),
- 24-hour 7-day programmer with remote access,
- Boiler interlock,
- Room thermostat controlling the first space heating zone,
- Cylinder thermostat,
- An additional space heating zone with room thermostat or Thermostatic Radiator Valves (TRVs),
- Time and Temperature Control of Electric Immersion Heater, and
- Hot Water Cylinder Insulation.

This measure is based on the energy efficiency and carbon savings that can be achieved by installing the items above in a home that previously had no or very basic heating controls installed. Replacement of existing heating controls equipment cannot be accepted under this measure.

In addition to the above, the following items must be addressed, where required:

- Auto by-pass, and
- Earthing and equipotential Bonding

The following sub-sections describe the requirements for the items above.

6.7.1 Two Zones (Space Heating and Domestic Hot Water)

This measure divides the heating system into **two zones** and incorporates a **24 hour 7-day programmer** for time and temperature control and a **boiler interlock arrangement** to prevent boiler operation when the heat demand drops off. These initial two zones must include the space heating zone and the domestic hot water heating zone. Further zones to split areas of the dwelling can be added as additional zones (as discussed below).

Product Standard and Specification

All timers, programmers, thermostats, zoning manifolds and motorised control valves must conform to the appropriate BS or IS standard for that measure. For example, BS EN 60730-2-7 '*Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*'. It should also be noted that 22 mm motorised control valves are usually suitable for boilers rated up to 20kW. For larger boilers, when fitting a motorised control valve on a gravity hot water circuit, 28 mm valves or larger should be used.

Installation Standard and Specification

Zoning: Zones should be divided according to Industry Best Practice as outlined in Good Practice Guide 302 – *Controls for domestic central heating and hot water – guidance for specifiers and installers*. This guide recommends using motorised control valves to subdivide the home into separate heating zones. A zoning manifold can also be used to achieve separate heating zones. Motorised control valves can be plumbed at an angle but must not be mounted so that the power-head is below the horizontal level of the pipework. If fitted in a confined space, adequate ventilation must be available to keep the valve within its recommended temperature range. There must also be adequate access so that the power head can be removed if necessary. Motorised valves should not be positioned in the line of the open safety vent pipe or the feed and expansion pipe. Solid fuel systems should use normally-open motorised valves (*i.e.* they close only when power is applied) to ensure safe operation in the event of power failure or malfunction.

Alternative zoning without pipework separation: In cases where physically separating the pipework would be too costly or disruptive, a system based on electronic thermostat TRVs connected wirelessly to a centralised control unit may be used to achieve fully separated time and temperature control of space heating and hot water. This system must provide the same or higher level of separate time and temperature control as a fully integrated system based on pipework separation and motorised valves. The following items must be installed:

1. Wireless electronic thermostatic valves connected to the centralised control unit on all heat emitters;
2. Wireless electronic cylinder thermostat connected to the centralised control unit and controlling the hot water cylinder valve;
3. A centralised control unit ensuring that the boiler only fires when there is heating demand from one of the wireless electronic thermostatic valves, or from the hot water cylinder thermostat.

All product and installation standards and specifications in this section 6.7 must be met by the system. The homeowner must be fully trained in the use and basic maintenance of the system, for example in the replacement of batteries for the electronic thermostatic valves or changing the settings.

A 24 hour 7-Day Programmer, facilitating time and temperature control should be installed in accordance with the manufacturer's guidelines and industry best practice as outlined in Good Practice Guide 302. The room thermostat must be in an area where it is not subject to heat gains, direct sunlight or draughts. The thermostat should be in a well-lit, easily accessible position with good air circulation. The chosen position must be representative of average room/zone temperature. Do not install room thermostats in areas such as corners, behind furniture or curtains. Similarly, room thermostats must not be in areas where the air flow may pick up extra heat such as close to TVs, computers, wall lights, in a room with a fixed heating appliance or direct sunlight. Installing a room thermostat in an area subject to external draughts such as beside external doors etc. should also be avoided. Best practice recommends that thermostats are situated approx. 1.5 m from the floor. Furthermore, room thermostats should not be installed in any room already using TRVs for temperature control. If wireless room thermostats are used, the homeowner must be informed as part of the handover on what are suitable and unsuitable locations for the thermostat (e.g. the wireless room thermostat should not be placed in rooms with TRVs, including wireless electronic thermostatic valves).

To ensure that the correct hot water temperature is detected, **the Hot Water Cylinder Thermostat** (installed with the immersion timer and temperature control device) should be installed between 1/4 and 1/3 of the way up the height of the cylinder unless otherwise instructed by the manufacturer. Timers should not be installed as an alternative to immersion switches as they cannot perform the function of controlling bath and sink where applicable. Care should be taken to ensure that there is good clean contact between the thermostat and the cylinder when attaching. The thermostat should also be located on the front face of the cylinder so that it is easily accessible by the Customer. Contractors should set the hot water temperature no higher than 60°C. It is not uncommon in many households for domestic hot water to be heated to temperatures higher than 60°C only for residents to add cold water to it to bring the temperature down. This is wasteful of energy. The Contractor should advise the homeowner that the safe temperature for storing hot water is 60°C. This is to protect against the risk of Legionella.

Boiler Interlock – A boiler interlock arrangement must be included as part of this set of controls whereby the boiler will not fire when there is no demand for heat. Unnecessary boiler firing can be eliminated with this control measure. The Contractor should turn all thermostats right down when the boiler is firing to assess whether a boiler interlock arrangement is already in place. If the boiler continues to fire, then there is no interlock. The pump may continue to run if the boiler requires a pump to overrun – this

is intentional and does not affect the boiler interlock. On a traditional central heating system with stored hot water, a boiler interlock arrangement can be set up by interconnecting the room and cylinder thermostats with motorised valve(s). With a combination boiler, installing a room thermostat is all that is required to set up a boiler interlock arrangement.

Boiler Management System – An acceptable alternative to the above control measures would be to install a boiler management system that delivers the specified zoning, timing and temperature and boiler interlock control provisions. Such systems must provide the same functionality as is described above and be installed in accordance with the manufacturer’s guidelines and industry best practice.

In some exceptional cases, the hot water cylinder is significantly isolated from the boiler and the installation of additional pipes to connect it separately would involve substantial civil works. In these cases, a manifold/valve arrangement to bypass the hot water cylinder would be an acceptable alternative. This arrangement would allow the Customer to use their boiler for space heating without heating the water in the hot water cylinder. The Contractor must explain to the Customer this new heating arrangement and how to use this system for heating hot water in the summer months e.g. turning off the radiators or using the time/temp programmer. The reasons for implementing this alternative solution as part of the heating control upgrades must be documented in the comments sections as required by the specific Programme.

6.7.2 An Additional Zone

In addition to establishing 2 zones (as described above), the Customer must also commission the installation of an additional space heating zone **OR** the installation of Thermostatic Radiator Valves. TRVs must not be installed in rooms with room thermostats.

A Third Zone can be established using an additional motorised control valve or a zoning manifold arrangement and room thermostat. Installation should be carried out in accordance with the manufacturer’s instructions and with all relevant standards (see Section 6.7.1).

6.7.3 Thermostatic Radiator Valves (TRVs)

In addition to establishing 2 zones (as described above), the Contractor must also install an additional space heating zone **OR** install Thermostatic Radiator Valves (TRVs) on at least three radiators but no less than half of all radiators in rooms without room thermostats.

Product Standard and Specification

All TRVs must conform to the appropriate BS or IS standard for Thermostatic Radiator Valves (if available) such as BS EN 215 *‘Thermostatic Radiator Valves. Requirements and Test Methods’*.

Installation Standard and Specification

TRVs should be installed in accordance with the manufacturer’s guidelines, NSAI’s S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings* and BS 7478 *Selection and use of thermostatic radiator valves*. This British Standard guides on selection, application and use of thermostatic radiator valves (TRVs) manufactured in accordance with BS EN 215-1 for use in domestic and commercial wet central heating systems up to a water temperature of 120°C. TRVs must not be fitted in rooms with room thermostats.

When installing TRVs, the Contractor must ensure that the temperature selector scale and reference point are easily visible and accessible to the user and that the TRV is not positioned in an area which

may distort the temperature sensor. Avoid locating TRVs behind curtains, in direct sunlight, in very draughty locations or other areas which may distort the temperature sensor. If these conditions are unavoidable, a remote sensor should be used. When inaccessibility of the valve to the user is unavoidable e.g. when the radiator and valve are located behind a decorative grille, valves with combined remote temperature sensors and adjuster should be used.

Most modern TRVs are bi-directional and can be installed in the flow or return direction. Due care should be taken to ensure that the valve is bi-directional. If the valve is not bi-directional, the flow through the valve must correspond to the direction on the arrow of the valve body.

When fitting TRVs to a one-pipe system, units designed for minimum flow resistance should be used.

An automatic bypass circuit must be installed (in fully pumped systems) in homes where there are 3 or more TRVs in place. When most TRVs are open, the automatic bypass remains closed, allowing full circulation around the heating system. When the TRVs close, the automatic bypass opens, allowing an appropriate flow rate through the boiler. The use of an automatic bypass also reduces the noise in the system due to excess water velocity. An automatic bypass circuit must also be fitted if the boiler manufacturer requires one, or if it specifies that a minimum flow rate must be maintained while the boiler is firing. An automatic bypass circuit must then incorporate an automatic bypass valve to control water flow in accordance with the water pressure across it. The valve is used to maintain a minimum flow rate through the boiler and to limit circulation pressure when some radiators or zones are turned off. This level of control cannot be achieved using a fixed position valve. The valve should be installed between the boiler primary flow and return noting the direction of flow. When an in-built auto-bypass valve is present in a system boiler, it must be checked that this arrangement is sufficient to provide the minimum flow rate required to the boiler when all the TRVs are closed. In some cases, an external bypass circuit is also required.

All systems should be flushed to remove debris before commissioning with all thermostatic sensor heads removed and valves fully open. Thermostatic sensor heads should also be removed during hydraulic balancing of the system to prevent changes in room temperature affecting the balancing procedure.

The Contractor should set the TRVs to the desired temperature and demonstrate to the Customer how to adjust the temperature setting as they may require.

IMPORTANT NOTE: The room where the main thermostat is fitted should **NOT** have a TRV fitted to the radiator in that location. This would cause inaccuracies in the thermostatic control.

6.7.4 Time and Temperature Control of Electric Immersion Heater

Product Standard and Specification

Timers and temperature control for electric immersion heaters must conform to the appropriate BS or IS standard for that particular measure (if available) such as BS EN 60730-2-7 '*Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*'.

Installation Standard and Specification

Installation should be carried in accordance with the manufacturer's guidelines and Industry Best Practice as outlined in Good Practice Guide 302 – *Controls for domestic central heating and hot water – guidance for specifiers and installers* or similar.

6.7.5 Hot Water Cylinder Insulation

The following requirements apply to insulation on existing hot water cylinders:

- If not replacing the hot water cylinder with a pre-insulated hot water cylinder during the boiler and/or controls upgrade, then a correctly sized insulating jacket tested and approved to BS 5615 must be fitted.
- The insulation jacket shall not cover the immersion heater head and/or cylinder thermostat.
- The fixing bands shall be of a durable material and shall not be over tight or loose.
- Hot water storage cylinders having factory-applied thermal insulation shall not be fitted with insulating jackets unless existing thermal insulation is rendered ineffective through mechanical damage or deterioration.
- Where the specification details of an existing hot water storage cylinder jacket are not completely legible and/or are not perfectly visible, a self-adhesive label shall be additionally applied to the jacket at an accessible position stating the name of the jacket supplier and the Irish Standard reference details.
- For an existing jacket where the British Standards compliance marking is not indicated by any means the following action shall be undertaken:
 - The jacket shall be checked for compliance with this specification.
 - The insulating material, covering material and fastenings shall not have suffered any permanent deterioration.
 - The insulating material shall be at least 80mm nominal thickness.

6.8 High Efficiency Boilers

Contractor Requirements and Competency

High efficiency boilers must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

Oil Boilers

Contractors installing oil-fired boilers must comply with requirements and competencies stated above. It is also recommended that the Contractor is registered with a professional organisation, e.g. OFTEC.

Gas Boilers

In addition to the above criterion, Contractors installing Liquefied Petroleum Gas (LPG) or Natural Gas boilers under this measure must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3).

It is an offence for any person to carry out domestic Natural Gas or LPG works unless they are a registered gas installer with RGII. To align with this requirement gas installers undertaking High Efficiency Gas Boiler and Heating Controls upgrade works must be on the RGII list. Details on how to register with RGII is available at www.rgii.ie.

Product Standard and Specification

Qualifying boilers must be listed on the SEAI Home-heating Appliance Register of Performance (HARP) database or equivalent, such as the UK SEDBUK database. Boilers must have a HARP seasonal efficiency of at least 90%.

Where a replacement boiler installation involves a change of fuel, the procedure outlined in Section 1.4 of the DHPLG and SEAI document "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*" must be adhered to. This procedure discourages replacement of an existing appliance by a significantly less carbon-efficient one.

The Contractor must discuss the specification and sizing of the boiler with the Customer before selecting the final system. Size of home, levels of glazing and insulation should all be considered among other parameters.

Installation Standard and Specification

Qualifying boilers must be fitted in accordance with:

- manufacturer's guidelines,
- the applicable National Rules for Electrical Installations (Please refer to Section 3.2 IMPORTANT GUIDANCE NOTES FOR ELECTRICAL WORKS for details.)
- BS 5449 *Specification of Forced Air Circulation Hot Water Central Heating Systems for Domestic Purposes* (or equivalent Irish Standard) where applicable.

Condensing Boilers

When installing condensing boilers, the DHPLG and SEAI document '*Guide to the condensing boiler installation assessment procedure for Existing Dwellings*' should be consulted before installation. This document is included as an Appendix in the DHPLG and SEAI document '*Heating and Domestic Hot Water*

Systems for Dwellings – Achieving Compliance with Part L’. It contains the detailed guidance referred to in paragraph 2.2 of Technical Guidance Document L – Dwellings to assess cases where the provision of condensing boilers is not practicable.

Gas Boilers

All qualifying Natural Gas and LPG boilers must be installed by a competent person and in accordance with the following documents:

- a. I.S. 813 *Domestic Gas Installations*. This Standard covers the Code of Practice for the installation of Natural Gas or LPG, in domestic premises, from the point of delivery to the gas appliance.
- b. The CRU Criteria document *‘The Regulation of Gas Installers with respect to safety’*.

6.8.1 Hot Water Cylinder Insulation

The following requirements apply to insulation on existing hot water cylinders:

- If not replacing the hot water cylinder with a pre-insulated hot water cylinder during the boiler and/or controls upgrade, a correctly sized insulating jacket tested and approved to BS 5615 must be fitted.
- The insulation jacket shall not cover the immersion heater head and/or cylinder thermostat.
- The fixing bands shall be of a durable material and shall not be over tight or loose.
- Hot water storage cylinders having factory-applied thermal insulation shall not be fitted with insulating jackets unless existing thermal insulation is rendered ineffective through mechanical damage or deterioration.
- Where the specification details of an existing hot water storage cylinder jacket are not completely legible and/or not perfectly visible, a self-adhesive label shall also be applied to the jacket at an accessible position stating the name of the jacket supplier and the Irish Standard reference details.
- For an existing jacket where the British Standards compliance marking is not indicated by any means the following action shall be undertaken:
 - The jacket shall be checked for compliance with this specification.
 - The insulating material, covering material and fastenings shall not have suffered any permanent deterioration.
 - The insulating material shall be at least 80mm nominal thickness.

6.8.2 Important guidance notes for the installation of safety valve discharge works

A safety valve is permitted to discharge externally or internally. The following text details what is acceptable under this measure, I.S. 813 (natural gas and LPG installations) and OFTEC (oil installations):

External discharge:

A discharge pipe shall be run from the safety valve in 15mm (½”) copper. The pipework shall terminate in a visible position outside the building and have a 100mm minimum turn down with the outlet facing downwards. Alternatively, use a boiler manufacture supplied purposed designed fitting, to ensure that the discharge of hot water or steam shall not endanger any person or property. The discharge pipework shall be installed with enough continuous fall to prevent the retention of water and the risk of pipework becoming blocked due to freezing.

Internal discharge:

A discharge pipe shall be run from the safety valve in 15mm (½”) copper to a suitable discharge point into the wastewater system within the dwelling in pipework suitable for temperatures exceeding 100°C. The discharge of hot water or steam shall not endanger any person or cause damage to appliances, controls, other equipment or property. The discharge into the wastewater system shall be made in an accessible location. The discharge must be fitted with a waste trap and a tundish or a (30mm) open-ended riser of enough height to ensure that spillage cannot take place. The discharge pipework shall be installed with enough continuous fall to prevent the retention of water and the risk of the pipework becoming blocked due to freezing.

Additional Installation Guidance

The installation of boilers should also follow the guidance outlined in the following Energy Savings Trust, CIBSE and Good Practice Guide Publications:

- *CE29 Domestic Heating by Oil: Boiler Systems – Guidance for Contractors and Specifiers*
- *CE30 Domestic Heating by Gas: Boiler Systems – Guidance for Contractors and Specifiers*
- *Good Practice Guide 301 Controls for Domestic Heating and Hot Water – Choice of Fuel and System Type*
- *CIBSE – Domestic Heating Design Guide*

6.9 Heat Pump Systems

For the purposes of SEAI grants, a Heat Pump System is defined as a space heating and Domestic Hot Water¹ (DHW) system including:

- An electrically driven heat pump as heat source,
- the heat distribution and control systems and
- the DHW system¹, including hot water storage

6.9.1 Contractor's Competence

Heat pump systems must be installed by suitably qualified personnel. Personnel nominated to supervise and inspect the works, and to sign off the Declaration of Works must be competent in the different aspects of the works. This includes design, sizing and installation of the whole heat pump system. The minimum qualification and training requirements that must be met by personnel nominated to sign off the Declaration of Works for grant purposes are:

- Fetac/QQI Level 6 Advanced Craft in Plumbing, including a module on minor electrical works, or equivalent²
- Certificate of competence from the specific manufacturer of the heat pumps installed, based on an adequate training programme
- Fetac/QQI Level 6 Heat Pump Systems (Course Code C30263) and supplemental Domestic Heat Pump Installation (Code 700606) or equivalent²

Manufacturer's training programmes must be available for SEAI to examine and verify. Training outcomes must include the ability to successfully complete a heat pump system installation of the heat pump products from the specific manufacturer, and to carry out the correct heat distribution and emitters design and sizing. Installers must attend any refresher training that may be required to update their competence in relation to changes to products and technologies.

Important notes:

- I. A Registered Electrical Contractor (REC) is required to supervise and sign off the electrical installation of a heat pump system, in accordance with the definition of "Controlled Works and Restricted Works" by the CRU. A copy of the RECI certificate must be left with the homeowner and available for inspection.
- II. An F-Gas engineer is required to carry out and certify heat pump system installations involving refrigerant pipework and charging as per the F-Gas Regulation³

¹ Except for air-air

² Equivalence refers primarily to course content and is related to the competence required to correctly install heat pumps in accordance with these technical specifications. SEAI reserves the right to decide whether a qualification is equivalent to the reference Fetac/QQI curriculum. Supplementary certifications may be required to support equivalence.

³ Regulation EU No. 517/2014 in force since 1st January 2015

It is also recommended that **all personnel** working on installation of heat pumps:

- are competent or training to be competent to the level specified above,
- are competent in carrying out minor electrical works and in electrical safety, and
- are experienced in heat pump installation and heating systems design.

SEAI reserves the right to amend the training and certification requirements above. SEAI may require nominated personnel to attend additional training in accordance with the QADP and the Programme's Terms and Conditions as applicable.

6.9.2 Energy Performance of the building fabric

There is a minimum requirement for dwellings carrying out this measure in relation to the energy performance of the building fabric. This pre-requisite must be assessed by an SEAI Registered Technical Advisor based on the DEAP methodology. Details of the Technical Advisor role and process are published on the Contractor Support section of the SEAI Website, and the list of SEAI Registered Technical Advisors is available on the SEAI Heat Pump Systems page: <https://www.seai.ie/grants/home-energy-grants/heat-pump-systems/>

The process allows homeowners to apply for the heat pump system grant before carrying out the required fabric upgrade works, once the level of these fabric upgrades is documented and agreed. To receive payment for the heat pump system grant, however, completion of the fabric upgrades to the required level must be confirmed in the post-works BER. The level of upgrade works is included in the Technical Assessment Form completed by the Registered Technical Advisor, to be submitted as part of the grant application.

The Contractor must take this pre-requisite and the upgrade works into account when calculating the design heat load and sizing of the heat pump system.

The minimum requirement is based on the total heat loss for the dwelling, including the fabric and ventilation heat loss. The Heat Loss Indicator, HLI, is calculated by the DEAP software, specified as the "Total Heat Loss per m²". It is found in DEAP Version 3 in the Building Elements section, Heat Loss results tab, specified as the Total Heat Loss per m². In DEAP Version 4 it is in "View Assessment – Building – Heat Loss (Building Fabric)".

The HLI is defined as the Total Heat Loss per m² of dwelling floor area:

$$HLI = \frac{\text{Fabric Heat Loss} + \text{Ventilation Heat Loss}}{\text{Floor area of dwelling}} \left[\frac{W}{K \cdot m^2} \right]$$

The HLI is the quantity used to indicate the energy performance of the dwelling fabric for heat pump system grants. The requirement applying to the HLI calculated with the DEAP methodology is:

$$HLI \leq 2 \text{ W/K m}^2$$

Where the HLI is between 2 and 2.3 W/K m², in some cases it may not be economically feasible to upgrade the home further. An HLI ≤ 2.3 can be accepted where the following requirements are met:

- Maximum exposed wall U-value 0.37 W/m²K
- Maximum roof U-value 0.16 W/m²K or 0.25 W/m²K where not accessible (e.g. flat roof or rafters)
- Maximum Window U value 2.8 W/m²K* (and double glazed)
- Maximum Adjusted Infiltration Rate of 0.5 ac/h

*Note the Cost Optimal Window performance is 1.4 W/m²K, however a value of 2.8 W/m²K recognises that it may not be economically feasible to upgrade windows.

Where the HLI is between 2 and 2.3 W/k m², the homeowner should be advised that the cost savings may not be significant, depending on the fuel and efficiency of the current heating system.

6.9.3 Product and installation requirements

It is a basic requirement for a heat pump system to avail of the grant that the system design specifications are:

- Compliant with these specifications;
- Well documented by the Contractor;
- Discussed, explained and agreed with the homeowner and recorded in contract.

The following types of electrically driven heat pumps are included in this measure. Only heat pump systems that do not involve onsite fossil fuel combustion are funded under this measure:

- Air to water;
- Ground source (horizontal) to water;
- Ground source (vertical) to water;
- Exhaust air to water;
- Water to water;
- Air to air.

A heat pump system may include more than one type of heat pump (i.e. a combination of the above), provided the heat pump units and the whole system satisfy the requirements. More details are provided in point d below.

To avail of the grant, heat pumps must:

- Fully comply with the EU Energy Label and Ecodesign regulations¹
- Provide the data required for the Domestic BER assessment (Ecodesign datasheets). These must be based on EN14825 and EN16147 testing standards
- Be CE marked and have the EC declaration of conformity
- Be listed on the SEAI Triple E register²
- Satisfy the minimum Seasonal Performance Factor (Main Space Heating Efficiency) calculated according to the DEAP methodology as specified in Table 3. To ensure that this requirement is met, the heat pump system should be assessed in DEAP during the design phase and prior to installation.

Heat Pump type	Space Heating			DHW		
	DEAP Heating Efficiency [%]	Main Space Heating Efficiency [%]	Space Heating Efficiency [%]	DEAP Heating Efficiency [%]	Main Water Heating Efficiency [%]	Water Heating Efficiency [%]
Air to Water	300			160		
Ground to water	300			160		
Exhaust Air to Water	300			160		
Water to Water	300			160		
Air to Air	300			N/A		

*Table 3: Minimum heat pump efficiency requirements**

***Important Note:** In addition to meeting the minimum values for the DEAP efficiencies, it is a legal requirement that all heat pump units installed comply with the minimum efficiencies set by the Ecodesign regulations.

Important Note on Hydrofluorocarbons (HFCs)

SEAI recommends that, to the extent possible, HFCs are avoided in heat pumps. The F-Gas Regulation³ instigates the phasing out of HFCs. If HFCs are used, all refrigerant handling operations on heat pump equipment containing HFC refrigerants must be carried out by suitably trained technicians holding an F-Gas handling certificate and working for an F-Gas certificated company. In addition, applicants with heat pumps using HFCs, must comply with the service and maintenance requirements, including mandatory leak checks on all heat pump equipment above certain size thresholds, in accordance with Article 4 of the F-Gas Regulation.

¹ Regulations 813/2013 and 811/2013 for Air/Ground/Water/Exhaust air to water, and 206/2012 and 626/2011 for Air to air heat pumps

² Mandatory from 2019, date to be communicated.

³ Regulation EU No. 517/2014 in force since 1st January 2015

The following requirements for the Heat Pump system design and installation must be satisfied to meet the requirements of this Heat Pump Systems measure:

- a. Design and installation must be carried out in accordance with the relevant Standards and Guidance documents as set out in Section 6.9.4.
- b. Contractors shall make the homeowner aware of all potential permissions and approvals required. Where required, the Contractor shall ensure that these permissions and approvals have been obtained before work is commenced. The suitability of a proposed heat pump system installation site, including the location of ground loops or boreholes, where present, shall be assessed by a qualified professional experienced in heat pump systems. An environmental assessment shall be carried out if required. For Water to Water and Ground to Water (vertical) heat pump types, the installer should obtain confirmation from the homeowner that any additional requirements the EPA may have in relation to the installation have been communicated to the installer.
- c. Design, sizing and installation should be such that the heat pump system can provide at least:
 - 100% of the designed space heating requirements of the floor area as per DEAP assessment, and
 - 80% of the Domestic Hot Water demand as per DEAP methodology estimates

Oversizing of the heat pump system or any components should be avoided. Contractors are responsible for sizing new heat emitters or verifying the size of existing ones, based on a room-by-room heat loss calculation. The design and sizing details of the heat distribution system, as installed, must be included in the Designer/Installer spreadsheet (see Section **6.9.5 Documentation requirements**). The sizing must be based on an external design temperature of -3°C.

- d. Heat pump systems may include a combination of heat pump units. To be eligible, all heat pump units must be tested to the standards specified, and the whole system must satisfy the heat pump system requirements. In cases where a heat pump system includes more than one type of heat pump, this must be clearly explained in the grant documentation, and specific Programme requirements must be followed.
- e. Where existing heat sources are retained (*e.g.* boilers), they shall be only used as backup. If a boiler and a heat pump are connected to the same distribution system, the pipework and controls must be configured so that the systems operate safely and efficiently.
- f. Heat pump installations must not be used for cooling purposes. Reverse valves should be locked or disabled, so that the cooling function cannot be enabled from the user controls.
- g. Heating Controls must include the items listed in the table below as a minimum:

Heat pump system controls and protection			
	Ground/Water to water	Air/Exhaust air to water	Air to air

24h 7-day programmer	√	√	√
room thermostat to regulate the space temperature and interlocked with the heat pump unit operation (minimum one space heating zone)	√	√	√
load and weather compensation	√	√	√
time and temperature control of DHW, separate from space heating	√	√	
control of water pump operation (internal and external as appropriate)	√	√	
control of water temperature for the distribution system	√	√	
control of outdoor or exhaust fan operation		√	√
defrost control of external airside heat exchanger		√	√
protection for water flow failure	√	√	
protection for high water temperature	√	√	
protection for high refrigerant pressure	√	√	√
protection for air flow failure		√	√

Table 4: Heat pump system controls and protection

h. The DHW system must meet the following requirements:

- The Hot Water Cylinder must meet the heat pump manufacturer’s requirements and the HPAI installation guidelines, with attention to the size of the heat exchanger and insulation;
- Where present, pipework between the heat pump unit and the DHW cylinder must be insulated.
- The system must be able to operate at temperatures preventing growth of Legionella. The heat pump must be able to supply hot water at 55°C and the supplementary hot water heater shall provide stored hot water at 60°C. See further guidance in standards, guidance and specifications documents;
- Any other requirements under the regulations and standards listed in 6.9.4 Standards and Guidance documents.

i. The location must be chosen to satisfy the following requirements:

- Must be agreed with the Homeowner;
- In relation to noise from external fans, pumps and compressors, nuisance to sleeping areas and neighbours must be avoided;
- Must follow the manufacturer’s instructions and guidance;
- Must be in accordance with applicable regulations and planning requirements;
- Must allow the system to be safely maintained;
- Where external components of a heat pump are installed in a coastal or saline environment, additional corrosion protection must be provided.

j. Measures must be taken to minimise the transmission of vibrations in accordance with the manufacturer’s installation instructions.

- k. Documentation of ground and water collector design and installation must be provided to the Homeowner. This must contain as a minimum:
- Type of collector;
 - Land area size and location;
 - Heat extraction rates;
 - Installation procedure and pipe specifications;
 - Record of all welded connections of collector and horizontal pipework to the manifold;
 - As-built drawings for the ground portion of the collector showing detailed borehole and horizontal pipework locations;
 - For boreholes: collector testing on the surface before insertion and once installed, in accordance with IS EN 17628:2015. Specification of grouting as required to ensure aquifers remain hydraulically separated during and after borehole completion, and to provide thermal conductivity within the ground.
- l. In addition to a minimum manufacturer's guarantee of 3 years on the heat pump unit(s), and to the manufacturer's guarantees on other new parts, the whole heat pump system in its design and installation aspects must be covered by a minimum installer's guarantee of 2 years.
- m. The heat distribution system should be cleansed and pressure tested as required and in accordance with the draft NSAI SR 50 and BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems*.
- n. Earthing and Bonding must be in accordance with the applicable National Rules for Electrical Installations. Please refer to Section 3.2 Important guidance notes for Electrical works for details.
- o. Commissioning must be based on the manufacturer's instructions and on the design specifications. All performance and design parameters must be achieved. The commissioning report shall contain all the relevant parameters and checklists required to confirm that the heat pump system is installed and set up to function according to the design objectives and SEAI Heat Pump Systems specifications. A list of the installer settings shall be provided to the homeowner for future reference.
- p. The installer must fulfil all documentation requirements, as specified in Section 6.9.5 Documentation requirements below.
- q. The homeowner shall be instructed on how to correctly use the controls and operate the heat pump system. Maintenance requirements and schedules shall also be explained to the homeowner.
- r. Where applicable, the homeowner must be made aware of obligations under the F-Gas regulations, and equipment must be labelled according to these regulations.

6.9.4 Standards and Guidance documents

Design and installation of the heat pump system shall be based on the latest version of the following standards, guidance and specifications:

- The applicable National Rules for Electrical Installations
- EPA “*Summary Guidance for Compliance with the ODS and F-Gas Regulations*” and “*Complying with Regulations Controlling Fluorinated Greenhouse Gases and Ozone Depleting Substances – A Guidance Note for Operators of Equipment Containing F-gases and ODS*”
- I.S. EN 15450 *Heating Systems in Buildings – Design of Heat Pump Heating Systems*
- I.S. EN 12831 *Heating Systems in Buildings – Method for calculation of the design heat load*
- B.S. EN 12828+A1 *Heating systems in buildings. Design for water-based heating systems*
- *HPI Heat Pump installation guidelines*
- Draft S.R. 50 – 1 *Code of Practice for Building Services Part 1: Domestic Plumbing and Heating*
- Microgeneration Certification Scheme MCS 021 *Heat emitter guide for domestic heat pumps* and “*Heat Emitter supplement to the Domestic Heating Design Guide*” by the Institute of Domestic Heating and Environmental Engineers (IDHEE)
- ‘*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*’, Section 8 from DHPLG
- SEAI DEAP Heat Pump Methodology
- I.S. EN 378-1 and I.S. EN 378-3: *Refrigerating systems and heat pumps – Safety and environmental requirements -Part1: Basic requirements, definitions, classification and selection criteria and -Part3: Installation site and personal protection*
- Manufacturer’s installation instructions for the specific Heat Pump model(s) and other parts of the system installed
- CIBSE TM 51 *Ground Source Heat Pumps*
- CIBSE – *Domestic Heating Design Guide*
- Microgeneration Certification Scheme (MCS) MIS 3005 “*Requirements for MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration heat pump systems*”
- I.S EN 17628 – *Geotechnical Investigation and Testing – Geothermal Testing- Determination of thermal conductivity of soil and rock using borehole heat exchangers*
- *Environmental good practice guide for ground source heating and cooling* (GEHO0311BTPE-E-E) by the UK Environment Agency
- GSI Geothermal Collector suitability Maps
- GSI *Ground Source Heat and Shallow Geothermal Energy Homeowner Manual*

When installing a buffer/accumulator tank as part of the heat pump system, the tank must meet the following requirements:

- Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of BS 1566-1:2000 ‘*Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system*’ or BS 3198 ‘*Specification for copper hot water storage combination units for domestic purposes*’

- Vented cylinders in materials other than copper should comply with the heat loss and heat exchanger requirements of BS 1566
- Unvented hot water storage system products should:
 - comply with IS. EN. 12897 '*Water supply. Specification for indirectly heated unvented (closed) storage water heaters*'; or
 - be certified by the Irish Agrément Board; or
 - be certified by another accredited body as complying with Building Regulations.
- Unvented systems should not be used with gravity circulation

6.9.5 Documentation requirements

The Contractor must meet all the documentation requirements for the installation, in accordance to this document and to any Programme-specific requirements.

Heat Pump System documentation to be provided to the homeowner, and to be available for inspection¹:

- Ecodesign datasheet (max 5 pages)
- Completed Designer/Installer spreadsheet as per template available from the [SEAI Contractor Supports Web page](#), including the DHW and Heat distribution design and specifications (radiator, underfloor sizing, air-to-air)
- Commissioning certificate completed in all relevant parts
- Safe Electric Completion certificate, completed in all relevant parts
- Details of F-Gas Certified Company and sign-off
- Where applicable, documentation of Ground and Water collector design and installation (see point k above)
- User and Installation Manuals

The heat pump installer must also provide all required data and information to the BER Assessor carrying out the post-works BER assessment. If required, the heat pump system design data must be provided for early assessment, before works are carried out.

6.9.6 Important notes

The following limitations apply to heat pump systems eligibility:

- Gas driven, or gas absorption heat pumps are not covered by this measure, due to the restriction on onsite fossil fuel combustion;
- Hybrid heat pumps consisting of a combination of an electrical heat pump and gas or oil boiler are not covered by this measure. The requirement to meet 100% of space heating and 80% of hot water demand applies to the heat pump unit and not to the heat pump and boiler combined.

¹ Make and model on all the documentation must match that of the unit installed.

6.10 Biomass Boilers (with/without thermal storage)

Contractor Requirements and Competency

Biomass boilers must be installed by suitably qualified individuals in accordance with the manufacturer's guidelines and the DHPLG and SEAI document "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*".

In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. All electrical associated works must be carried out in accordance with the applicable National Rules for Electrical Installations. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

The heating system must be divided into space heating and water heating zones with at least one more space heating zone added so that there are at least two zones for space heating. This should incorporate a 24-hour 7-day programmer (installation and standards specifications outlined in Section 6.7) with/without a remote access and be interlocked with the operation of the biomass boiler unit or a controls package approved by the manufacturer for the specific biomass boiler installation. The installation and standards specifications outlined in Section 6.7 apply to the installation of the zoning measures. In addition, a suitably sized pre-insulated hot water cylinder, with an insulant thickness of at least 80mm, should be installed where the existing cylinder does not meet this requirement. In the interest of safety, appliances with uncontrollable heat sources should not be connected to pressurised cylinders.

Product Standard and Specification¹

Qualifying biomass boilers must be CE marked to demonstrate compliance with The Low Voltage Directive (72/23/EEC) and The Machinery Directive (98/37/EC).

The boiler must also be listed on the SEAI Home-heating Appliance Register of Performance (HARP) database, or appropriate equivalent, and have the following minimum gross efficiency on HARP:

- With thermal store: 77%
- Without thermal store: 82%

For boilers without automatic ignition, a buffer (or accumulator) tank should be connected to the boiler and the heating system. When installing a buffer/accumulator tank, the tank must meet the following requirements:

- Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of BS 1566-1:2000 '*Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system*' or BS 3198 '*Specification for copper hot water storage combination units for domestic purposes*'
- Vented cylinders in materials other than copper should comply with the heat loss and heat exchanger requirements of BS 1566
- Unvented hot water storage system products should:
 - comply with IS. EN. 12897 '*Water supply. Specification for indirectly heated unvented (closed) storage water heaters*'; or
 - be certified by the Irish Agrément Board; or

¹ Solid fuel stoves are covered as a different measure to biomass boilers. See Section 6.20.

- be certified by another accredited body as complying with Building Regulations
- Unvented systems should not be used with gravity circulation

The guidance in Section 5.3 of the DHPLG and SEAI document “*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*” must be adhered to.

The Contractor must discuss the specification and sizing of the biomass boiler and storage requirements with the customer before selecting the final system.

Installation Standard and Specification

- a. The Contractor must at all times comply with BS EN 14336:2004 ‘*Heating systems in buildings. Installation and commissioning of water-based heating systems*’ and the requirements of the system suppliers’ specifications.
- b. A pre-installation survey of the property should be carried out to assess site and location issues likely to affect installation and fuel storage, fuel delivery considerations and specific user requirements.
- c. The survey should also determine heat demand use trends. An assessment of the site and heating requirements is made and recommendations on the required boiler size, provision for backup heating, fuel supply and any other relevant issues are made.
- d. The calculation of the heating requirement for sizing of the biomass boiler should be in compliance with IS EN 12831 ‘*Heating systems in buildings. Method for calculation of the design heat load*’ or equivalent.
- e. The Contractor will discuss the implications of the fuel storage requirements and the available storage space and its impact on the cost-effectiveness of the system.
- f. The biomass boiler should not be installed inside the dwelling or outdoors. It should be installed in a suitable boiler room. The outbuilding/boiler room should have the required boiler and hopper clearances to allow the boiler installation, access for loading, cleaning and servicing as per manufacturer’s instructions.
- g. The Contractor will ensure that there is enough permanent ventilation to the boiler room. Where the manufacturer has not specified the minimum area for the required ventilation opening, a permanent air vent of at least 550mm² per kW of boiler output but no less than 6500mm² will be provided, or as required by TGD Part J of the Building Regulations.
- h. The Contractor shall ensure that the required electricity supply is available for the plant in the boiler room.
- i. The Contractor shall ensure there is adequate water supply and that the boiler is plumbed according to all relevant regulations and as per the manufacturer’s instructions. Provision must also be made to ensure the safe and effective disposal of condensate from the boiler.
- j. Where the boiler is fed directly from a bulk storage unit, the storage unit should be in accordance with the manufacturer’s guidelines. Where the fuel is not supplied directly, the fuel storage facility being provided should be in accordance with the fuel supplier’s guidance.
- k. The existing central heating system should be thoroughly cleaned and flushed out before installing a new boiler.
- l. All components shall be installed to allow for maintenance, repair/replacement and insulation. Where components or joints are inaccessible, they shall be permanent. Permanent components and joints shall be maintenance free and have a durability corresponding to the lifetime of the components in which they are installed.
- m. An exhaust flue should be twin-walled insulated stainless steel. The inner wall should be grade 316 and the outer wall should be 306 or better. The flue should be certified as suitable for use with wood fuels and it should be the diameter specified by the boiler manufacturer.
- n. Any pipework exposed as part of the work or is otherwise accessible should be insulated as recommended in *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*. A lesser standard is only acceptable where practical constraints dictate.

- o. Biomass boilers must be commissioned to verify that the system is installed in accordance with IS EN 12828 '*Heating systems in buildings. Design for water-based heating systems*', BS EN 14336 '*Heating systems in buildings. Installation and commissioning of water-based heating systems*' and manufacturer's guidelines.
- p. Commissioning should include:
 - Testing for leakage to ensure the system is watertight;
 - Pressure testing to a pressure 30% greater than the working pressure or as per manufacturers instruction;
 - The system shall be cleaned and/or flushed;
 - The system shall be filled with suitable water and vented;
 - A check that any equipment prone to frost damage is protected;
 - All components of the system shall be checked for correct operation;
 - Water flow rates shall be balanced to meet the requirements of the design;
 - All controls shall be adjusted in accordance with the manufacturer's instructions and the design specification.
- q. All written information on the operation, maintenance and use of the system shall be provided to the Customer, including the manufacturer's instructions. The Contractor shall also instruct the Customer in the safe and efficient operation, maintenance and use of the biomass heating system.
- r. The Contractor shall provide the Customer with the records of all functional, pressure and environmental tests carried out and a balancing report.

Buffer/Accumulator Tanks

- The Contractor shall ensure that the buffer/accumulator tank is sized correctly as per manufacturer's recommendations. There should be at least 15 litres of storage for every kilowatt of output from the boiler. Where it is not possible to install a large enough tank, the customer should be made aware of this and of the implications of a smaller tank.
- A temperature sensor shall be fitted to the top and the bottom of the buffer/accumulator tank.
- If two or more buffer/accumulator tanks are being used, they should be connected in series. The outlet from the bottom of the first tank must be connected to the inlet at the top of the next tank and so on.
- The Contractor shall ensure that the buffer/accumulator tank is insulated sufficiently. Where the tank is not pre-insulated, it should be insulated to a minimum of 80 mm in thickness.

Additional Guidance

- Microgeneration Installation: MIS 3004 *Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Solid Biofuel Heating Systems*
- TR38 *Guide to Good Practice – Installation of Biofuel Heating* (Heating and Ventilation Contractors' Association)
- CIBSE – *Domestic Heating Design Guide*

6.11 Solar Water Heating

Contractor Requirements and Competency

Solar water heating systems must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. The Contractor undertaking the works must hold a Level 6 FETAC Certificate in Solar Domestic Hot Water Systems or an equivalent qualification. Accredited training providers are listed on the SEAI website: <https://www.seai.ie/energy-in-business/register-with-seai/renewable-energy-installer>.

Product Standard and Specification

Qualifying solar water heating systems must be listed on the [SEAI Solar Thermal Registered Product List](#). The solar thermal installation must contribute a portion of renewable energy for domestic hot water heating as detailed in the table below:

Floor Area of dwelling (as defined in the DEAP methodology)	Solar Renewable Energy Contribution Per Year
0-170m ²	At least 10 kWh/m ² Calculated by Qs/floor area
171 – 200m ²	At least 1,700 solar hot water input Qs (kWh/year) *
201-250m ²	At least 1,850 solar hot water input Qs (kWh/year) *
250+m ²	At least 2,000 solar hot water input Qs (kWh/year) *

Table 5: Minimum solar renewable energy contribution per year

*Qs (kWh/year) Annual Solar Energy contributed to the heating system by the proposed collectors. This is based on the formula for Solar Energy available in Appendix H of the DEAP manual.

Solar fraction is the Annual Solar Energy (Qs) as a percentage of the total heat required for Domestic Hot Water (DHW) and is calculated using the formula below.

$$\text{Solar Fraction} = \frac{\text{Annual solar energy (Qs)} \times 100}{\text{Total heat required for DHW}}$$

An Excel version of the calculator is available in the [Better Energy Homes Contractor Supports webpage](#). This solar hot water compliance calculator is accompanied by a guidance note setting out the calculation methodology for achieving compliance with the solar thermal measure requirements.

Solar fraction is recommended under best practice not to exceed 60% except when the system is also used for solar space heating. Where the system is only used for hot water the acceptable method of calculating the energy yield per solar system is as per Appendix H: Solar water heating in the DEAP Manual and uses the Excel calculator referenced above.

The Contractor must discuss the specification and the appropriate sizing (including hot water storage) of the solar heating system with the customer before selecting the final system. Size of home, levels of occupancy and payback periods etc. should be discussed. A review of the renewable energy contribution for the proposed system should also be undertaken with a BER assessor before the system is purchased/installed.

Where the solar heating system is being installed to contribute to the space heating requirements, the DEAP Solar Space Heating calculator must be used¹.

If Solar Space Heating is being considered, the Contractor must inform the customer of the expected space heating energy and cost savings expected from the solar heating system as the payback period is likely to be long. Solar Space Heating systems would typically meet a low percentage of the space heating requirement. The Annual Space Heating requirement is as calculated by DEAP and the Space Heat Contribution from the solar heating system is as calculated by the DEAP Solar Space Heating Calculator.

It is required that the hot water storage is using a heat retention cylinder as per the Heating and Domestic Hot Water Systems for dwelling in order to achieve compliance with Building Regulations Part L (Section 1.4.4.2).

Installation Standard and Specification

- a) Qualifying solar water heating systems must be fitted in accordance with manufacturer's guidelines and Industry Best Practice as set out in NSAI document SR 50-2:2010 "*Code of practice for building services – Part 2: Solar panels*", and the applicable *National Rules for Electrical Installations*, as applicable. Please refer to Section 3.2 Important guidance notes for Electrical works for details.
- b) All solar water heating works must be in full compliance with this DTSS.
- c) A Standard Solar Commissioning Report (SCR), available on the SEAI website, must be completed and a copy provided to each homeowner. The Contractor must keep a copy for their own records.
- d) SEAI recommends that a solar water heating system should have 'TMV2' type temperature mixing/blending valve(s) installed on the hot water system to prevent the likelihood of an occupant being scalded due to excess water temperatures (particularly in the case of elderly, infirmed or young users). SEAI requires that Contractors discuss this matter fully with homeowners and that the homeowner is properly advised on the option best suited to their household's needs, as part of the specification process ahead of installation commencement. Further guidance is available in the Better Energy Homes Contractors section at www.seai.ie. A 'TMV2' type temperature mixing/blending valve is for use in domestic situations. 'TMV2' approval certifies that the valves conform to the performance requirements of BS EN 1111 and BS EN 1287.
Note: A mixer tap is not deemed to be a TMV2 type valve.
- e) If 'TMV2' type blending/mixing valves as referenced above are not installed, the homeowner must be issued with a '**Solar water heating safety notice to the homeowner**'. This notice informs the householder of the risks associated with not installing a 'TMV2' mixing/blending hot water valve(s). This document must be signed (in duplicate) by the installer and homeowner with a copy supplied to the homeowner and a copy retained by the installer. The document can be downloaded at the following link:
https://www.seai.ie/resources/publications/Solar_Hot_Water_Heating_Safety_Notice_2017.pdf
- f) The '**Solar water heating safety notice to the homeowner**' shall be retained with any documents supplied with the solar water heating installation i.e. operation manuals for SEAI inspection and future maintenance purposes.
- g) Water services should be operated at temperatures that prevent Legionella growth. Hot water storage cylinders (calorifiers) should store water at 60°C or higher. Hot water should be

¹ See "Solar Space Heating" here: <https://www.seai.ie/energy-in-business/ber-assessor-support/deap/>

distributed at 50°C or higher. Ensure that hot water draw offs have temperature mixing/blending valve(s) to prevent scalding.

- h) The recommended maximum mixed hot water temperatures for safe use for the most common installations are listed in
- i) Table 6:

44°C	For bath fill (46°C for assisted bathing)
41°C	For shower applications.
38°C	For bidet applications

Table 6: Maximum mixed hot water temperatures for safe use

- i) The sizing of the expansion vessel must take into account the capacity of the system, including the length of pipework and of the tank coil. The expansion vessel must also be adequately pre-charged at commissioning. An undersized or undercharged expansion vessel may cause the system to become over-pressurised, leading to the system safety valve discharging. This may become a cause of system stagnation and poor performance due to air-locks.

Additional Installation Guidance

The installation of solar water heating systems should also follow the guidance outlined in the *Solar Heating Design and Installation Guide* – CIBSE Guide.

Warranty

Each homeowner must be supplied with a warranty (product and labour) of at least 5 years.

6.12 Draught Proofing

Contractor Requirements and Competency

Draught proofing Contractors must be competent to complete the installation and must complete the work as set out in the guidance document BS 7386:1997 *Specification for draught strips for the draught control of existing doors and windows in housing*. Draught proofing shall be installed in accordance with Best Practice Guides/ Technical Guides supplied by the material manufacturer. Where a product is covered by an NSAI Agrément Certificate, it must be installed in accordance with this certificate and by suitably qualified people.

Product Standards and Specification

- **Draught proofing windows and doors**
 - Materials used for draught proofing must be manufactured to a relevant European, Irish, or British Standard. Draught proofing of windows and doors shall be installed as per manufacturer's instruction and shall be installed as per draught strip class relating to nominal and maximum compression of the strips. NSAI Agrément-certified products may also be used. It is the responsibility of the Contractor to ensure that the optimum solution for the dwelling is achieved, within the cost constraints and preference of the homeowner.
 - The bottom horizontal edge of the door shall be fitted with a draught brush cut to between –1mm and –4mm of the width of the door.
 - Side hinged vertical letterboxes and horizontal letterboxes shall be draught-proofed using a suitable draught seal.
 - Centre Pivot Windows, Sliding Sash Windows and Steel Casement Windows should not be draught proofed.
- **Attic Hatch**
 - See Sections 6.4.1 for requirements and installation instructions for attic hatch draught proofing.

Installation Standards and Specifications

- a. Draught proofing should be carried out using materials approved by a European, Irish, or British Standard for draught proofing and installed in accordance with the relevant European, Irish, or British Standard, where available.
- b. Manufacturer's instructions should be followed for all draught proofing measures.
- c. The homeowner should be notified in writing where draught proofing cannot be installed because of the air supply requirements of appliances present. Draught proofing shall be omitted where appropriate air supply requirements and permanent openings to the outside air are not present for fuel burning space heating appliances.
- d. Draught proofing shall not be applied to windows/doors in a room with a fixed heating device or gas cooking appliance that doesn't have the correct permanent ventilation provisions.
- e. The correct background and extract ventilation provisions do not have to be present for draught proofing to be considered.
- f. Where a portable flue burning appliance is present or used in a dwelling, draught proofing shall not be applied to windows/doors in the dwelling.
- g. Where mould problems are present in a room, the Contractor shall not install draught proofing in that room. This helps avoid increasing the likelihood of further mould and condensation. The Contractor must notify the homeowner in writing of the reasoning for omission of the draught proofing.

- h. Care should be taken to ensure that the door or window to be fitted with draught control materials opens and closes easily and is in good working order before any work is carried out. Draught proofing should not be carried out on faulty doors and windows.
- i. Draught proofing shall not be fitted where security facilities are likely to be impaired as a result. In this case, the Homeowner should be notified in writing why the draught proofing could not be fitted.
- j. The following are additional guidelines when draught stripping windows and doors:
 - i. Where carrier-based products are used, initial compression of the draught strip is listed in the table below. The recommended gap sizes given by the manufacturers assume this compression on fitting and take into account the need to avoid fixing positions too close to the edge of timber sections.

Draught strip Class	Nominal Compression (mm)	Maximum Compression (mm)
1	3.0	6.0
2	1.5	3.0
3	1.5	3.0

Table 7: Draught strip compression

- ii. Draught-strips shall be fixed using all available fixing holes. If necessary, additional fixing holes shall be made in line with the existing fixing holes to ensure that the draught strip is fixed at a maximum of 25mm from each end of the carrier.
 - iii. Corners should be butt, mitred or notch cut as appropriate with a maximum gap of 1mm at the corners to ensure a good seal at the joint.
 - iv. All fixings shall be fully driven home perpendicular to the structure being draught-proofed.
 - v. Carrier-based draught strip shall be fitted on the two vertical sides and the top horizontal side of doorframes. The draught strip shall be fixed. The carrier must not interfere with the operation of the door handles or locks.
 - vi. On all double doors the meeting rail shall be fitted with draught strip.
 - vii. Carriers and seals will be cut to length accurately between +0mm and – 2mm to fit the size of the door perimeter.
 - viii. Internal doors shall not be draught-proofed except between a heated and unheated space for example an inner door to an integral garage.
 - ix. If using nails, they should be galvanised rust proof nails.
- k. Draught proofing wooden casement windows:
 - i. Wooden casement windows will be draught proofed using carrier based draught strips that comply with BS 7386 (1997) Class 3 – *Specification for draught strips for the draught control of existing doors and windows in housing (including test methods)*. The carrier should be selected to suit the width of the window frame.
 - ii. Carrier-based draught strip shall be fitted to all sides of the opening window frame with ‘L’ section or box section carrier, dependent upon the shape and size of the frame.
 - iii. Initial compression will be 1.5mm with the carriers and seals cut to form a continuous seal around the perimeter of the window. Compression must be achieved for 100% of the perimeter.
 - iv. In areas where the carrier based draught strip interferes with the operation of window furniture, draughtproofing shall be omitted. If this is the case, the homeowner should be notified in writing why the draughtproofing could not be fitted.
 - v. Carrier based draught strip shall not be used in sections shorter than 75mm.
- l. Installation of door bottom brushes:
 - i. Inward and outward opening doors shall be fitted with the draught brush on inside and outside respectively.

- ii. Outward opening doors or frames with a weatherboard, which do not allow draught brushes to be fixed, shall be fitted with an internal draught brush or rebate seal where possible.
- iii. The seal will have an angle section or a straight section carrier with a nylon brush.
- iv. The seal shall be fixed with 20mm stainless steel screws using all fixing holes.
- v. An additional screw must be fitted with 35mm of the end of the carrier.
- vi. The seal will be fitted to give visible compression or deflection over 90% of the length of the seal.
- vii. The seal should be fitted so that it does not interfere with the opening of the door.
- viii. Draught brushes shall be fitted with a minimum of three fixings and there shall be a fixing no more than 35mm from each end of the draught brush.
- ix. When fitted to items such as hollow core doors, the two end fixings must engage into the solid frame at the edge of the door being draught-proofed.
- x. Inner and outer carriers will be crimped and all sharp edges and burrs removed.
- m. Installation of letterbox draught seal
 - i. The draught seal shall be fixed to the inside of the letterbox.
 - ii. The fitted draught seal shall not interfere with the movement of letter post through the letterbox or with the letterbox flap.
 - iii. Draught seal fixings shall be as supplied and/or recommended by the draught seal manufacturer.

6.13 Window Replacement

Contractor Competency

Contractors installing windows must be competent to complete the installation and must complete the work in accordance with British Standard document *Code of practice for the survey and installation of windows and external doorsets* (BS 8213-4) and the manufacturer's guidelines as a minimum requirement.

Product Standards and Specification

All window units and glazing being installed must meet the requirements of the *Construction Products Regulation* (Council Regulation no. 305/2011).

All window units being installed must carry CE marking and must conform to the requirements of the following standards:

- EN 14351-1:2006 (*Windows and doors – Product standard, performance characteristics*).
- EN 1279-1 (*Glass in building. Insulating glass units. Generalities, dimensional tolerances and rules for the system description*)
- EN 1279-2 (*Glass in building. Insulating glass units. Long term test method and requirements for moisture penetration*)

The objective is to install materials that will achieve a level of performance in the home exceeding the required standard. Thus, replacement windows must, in as much as is physically and economically feasible, achieve a U-value of 1.4 W/m²K.

The stated U-value of the units must be certified by an appropriate independent body, e.g. NSAI Window Energy Performance (WEP) certification, British Fenestration Rating Council, and have been derived according to IS EN ISO 12567 or IS EN ISO 10077 (Parts 1 and 2).

This economic feasibility refers only to the economic performance of the installation itself. For example, in exceptional circumstances, a home may require significant additional modifications compared to a normal case. This could make the initial investment in the window installation solution inappropriate compared to the benefit the homeowner will get from the investment. Economic feasibility, in this case, does not refer to the ability of the homeowner to fund their portion of the capital cost for a conventional installation.

Installation Standards and Specifications

- a. All glazing should conform to the recommendations given in the relevant part of BS 6262 and in BS 8000-0. In addition, any glass or insulating glass unit manufacturer's instructions should be followed.
- b. The walls must be surveyed by a competent surveyor on behalf of the approved Contractor before the installation. A complete survey will ascertain the condition of the structural opening into which the window will be installed, the suitability of the window and any other issues affecting the installation of the window.
- c. Any structural defects recorded in the survey, which may affect the performance of the window when installed, should be notified to, and rectified by, the Customer with or without involving the Contractor before installation work commences.
- d. The existing windows must be removed with care to avoid unnecessary damage to the building structure and its finishings and without permitting any subsidence of the superstructure during or after the installation procedure. Reasonable care should be taken to keep damage to the reveals to a minimum.

- e. The number, location and quantity of frame fixings used in the installation of the replacement windows and/or doors shall be appropriate for the window frame material.
- f. Where lugs are used externally, they should be secured to the walls using suitable security screws.
- g. Finishing trims should be compatible with the material of the frame and external trims should be suitable for exterior use.
- h. The area of openings should not be reduced below that required for the provision of adequate daylight as per BS 8206-2:2008.
- i. The replacement windows and/or doors should be positioned to minimise the amount of making good and without any twist, racking or distortion of the frame.
- j. The frame should be positioned within the structural opening so that it:
 - bridges the DPM/radon barrier. Any damage to the DPM/radon barrier should be repaired before installation.
 - is as far back in the reveal as is feasible to reduce exposure and facilitate the required level of weather performance.
 - allows enough space for expansion of the window set.
- k. Open cavities between the inner and outer leaf of a cavity wall should be closed with an insulating material. Care should be taken to maintain the integrity if the DPM/ radon barrier and adequate purchase for fixings should be ensured.
- l. Installation packers should be used adjacent to fixing positions to prevent outer frame distortion during installation. Installation packers should be resistant to compression, rot and corrosion. They should span the full depth of the outer frame.
- m. Upon completion of the installation of the windows and/or doors, the structure around the window is made good. This may involve some or all of the following:
 - Debris or contaminants should be removed, and any drainage paths should be cleared.
 - Internal reveals should be made good, as agreed with the Customer, ready for the Customer to redecorate if necessary.
 - Any materials such as trims or sealant should not be applied on top of loose material.
 - Protective tapes should be removed as soon as practicable, as ageing of tapes can cause difficulties in removal. Refer to the manufacturer's guidance.
 - Sand cement should not be used to fill the gap between the outer frame and the substrate except for backfill for steel windows. Nowadays, this is usually limited to windows in stone surrounds or interior fair-faced brick and concrete.
 - Where the replacement window has a smaller front to back dimension than the original, there might be mastic and/or paint line visible on the substrate. This should be removed as much as practicable or covered with a trim.
 - The method of, and responsibility for, repair to any render should be as agreed with the Customer.
- n. After installation, a final inspection should be carried out, preferably accompanied by the customer, to ensure that the installation is fully in accordance with the surveyor's and manufacturer's instructions.
- o. It is essential that the customer is made aware of the method(s) of operation, locking and unlocking and fire egress. This should be accompanied by written operating and maintenance instructions.
- p. The homeowner shall be supplied with a written specification of the windows detailing the U-Value of the unit(s). The homeowner shall be advised that this material should be retained as an inspection of the installation may be required. The specification of the units shall be retained by the installer for audit purposes.

6.14 External Door Replacement

Contractor Competency

Contractors installing doors must be competent to complete the installation and must complete the work in accordance with British Standard document *Code of practice for the survey and installation of windows and external doorsets* (BS 8213-4:2016) and the manufacturer's guidelines as a minimum requirement.

Product Standards and Specification

All door sets being installed must meet the requirements of the *Construction Products Regulation* (Council Regulation no. 305/2011).

All door sets being installed must carry CE marking and must conform to the requirements of EN 14351-1:2006 (*Windows and doors – Product standard, performance characteristics*).

All single-leaf door sets being installed must have been tested to and meet requirements in PAS 24: 2016 (*Enhanced security performance requirements for doorsets and windows in the UK. Doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk*).

The objective is to install materials that will achieve a level of performance in the home exceeding the required standard of the current TGD Part L. Thus, replacement doors must, in as much as is physically and economically feasible, achieve a U-value of 1.4 W/m²K.

The stated U-value of the door sets must be certified by an appropriate independent body and have been derived according to IS EN ISO 12567 or IS EN ISO 10077 (Parts 1 and 2).

This economic feasibility refers only to the economic performance of the installation itself. For example, in exceptional circumstances, a home may require significant additional modifications compared to a normal case. This could make the initial investment in the installation of external doors a solution inappropriate compared to the benefit the homeowner will get from the investment. Economic feasibility, in this case, does not refer to the ability of the Homeowner to fund their portion of the capital cost for a conventional installation.

Installation Standards and Specifications

- a. All glazing should conform to the recommendations given in the relevant part of BS 6262 and in BS 8000-0. In addition, any glass or insulating glass unit manufacturer's instructions should be followed.
- b. The walls must be surveyed by a competent surveyor on behalf of the approved Contractor before the installation. A complete survey will ascertain the condition of the structural opening into which the door will be installed, the suitability of the door and any other issues affecting the installation of the door.
- c. Any structural defects recorded in the survey, which may affect the performance of the door when installed, should be notified to, and rectified by, the customer with or without involving the Contractor before installation work commences.
- d. The existing door(s) must be removed with care to avoid unnecessary damage to the building structure and its finishings and without permitting any subsidence of the superstructure during or after the installation procedure. Reasonable care should be taken to keep damage to the reveals to a minimum.
- e. The number, location and quantity of frame fixings used in the installation of the replacement door(s) shall be appropriate for the door frame material.

- f. Where lugs are used externally, they should be secured to the walls using suitable security screws.
- g. Finishing trims should be compatible with the material of the frame and external trims should be suitable for exterior use.
- h. The area of openings should not be reduced below that required for the provision of adequate daylight as per BS 8206-2:2008.
- i. The replacement doors should be positioned to minimise the amount of making good and without any twist, racking or distortion of the frame.
- j. The frame should be positioned within the structural opening so that it:
 - bridges the DPM/radon barrier. Any damage to the DPM/radon barrier should be repaired before installation.
 - is as far back in the reveal as is feasible to reduce exposure and facilitate the required level of weather performance.
 - allows enough space for expansion of the door set.
- k. Open cavities between the inner and outer leaf of a cavity wall should be closed with an insulating material. Care should be taken to maintain the integrity if the DPM/radon barrier and adequate purchase for fixings should be ensured.
- l. Installation packers should be used adjacent to fixing positions to prevent outer frame distortion during installation. Installation packers should be resistant to compression, rot and corrosion. They should span the full depth of the outer frame.
- m. Upon completion of the installation of the doors, the structure around the door is made good. This may involve some or all of the following:
 - Debris or contaminants should be removed, and any drainage paths should be cleared.
 - Internal reveals should be made good as agreed, ready for the Customer to redecorate if necessary.
 - Any materials such as trims or sealant should not be applied on top of loose material.
 - Protective tapes should be removed as soon as practicable, as ageing of tapes can cause difficulties in removal. Refer to the manufacturer's guidance.
 - Sand cement should not be used to fill the gap between the outer frame and the substrate except for backfill for steel doors. Nowadays, this is usually limited to doors in stone surrounds or interior fair-faced brick and concrete.
 - Where the replacement door has a smaller front to back dimension than the original, then there might be mastic and/or paint line visible on the substrate. This should be removed as much as practicable or covered with a trim.
 - The method of, and responsibility for, repair to any render should be as agreed with the customer.
- n. After installation, a final inspection should be carried out, preferably accompanied by the customer, to ensure that the installation is fully in accordance with the surveyor's and manufacturer's instructions.
- o. It is essential that the customer is made aware of the method(s) of operation, locking and unlocking and fire egress. This should be accompanied by written operating and maintenance instructions.
- p. The homeowner shall be supplied with a written specification of the external doors detailing the U-Value of the unit(s). The homeowner shall be advised that this material should be retained as an inspection of the installation may be required. The specification of the units shall be retained by the installer for audit purposes.

6.15 Window Glazing Envelope Replacement

Contractor Competency

Contractors installing window glazing envelopes must be competent to complete the installation and must complete the work in accordance with British Standard document *Code of practice for the survey and installation of windows and external doorsets (BS 8213-4:2016)* and the manufacturer's guidelines as a minimum requirement.

Contractors installing glazing within existing frames must be competent to complete the installation and must complete the work in accordance with British Standard document *Workmanship on construction sites. Introduction and general principles (BS 8000-0)*.

In all cases the manufacturer's instructions should be followed. Insulating glass units, setting and location blocks (see Figure 5 of BS 8213-4:2016), distance pieces, frame to glass and bead to glass gaskets, bead to frame airseals, corner sealing blocks, beads and bead end caps, bedding and capping sealants should be installed in accordance with BS 8000-0.

Product Standards and Specification

All glazing being installed must meet the requirements of the *Construction Products Regulation (Council Regulation no. 305/2011)*.

The glazing must conform to EN 1279-1 (*Glass in building. Insulating glass units. Generalities, dimensional tolerances and rules for the system description*) and EN 1279-2 (*Glass in building. Insulating glass units. Long term test method and requirements for moisture penetration*). All glazing should conform to the recommendations given in the relevant part of BS 6262 and in BS 8000-0.

The objective is to install materials that will achieve a level of performance in the home in line with the required standard. Thus, replacement window envelopes must, in as much as is physically feasible, achieve a U-value for the glazing of envelopes of 2.1 W/m²K.

All U-values of the glazing envelopes shall be calculated according to either EN standards 410 and 673/12898.

Installation Standards and Specifications

- a. All glazing should conform to the recommendations given in the relevant part of BS 6262 and in BS 8000-0. In addition, any glass or insulating glass unit manufacturer's instructions should be followed.
- b. The walls must be surveyed by a competent surveyor on behalf of the approved Contractor before the installation. A complete survey will ascertain the condition of the structural opening into which the glazing will be installed, the suitability of the glazing and any other issues affecting the installation of the glazing.
- c. Any structural defects recorded in the survey, which may affect the performance of the glazing when installed, should be notified to, and rectified by, the customer with or without involving the Contractor before installation work commences.
- d. The existing glazing must be removed with care to avoid unnecessary damage to the building structure and its finishing and without permitting any subsidence of the superstructure during or after the installation procedure. Reasonable care should be taken to keep damage to the reveals to a minimum.
- e. Finishing trims should be compatible with the material of the frame and external trims should be suitable for exterior use.
- f. The area of openings should not be reduced below that required for the provision of adequate daylight as per BS 8206-2:2008.

- g. The replacement glazing should be positioned to minimise the amount of making good and without any twist, racking or distortion of the frame.
- h. Care should be taken to maintain the integrity if the DPM/radon barrier and adequate purchase for fixings should be ensured.
- i. Upon completion of the installation of the replacement glazing, the area around the window is made good. This may involve some or all of the following checks to the installation:
 - Debris or contaminants should be removed. Any drainage paths should be cleared.
 - The sealed units should be free from scratches and signs of failure
 - All obscure and coated glasses shall be oriented properly
 - Beads/gaskets shall properly hold the glazing, etc.
 - Safety glass shall be installed where necessary
 - All joints should be smooth and correctly formed
 - The sealant shall be continuous around the frame
 - Any materials such as trims or sealant should not be applied on top of loose material.
 - The replacement frame position and joint construction must be as per manufacturer's guidelines
 - The method of, and responsibility for, repair to any render should be as agreed with the customer.
- j. After installation, a final inspection should be carried out, preferably accompanied by the customer, to ensure that the installation is fully in accordance with the surveyor's and manufacturer's instructions.
- k. It is essential that the customer is made aware of the method(s) of operation and maintenance of the glazing units. This should be accompanied by written operating and maintenance instructions.
- l. The homeowner shall be supplied with a written specification of the window envelopes detailing the U-Value of the units. The homeowner shall be advised that this material should be retained as an inspection of the installation may be required. The specification of the units shall be retained by the installer for audit purposes.

6.16 Window Glazing Low E-Film

Contractor Competency

Contractors installing window glazing low e-film must be competent to complete the installation and must complete the work in accordance with the manufacturer's guidelines.

Contractors installing window glazing low-e film must be trained and registered by the manufacturer. In all cases the manufacturer's instructions should be followed.

Product Standards and Specification

The installed product must meet the requirements of the *Construction Products Regulation* (Council Regulation no. 305/2011).

The objective is to install materials that will achieve a level of performance in the home in line with the required standard. Thus, window glazing low e-film must, in as much as is physically feasible, achieve a U-value for the glazing of envelopes of 2.4 W/m²K for double glazing envelope and 3.5 W/m²K for single glazing envelope.

All U-values for window glazing low e-film shall be calculated according to EN standards 410 '*Glass in building. Determination of luminous and solar characteristics of glazing*' and 673 '*Glass in building. Determination of thermal transmittance (U value) Calculation method before the installation of the film*'.

Installation Standards and Specifications

- a. All window glazing low e-film installations should conform to the recommendations given in the manufacturer's instructions.
- b. A complete survey will ascertain the condition of the windows into which the window glazing low e-film will be installed, the suitability of the glazing and any other issues affecting the installation of the glazing.
- c. Any structural defects recorded in the survey, which may affect the performance of the window glazing low e-film when installed, should be notified to, and rectified by, the Customer with or without involving the Contractor before installation work commences.
- d. The area of openings should not be reduced below that required for the provision of adequate daylight as per BS 8206-2:2008 '*Lighting for buildings. Code of practice for daylighting*'.
- e. The area around the window must be made good upon completion of the low e-film installation. This may involve some or all of the following checks to the installation:
 - Debris or contaminants should be removed, and any drainage paths should be cleared.
 - The window glazing low e-film should be free from scratches and signs of failure
 - All obscure and coated glasses shall be oriented properly
 - Safety glass shall be installed where necessary
 - The method of, and responsibility for, repair to any render should be as agreed with the Customer.
- f. After installation, a final inspection should be carried out, preferably accompanied by the customer, to ensure that the installation is fully in accordance with the surveyor's and manufacturer's instructions.
- g. It is essential that the customer is made aware of the method(s) of operation and maintenance of the window glazing low e-film. This should be accompanied by written operating and maintenance instructions.
- h. The homeowner shall be supplied with a written specification of the window glazing low e-film detailing the U-Value of the units to EN standards 410 and 673.

- i. The homeowner shall be advised that this material should be retained as an inspection of the installation may be required. The specification of the units shall be retained by the installer for audit purposes.

6.17 Entry Level Heating Controls

General Standards and Specifications

This section outlines the general Standards and Specifications for Contractors, products and installation methods for entry level heating controls.

Contractor Requirements and Competency

Heating controls must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

Product Standard and Specification

All heating controls products must conform to the appropriate BS, EN or IS standard for that measure. As a minimum, the following Standards should be satisfied:

- EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- BS EN 60730-2-7 *Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*

Installation Standard and Specification

All Heating Controls should be installed in accordance with the manufacturer's specifications. All works should be installed in accordance with NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, the DHPLG and SEAI Document *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*, CIBSE – *Domestic Heating Design Guide* and Energy Savings Trust Guidelines:

- GPG 302 *Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers (Energy Savings Trust and BRE)*
- CE29 *Domestic Heating by Oil: Boiler Systems – Guidance for Installers and Specifiers*
- CE30 *Domestic Heating by Gas: Boiler Systems – Guidance for Installers and Specifiers*

All works should be carried out in accordance with the applicable *National Rules for Electrical Installations* and BS 5449 – *Specification of Forced Air Circulation Hot Water Central Heating Systems for Domestic Purposes* (or equivalent Irish Standard) where applicable. Please refer to Section 3.2 Important guidance notes for Electrical works for details.

Attention should be given to good housekeeping and safety during installation. The Contractor must fully demonstrate every installed measure to the customer and provide a written set of operating instructions. Before leaving the home, the Contractor must ensure that the owner can correctly operate their upgraded heating system.

Entry-level heating controls must include the following items:

- 24-hour 7-day programmer,
- Room thermostat, and
- Boiler interlock.

This measure is based on the energy efficiency and carbon savings that can be achieved by installing the items above in a home that previously had no heating controls installed. Replacement of existing heating controls equipment cannot be accepted under this measure.

6.17.1 Single Zones (Space Heating)

This measure controls the heating system in a **single zone** and incorporates a **24 hour 7-day programmer** for time and temperature control and a **boiler interlock arrangement** to prevent boiler operation when the heat demand drops off. The initial single zone must be for space heating. Further zones to split areas of the dwelling can be added as additional zones (this is classed under the fully integrated heating controls upgrade).

Product Standard and Specification are as detailed above for all heating controls.

Installation Standard and Specification

A 24 hour 7-Day Programmer facilitating time and temperature control should be installed in accordance with the manufacturer's guidelines and industry best practice as outlined in Good Practice Guide 302. The room thermostat must be in an area where it is not subject to heat gains, direct sunlight or draughts. The thermostat should be in a well-lit, easily accessible position with good air circulation. The chosen position must be representative of average room/zone temperature. Do not install room thermostats in areas such as corners, behind furniture or curtains or in areas where the air flow may pick up extra heat such as close to TVs, computers, wall lights, in a room with a fixed heating appliance or direct sunlight. Installing a room thermostat in an area subject to external draughts such as beside external doors etc. should also be avoided. Best practice recommends that thermostats are situated approx. 1.5 m from the floor. Furthermore, room thermostats should not be installed in any room using a TRV(s) for temperature control.

Boiler Interlock – A boiler interlock arrangement must be included as part of this set of controls whereby the boiler will not fire when there is no demand for heat. All unnecessary boiler firing can be eliminated with this control measure. The Contractor should turn all thermostats right down when the boiler is firing to assess whether a boiler interlock arrangement is already in place. If the boiler continues to fire, then there is no interlock. The pump may continue to run if the boiler requires a pump to overrun, this is intentional and does not affect the boiler interlock. On a traditional central heating system with stored hot water, a boiler interlock arrangement can be set up by interconnecting the room thermostats with the boiler. On a combination boiler all that is required to set up a boiler interlock arrangement is a room thermostat.

6.18 Entry Level Heating Controls with Remote Access

General Standards and Specifications

This section outlines the general Standards and Specifications for Contractors, products and installation methods for entry level heating controls with remote access.

Contractor Requirements and Competency

Heating controls with remote access must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

Product Standard and Specification

All heating controls products with remote access must conform to the appropriate BS, EN or IS standard for that measure. As a minimum, the following Standards should be satisfied:

- EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- BS EN 60730-2-7 *Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*

Installation Standard and Specification

All Heating Controls should be installed in accordance with the manufacturer's specifications. All works should be installed in accordance with NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, the DHPLG and SEAI Document *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*, CIBSE – *Domestic Heating Design Guide* and Energy Savings Trust Guidelines:

- GPG 302 *Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers (Energy Savings Trust and BRE)*
- CE29 *Domestic Heating by Oil: Boiler Systems – Guidance for Installers and Specifiers*
- CE30 *Domestic Heating by Gas: Boiler Systems – Guidance for Installers and Specifiers*

All works should be carried out in accordance with the applicable *National Rules for Electrical Installations* and BS 5449 – *Specification of Forced Air Circulation Hot Water Central Heating Systems for Domestic Purposes* (or equivalent Irish Standard) where applicable. Please refer to Section 3.2 Important guidance notes for Electrical works for details.

Heating controls with remote access must be installed only when the homeowner has access to the remote programmer, either through a smart phone app, or through the internet.

Attention should be given to good housekeeping and safety during installation. The Contractor must fully demonstrate every installed measure to the customer and provide a written set of operating instructions. Before leaving the home, the Contractor must ensure that the owner can correctly operate their upgraded heating system.

Entry-level heating controls with remote access must include the following items:

- 24-hour 7-day programmer with remote access,
- Room thermostat, and
- Boiler interlock.

This measure is based on the energy efficiency and carbon savings that can be achieved by installing the items above in a home that previously had no heating controls installed. Replacement of existing heating controls equipment cannot be accepted under this measure.

6.18.1 Single Zones (Space Heating)

This measure controls the heating system in a **single zone** and incorporates a **24 hour 7-day programmer** for time and temperature control with remote access and a **boiler interlock arrangement** to prevent boiler operation when the heat demand drops off. Further zones to split areas of the dwelling can be added as additional zones (this is classed under the fully integrated heating controls upgrade).

Product Standard and Specification are as detailed above for all heating controls.

Installation Standard and Specification

A 24 hour 7-Day Programmer with remote access, facilitating time and temperature control should be installed in accordance with the manufacturer's guidelines and industry best practice as outlined in Good Practice Guide 302. The room thermostat must be in an area where it is not subject to heat gains, direct sunlight or draughts. The thermostat should be in a well-lit, easily accessible position with good air circulation. The chosen position must be representative of average room/zone temperature. Do not install room thermostats in areas such as corners, behind furniture or curtains or in areas where the air flow may pick up extra heat such as close to TVs, computers, wall lights, in a room with a fixed heating appliance or direct sunlight. Installing a room thermostat in an area which may be subject to external draughts such as beside external doors etc. should also be avoided. Best practice recommends that thermostats are situated approx. 1.5 m from the floor. Furthermore, room thermostats should not be installed in any room using a TRV(s) for temperature control.

Boiler Interlock – A boiler interlock arrangement must be included as part of this set of controls whereby the boiler will not fire when there is no demand for heat. All unnecessary boiler firing can be eliminated with this control measure. The Contractor should turn all thermostats right down when the boiler is firing to assess whether a boiler interlock arrangement is already in place. If the boiler continues to fire, then there is no interlock. The pump may continue to run if the boiler requires a pump to overrun, this is intentional and does not affect the boiler interlock. On a traditional central heating system with stored hot water, a boiler interlock arrangement can be set up by interconnecting the room thermostats with the boiler. On a combination boiler all that is required to set up a boiler interlock arrangement is a room thermostat.

6.19 Fully Integrated Heating Controls with Remote Access

General Standards and Specifications

This section outlines the general Standards and Specifications for Contractors, products and installation methods for fully integrated heating controls with remote access.

Contractor Requirements and Competency

Heating controls with remote access must be installed by suitably qualified individuals in accordance with manufacturer's guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. Contractors must be competent in the installation of the control system chosen, seek guidance and attend training from the manufacturer or supplier if required.

Product Standard and Specification

All heating controls with remote access products must conform to the appropriate BS, EN or IS standard for that measure. As a minimum, the following Standards should be satisfied:

- EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- BS EN 60730-2-7 *Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*
- BS EN 215 *Thermostatic Radiator Valves. Requirements and Test Methods*

Installation Standard and Specification

All Heating Controls should be installed in accordance with the manufacturer's specifications and Industry Best Practice. All works should be installed in accordance with NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, the DHPLG and SEAI Document *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*, CIBSE – *Domestic Heating Design Guide* and Energy Savings Trust Guidelines:

- GPG 302 *Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers (Energy Savings Trust and BRE)*
- CE29 *Domestic Heating by Oil: Boiler Systems – Guidance for Installers and Specifiers*
- CE30 *Domestic Heating by Gas: Boiler Systems – Guidance for Installers and Specifiers*

All works should be carried out in accordance with the *applicable National Rules for Electrical Installations* and BS 5449 – *Specification of Forced Air Circulation Hot Water Central Heating Systems for Domestic Purposes* (or equivalent Irish Standard) where applicable. Please refer to Section 3.2 Important guidance notes for Electrical works for details.

Heating controls with remote access must be installed only when the homeowner has access to the remote programmer, either through a smart phone app, or through the internet.

Attention should be given to good housekeeping and safety during installation. The Contractor must fully demonstrate every installed measure to the customer and provide a written set of operating instructions. Before leaving the home, the Contractor must ensure that the owner can correctly operate their upgraded heating system.

Note on installation of wireless heating control equipment:

Care should be taken before installing wireless equipment, to ensure that there is no interference from metal objects or building elements, other wireless or non-wireless electrical devices. Checks should be carried out to ensure that the signal strength is sufficient for the heating controls to operate correctly. Manufacturer's installation instructions and guidance must be followed.

Fully integrated heating controls with remote access must include the following items:

- Separate control of Space Heating and Domestic Hot Water (Two Zones),
- 24-hour 7-day programmer with remote access,
- Boiler interlock,
- Room thermostat controlling the first space heating zone,
- Cylinder thermostat,
- An additional space heating zone with room thermostat or Thermostatic Radiator Valves (TRVs),
- Time and Temperature Control of Electric Immersion Heater, and
- Hot Water Cylinder Insulation.

This measure is based on the energy efficiency and carbon savings that can be achieved by installing the items above in a home that previously had no or very basic heating controls installed. Replacement of existing heating controls equipment cannot be accepted under this measure.

In addition to the above, the following items must be addressed, where required:

- Auto by-pass, and
- Earthing and equipotential Bonding

The following sub-sections describe the requirements for the items above.

6.19.1 Two Zones (Space Heating and Domestic Hot Water)

This measure divides the heating system into **two zones** and incorporates a **24 hour 7-day programmer with remote access** for time and temperature control and a **boiler interlock arrangement** to prevent boiler operation when the heat demand drops off. These initial two zones must include the space heating zone and the domestic hot water heating zone. Further zones to split areas of the dwelling can be added as additional zones (as discussed below).

Product Standard and Specification

All timers, programmers, thermostats, zoning manifolds and motorised control valves must conform to the appropriate BS or IS standard for that measure. For example:

- EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- BS EN 60730-2-7 *Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*

It should also be noted that 22 mm motorised control valves are usually suitable for boilers rated up to 20kW. For larger boilers, when fitting a motorised control valve on a gravity hot water circuit, 28 mm valves or larger should be used.

Installation Standard and Specification

Zoning: Zones should be divided according to Industry Best Practice as outlined in Good Practice Guide 302. This guide recommends using motorised control valves to subdivide the home into separate heating

zones. A zoning manifold can also be used to achieve separate heating zones. Motorised control valves can be plumbed at an angle but must not be mounted so that the power-head is below the horizontal level of the pipework. If fitted in a confined space, adequate ventilation must be available to keep the valve within its recommended temperature range. There must also be adequate access so that the power head can be removed if necessary. Motorised valves should not be positioned in the line of the open safety vent pipe or the feed and expansion pipe. Solid fuel systems should use normally-open motorised valves (i.e. they close only when power is applied) to ensure safe operation in the event of power failure or malfunction.

Alternative zoning without pipework separation: In cases where physically separating the pipework would be too costly or disruptive, a system based on electronic thermostat TRVs connected wirelessly to a centralised control unit may be used to achieve fully separated time and temperature control of space heating and hot water. This system must provide the same or higher level of separate time and temperature control as a fully integrated system based on pipework separation and motorised valves. The following items must be installed:

1. Wireless electronic thermostatic valves connected to the centralised control unit on all heat emitters;
2. Wireless electronic cylinder thermostat connected to the centralised control unit and controlling the hot water cylinder valve;
3. A centralised control unit ensuring that the boiler only fires when there is heating demand from one of the wireless electronic thermostatic valves, or from the hot water cylinder thermostat.

All product and installation standards and specifications in this section 6.19 must be met by the system. The homeowner must be fully trained in the use and basic maintenance of the system, for example in the replacement of batteries for the electronic thermostatic valves or changing the settings.

A 24 hour 7-Day Programmer with remote access, facilitating time and temperature control with remote access should be installed in accordance with the manufacturer's guidelines and industry best practice as outlined in Good Practice Guide 302. The room thermostat must be in an area where it is not subject to heat gains, direct sunlight or draughts. The thermostat should be in a well-lit, easily accessible position with good air circulation. The chosen position must be representative of average room/zone temperature. Do not install room thermostats in areas such as corners, behind furniture or curtains or in areas where the air flow may pick up extra heat such as close to TVs, computers, wall lights, in a room with a fixed heating appliance or direct sunlight. Installing a room thermostat in an area which may be subject to external draughts such as beside external doors etc. should also be avoided. Best practice recommends that thermostats are situated approx. 1.5 m from the floor. Furthermore, room thermostats should not be installed in any room using a TRV(s) for temperature control. If wireless room thermostats are used, the homeowner must be informed as part of the handover on what are suitable and unsuitable locations for the thermostat (e.g. the wireless room thermostat should not be placed in rooms with TRVs, including wireless electronic thermostatic valves).

Best Practice recommends that **the Hot Water Cylinder Thermostat** (installed with the immersion timer and temperature control device) is installed between 1/4 and 1/3 of the way up the height of the cylinder unless otherwise instructed by the manufacturer. Care should be taken to ensure that there is good clean contact between the thermostat and the cylinder when attaching. The thermostat should also be located on the front face of the cylinder so that it is easily accessible by the customer. Contractors should set the hot water temperature no higher than 60°C. It is not uncommon in many households for domestic hot water to be heated to temperatures higher than 60°C only for residents to add cold water to it to bring the temperature down. This is wasteful of energy. The Contractor should advise the

homeowner that the safe temperature for storing hot water is 60°C. This is to protect against the risk of Legionella.

Boiler Interlock – A boiler interlock arrangement must be included as part of this set of controls whereby the boiler will not fire when there is no demand for heat. All unnecessary boiler firing can be eliminated with this control measure. The Contractor should turn all thermostats right down when the boiler is firing to assess whether a boiler interlock arrangement is already in place. If the boiler continues to fire, then there is no interlock. The pump may continue to run if the boiler requires a pump to overrun, this is intentional and does not affect the boiler interlock. On a traditional central heating system with stored hot water, a boiler interlock arrangement can be set up by interconnecting the room and cylinder thermostats with motorised valve(s). On a combination boiler all that is required to set up a boiler interlock arrangement is a room thermostat.

Boiler Management System – An acceptable alternative to the above control measures would be to install a boiler management system that delivers the specified zoning, timing and temperature with remote access and boiler interlock control provisions. Such systems must provide the same functionality as is described above and be installed in accordance with the manufacturer's guidelines and industry best practice.

In some exceptional cases, the hot water cylinder is significantly isolated from the boiler and the installation of additional pipes to connect it separately would involve substantial civil works. In these cases, a manifold/valve arrangement to bypass the hot water cylinder would be an acceptable alternative solution. This arrangement would allow the customer to use their boiler for space heating without heating the water in the hot water cylinder. The Contractor must explain to the customer this new heating arrangement and how to use this system for heating hot water in the summer months *e.g.* turning off the radiators or using the time/temp programmer. The reasons for implementing this alternative solution as part of the heating control upgrades must be documented in the comments section of the Declaration of Works document.

6.19.2 An Additional Zone

In addition to establishing 2 zones (as described above), the customer must also commission the installation of an additional space heating zone **OR** the installation of Thermostatic Radiator Valves. TRVs must not be installed in rooms with room thermostats.

Product Standard and Specification

The Product Standards and Specifications outlined in Section 6.18.1 also apply to the components required to establish an additional heating zone (room thermostat and motorised control valve).

Installation Standard and Specification

A Third Zone can be established using an additional motorised control valve or a zoning manifold arrangement and room thermostat. Installation should be carried out in accordance with the manufacturer's instruction, NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings*, and Industry Best Practice. The Installation Standards and Specifications outlined in Section 6.18.1 also apply to the installation of an additional heating zone.

6.19.3 Thermostatic Radiator Valves (TRVs)

In addition to establishing 2 zones (as described above), the Contractor must also install an additional space heating zone **OR** install Thermostatic Radiator Valves (TRVs) on at least three radiators but no less than half of all radiators in rooms without room thermostats.

Product Standard and Specification

All TRVs must conform to the appropriate BS or IS standard for Thermostatic Radiator Valves (if available) such as BS EN 215 '*Thermostatic Radiator Valves. Requirements and Test Methods*'.

Installation Standard and Specification

TRVs should be installed in accordance with the manufacturer's guidelines, NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings* and BS 7478 - *Selection and use of thermostatic radiator valves*. This British Standard gives guidance on the selection, application and use of thermostatic radiator valves (TRVs) manufactured in accordance with BS EN 215-1 for use in domestic and commercial wet central heating systems up to a water temperature of 120°C. TRVs must not be fitted in rooms with temperature control through a thermostat.

When installing TRVs, the Contractor must ensure that the temperature selector scale and reference point are easily visible to the customer and that the TRV is not positioned in an area which may distort the temperature sensor. Avoid locating TRVs behind curtains, in direct sunlight, in very draughty locations or other areas which may distort the temperature sensor. If these conditions are unavoidable, a remote sensor should be used. When inaccessibility of the valve to the user is unavoidable *e.g.* when the radiator and valve are located behind a decorative grille, valves with combined remote temperature sensors and adjuster should be used.

Most modern TRVs are bi-directional and can be installed in the flow or return direction. Due care should be taken to ensure that the valve is bi-directional – if the valve is not bi-directional, the flow through the valve must correspond to the direction on the arrow of the valve body.

When fitting TRVs to a one-pipe system, *i.e.* only the boiler is being replaced, units designed for minimum flow resistance should be used.

An automatic bypass circuit must be installed (in fully pumped systems) in homes where there are three or more TRVs in place. When most TRVs are open, the automatic bypass remains closed, allowing full circulation around the heating system. When the TRVs close, the automatic bypass opens, allowing an appropriate flow rate through the boiler. The use of an automatic bypass also reduces the noise in the system due to excess water velocity. An automatic bypass circuit must also be fitted if the boiler manufacturer requires one, or if it specifies that a minimum flow rate must be maintained while the boiler is firing. An automatic bypass circuit must then incorporate an automatic bypass valve controlling water flow in accordance with the water pressure across it. The valve is used to maintain a minimum flow rate through the boiler and to limit circulation pressure when some radiators or zones are turned off. This level of control cannot be achieved using a fixed position valve. The valve should be installed between the boiler primary flow and return noting the direction of flow. When an in-built auto-bypass valve is present in a system boiler, it must be checked that this arrangement is sufficient to provide the minimum flow rate required to the boiler when all the TRVs are closed. In some cases, an external bypass circuit is also required.

All systems should be flushed to remove debris before commissioning with all thermostatic sensor heads removed and valves fully open. Thermostatic sensor heads should also be removed during hydraulic balancing of the system to prevent changes in room temperature affecting the balancing procedure.

Once the TRV is correctly set to the desired temperature by the Contractor, it should not normally require further adjustment by the customer. The customer they should be made aware of how to adjust the temperature setting for future reference.

NOTE: The room where the main thermostat is fitted should **NOT** have a TRV fitted to the radiator in that location. This would cause inaccuracies in the thermostatic control.

6.19.4 Time and Temperature Control of Electric Immersion Heater

Product Standard and Specification

All timers, programmers, thermostats, zoning manifolds and motorised control valves must conform to the appropriate BS or IS standard for that measure. For example:

- EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- BS EN 60730-2-7 *Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches*

Installation Standard and Specification

Installation should be carried in accordance with the manufacturer's guidelines and Industry Best Practice as outlined in Good Practice Guide 302 or similar.

6.19.5 Hot Water Cylinder Insulation

The following guidance applies to insulation on existing hot water cylinders:

- If not replacing the hot water cylinder with a pre-insulated hot water cylinder during a boiler and/or controls upgrade, then a correctly sized insulating jacket tested and approved to BS 5615 must be fitted.
- The insulation jacket shall not cover the immersion heater head and/or cylinder thermostat.
- The fixing bands shall be of a durable material and shall not be over tight or loose.
- Hot water storage cylinders having factory-applied thermal insulation shall not be fitted with insulating jackets unless existing thermal insulation is rendered ineffective through mechanical damage or deterioration.
- Where the specification details of an existing hot water storage cylinder jacket are not completely legible and/or are not perfectly visible, a self-adhesive label shall also be applied to the jacket at an accessible position stating the name of the jacket supplier and the Irish Standard reference details.
- For an existing jacket where the British Standards compliance marking is not indicated by any means the following action shall be undertaken:
 - The jacket shall be checked for compliance with this specification.
 - The insulation, covering material and fastenings shall not have suffered any permanent deterioration.
 - The insulation shall be at least 80mm nominal thickness.

6.20 Solid Multi-Fuel Stoves (Including Biomass)

Contractor Competency

Contractors installing high-performance stoves must be competent to complete the installation and must complete the work in accordance with the British Standard document *Installation of domestic heating and cooking appliances burning solid mineral fuels* (BS 8303: Parts 1, 2 and 3) and in accordance with *Domestic Heating: Solid fuel systems* (CE 47) published by the Energy Saving Trust.

Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list or certification by the manufacturer.

Installers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

Product Standards and Specification¹

The multi-fuel stove being installed must meet the requirements of the British Standard document BS EN 13240 (*Room heaters fired by solid fuel. Requirements and test methods*).

The objective is to install a multi-fuel stove that will achieve a level of performance in the home, equivalent to the standard required in Part L of the Building Regulations. The multi-fuel stove being installed should be as efficient in use as is reasonably practicable. Guidance on appropriate efficiency for various systems and fuels is contained in the DHPLG and SEAI Document "*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L*", particularly Table 16. The Contractor must discuss the specification and output of the stove with the customer before selecting the final system.

All stoves being installed under this measure must comply with the European Commission Regulation EC 2015/1185². While this aspect of the Regulation is not yet a requirement, it is best practice, so is mandatory for the SEAI Programmes funding installation of stoves. Stoves may be demonstrated to meet this requirement when listed on the following website: <http://www.hetas.co.uk/ecodesign-ready/>

In addition to the requirements detailed in this section, the following requirements are mandated for the Deep Retrofit Programme. While these requirements are considered best practice and are recommended for the BEC, BEF and EEOS Programmes, they are not mandatory.

1. The Deep Retrofit Programme funds biomass³ burning stoves only.

Biomass-only stoves are identified as follows:

The Stove must be designed to burn only biomass fuels. Its design must prohibit the use of any other fuel type. This can be demonstrated by one of the following:

- Documentation showing that the product warranty is void if the product is used with any fuel type other than biomass fuels
- Listing of the product under <http://www.hetas.co.uk> showing that the appliance burns wood fuels only.

¹ Biomass boilers are covered as a different measure to solid fuel stoves. See Section 5.21.

² Commission Regulation (EU) 2015/1185 of 24 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for solid fuel local space heaters (Text with EEA relevance)

³ Biomass does NOT include peat-based fuels.

2. The Deep Retrofit Programme only funds stoves with Gross Efficiency greater than or equal to 70%
Gross efficiency for dry stoves is demonstrated as per the standards in DEAP Manual Appendix E. The HARP database is recommended for sourcing certified stove gross efficiencies: <https://www.seai.ie/energy-in-business/ber-assessor-support/harp-database/harp-database-search/>

Installation Standards and Specifications

a. Handling and Storage on Site

- The appliance and components shall be handled in a manner such as to prevent damage/breakage. Any manufacturer's instructions on how to handle components must be followed. Care should be taken before, during and after installation to ensure that equipment is not damaged. This is essential with fittings that are vitreous enamelled, plated or fitted with glass
- Any components removed during transit or storage shall be handled so that they can be identified and refitted correctly to the original equipment. This is important where several different appliances are stored together as some parts are individually fitted to each appliance by the manufacturer and are not interchangeable.
- All components shall be stored:
 - On a firm level base in the original packaging and in accordance with the manufacturer's instructions.
 - On a sheet of polyethylene, pallets or timber to prevent any rising damp affecting them where storage is on a solid floor, components shall be stacked.
 - In a safe, dry and frost-free environment.
- The appliance instructions and any operating, stoking and cleaning tools shall be kept safely in store until they can be handed directly to the user on completion of the installation.

b. Installation preparation

- In preparing for the installation of an appliance, the following preparations must be made:
 - site access is available;
 - cooperation between trades is arranged and enough time is allowed for completing each phase of the installation;
 - all accessories and materials for construction are available on site;
 - chases are formed true to size and correctly positioned;
 - the fireplace recess, chimney, lintels and flue-connecting blocks are installed in accordance with the design specification in their true relation to the appliance, and hearth;
 - any ducts or vents required to be formed in builder's work have been laid or constructed;
 - the fitter's and finishing tradesmen's work are coordinated and protection is provided for vulnerable surface finishes, e.g. hearths, floors;
 - the hearth area shall be able to take the weight of the stove.

c. Installation work on site

- The multi-fuel stove should be installed on a solid, level concrete hearth able to bear the weight of the stove.
- The instructions of the appliance manufacturer shall be followed in conjunction with the design specification in accordance with BS 8303: Part 1 (*Installation of domestic heating and cooking appliances burning solid mineral fuels – Specification for the design of installations*)

- All components must be installed in a way that allows installation, maintenance and repair / replacement. There shall be enough clearance, in accordance with the manufacturer's instructions, between the multi-fuel stove and the adjacent materials to allow for cleaning and maintenance.
- Inaccessible components shall be permanent. Such permanent components shall be maintenance free and have a durability corresponding to the lifetime of the components in which they are installed.
- Components (*i.e.* flues) shall be placed, fixed and supported so that no harmful deformations occur and so that thermal expansion is possible.
- Where appropriate, existing chimneys should be lined or relined with rigid or flexible flue liners having the appropriate designation and performance level specific to the type of fuel and appliance.
- If a supply of electricity is necessary to operate the control equipment or initiate ignition in an appliance, the electrical installation and supply shall be installed in accordance with BS 7671: 2018 (*Requirements for electrical installations*). All Electrical components shall be installed in accordance with the applicable *National Rules for Electrical Installations*. Please refer to Section 3.2 Important guidance notes for Electrical works for details.
- Any soot door required for cleaning the chimney shall be correctly located and fitted. (See clause 10 of BS 8303: Part 1: 1994). Before proceeding with appliance installation, a check shall be made to ensure that the flue is clean, clear of any obstruction, in a sound condition and of adequate size to suit the appliance being installed.
- An inset multi-fuel stove shall be installed using in-fill material behind firebacks and around room heater casings (see BS 8303: Part 1: 1994, figures 1, 2, 3, 13 and 15). Further information is given in clause 14 of BS 8303: Part 3: 1994 (*Installation of domestic heating and cooking appliances burning solid mineral fuels – Recommendations for design and on-site installation*).
- If a gas point is required for connecting to an ignition burner or independent gas poker it shall be installed close to the appliance.
- NOTE. Attention is drawn to the Gas Safety (Installation and Use) Regulations IS 813.
- Following installation, all building works etc. shall be made good.

d. Post-Installation

- When installing a multi-fuel stove, a carbon monoxide (CO) alarm complying with I.S. EN 50291-1:2010/A1:2012 should be provided.
- An inspection of the installation should be carried out not less than 48 hours after the appliance is installed to ensure that:
 - All fittings (particularly dampers, flue pipe, flue adaptor and pipes) are fixed in the correct position and that no gaps allowing possible air or water leakage have appeared.
 - Air supply intakes and ducts shall be checked for size and position.
- After installation, the appliance shall not be used for burning builder's rubbish.
- The installation shall be dried out under slow fire conditions preferably for about 2 days using the type and size of fuel recommended in the appliance manufacturer's instructions.
- The installer shall confirm that the fire responds to the operation of the controls and that there is no visible emission of combustion products to the room.
- Where a hearth, fireplace, flue or chimney is provided or extended, a notice plate containing information on the type of heat-producing appliance, which can be safely served by the installed hearth, fireplace, flue or chimney, shall be permanently fixed in a suitable place in the building.

- On completion of installing and commissioning the system, the installer shall hand over the manufacturer's operating instructions to the user to provide full information regarding its safe and effective operation and maintenance.

6.21 Gas Fired Room Heater

Contractor Requirements and Competency

Gas fired room heaters must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. Contractors installing Liquefied Petroleum Gas (LPG) or Natural Gas boilers under this measure must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3) and be registered with RGI.

It is an offence for any person to carry out domestic Natural Gas or LPG works unless they are a registered gas installer with RGII. To align with this requirement all gas installers proposing to undertake High Efficiency Gas Boiler and Heating Controls upgrade works must be on the RGII list. Details on how to register with RGII is available at www.rgii.ie.

Product Standard and Specification

Qualifying gas-fired independent space heaters must meet the following conditions:

1. It must be replacing an open fire *e.g.* the fireplace must not be fitted with an existing gas fire or a low efficiency (in the region of 35%) decorative gas fire (DGF)
2. It must have a minimum efficiency (gross calorific value) of 65% awarded by an independent test body or as listed on the HARP database or using a manufacturer's declaration as outlined below.
3. The correct level of permanent ventilation must be installed as per TGD Part J of the Building Regulations and/or I.S. 813.
4. It must meet the conditions specified in Section 2.5 of the DHPLG and SEAI Document '*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008*'

The manufacturer's declaration of the efficiency (gross calorific value) of the appliance (gross calorific value) should include the following words:

"The efficiency of this appliance has been measured as specified in BS 7977-1:2009+A1:2013 'Specification for safety and rational use of energy of domestic gas appliances. Radiant/convector' and BS EN 613:2001 and the result is minimum 65% gross calorific value. The test data from which it has been calculated has been certified by {insert name and/or identification of Notified Body}. The efficiency value may be used in the Dwelling Energy Assessment Procedure (DEAP) for energy rating of dwellings."

The design and installation of the recommended works must not compromise the ventilation, air quality, humidity (and the potential for condensation) and quality of living environment in the home. Care must be given to the potential impact on the living environment in the home resulting from any measures installed under the Programmes. The Contractor must prevent any detrimental changes to the living environment and recommend to the Customer any measures necessary to ensure there is no detrimental change to the living environment because of the works. (See Section 4)

Installation Standard and Specification

A qualifying gas-fired independent space heater must be installed by a registered gas installer (RGII) and in accordance with the latest version of TGD Part J and I.S. 813 *Domestic Gas Installations*. I.S. 813 covers the Code of Practice for the installation of Natural Gas or LPG appliances in domestic premises. The gas-fired appliance must also be installed in accordance with manufacturer's guidelines, the CRU Criteria

document ‘*The Regulation of Gas Installers with respect to safety*’ and the latest draft of the appropriate standard, as listed in Section 2.5 of the DHPLG and SEAI Document ‘*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008*’.

If the installation involves work to the electrical wiring:

- All wiring must be in accordance with the applicable National Rules for Electrical Installations;
- Where required electrical works must be carried out by a Registered Electrical Contractor (REC)
- Please refer to Section 3.2 Important guidance notes for Electrical works for details.

6.22 Mechanically-assisted powered cleanse and flush (power flushing) of Heating system

Contractor Requirements and Competency

Contractors undertaking a mechanically-assisted powered cleanse and flush (power flushing) of a heating system must be suitably qualified in accordance with manufacturer’s guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds.

Oil Boilers

Contractors undertaking a mechanically-assisted powered cleanse and flush (power flushing) of an oil-fired system must comply with requirements and competencies stated above. It is also recommended that the Contractor is registered with a professional organisation, e.g. OFTEC.

Gas Boilers

It is an offence for any person to carry out domestic Natural Gas or LPG works unless they are a registered gas installer with RGII. To align with this requirement all gas installers undertaking High Efficiency Gas Boiler and Heating Controls upgrade works must be on the RGII list. Detail on how to register with RGII is available at www.rgii.ie.

Product Standard and Specification

Mechanically-assisted powered cleanse and flush (powerflushing) of the system must be performed as per Section 5.3 of BS 7593. Mains pressure with gravity cleanse and flush (Section 5.4 and 5.5 of BS 7593) is **not** deemed as an acceptable method of flushing a heating system.

As a part of this measure boiler service must be provided where an existing boiler is installed. The boiler service should be to manufacturer’s instructions or as per SEAI boiler servicing checklists.

- https://www.seai.ie/resources/publications/Communities-Programme_Oil-Checklist.pdf
https://www.seai.ie/resources/publications/Communities-Programme_Gas-Checklist.pdf

Installation Standard and Specification

Mechanically-assisted powered cleanse and flush (powerflushing) of a heating system must be performed in accordance with manufacturer’s guidelines, Industry Best Practice and BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems* where applicable.

The powerflushing procedure should include:

- Operation of the unit for at least 10 min (circulation mode) with all radiator and system valves open, reversing the flow regularly;

- Disposal of the dirty water by an appropriate method whilst mains water is continually added via the powerflushing reservoir tank until the water runs clear;
- Addition of the chosen cleansing chemical to the reservoir of the powerflushing machine and circulating to disperse throughout the system;
- Circulating the cleanser through each radiator for at least five minutes in turn by isolating the other radiators and the hot water circuit, reversing the flow regularly;
NOTE Tapping of the radiator with a rubber hammer will help to remove any loose material.
- Cleansing of the hot water circuit for at least five minutes (circulation mode) by isolating the radiators, reversing the flow regularly;
- Flushing of each radiator in turn for at least five minutes by isolating the other radiators and the hot water circuit, and dumping to foul drain until the water runs clear;
- Flushing of the hot water circuit for at least five minutes by isolating the radiators, and dumping to foul drain until the water runs clear;
- Flushing of the system with all radiator and system valves open for at least five minutes and dumping by an appropriate method until water runs clear;
- Continual flushing and appropriate disposal until all of the cleanser and debris have been removed. Refer to the manufacturer's instructions.

After this procedure, re-commissioning should be carried out in accordance with BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems* Section 5.6 where applicable.

On completion, a suitable inhibitor should then be added to protect the system from future problems. The inhibitor levels should be checked at the system's annual service and topped up if required. It is recommended to check the manufacturer's instructions that the chemical cleaner and inhibitor are suitable for the equipment installed. A label stating the date of application, the type and the amount of inhibitor used shall be fixed in a prominent position on the system.

It is recommended to check the manufacturer's instructions that the chemical cleaner and inhibitor are suitable for the equipment installed. A label stating the date of application, the type and the amount of inhibitor used shall be fixed in a prominent position on the system.

6.23 Mechanically-Assisted Powered Cleanse and Flush (Powerflushing) of Heating System and Installation of Magnetic Filtration System to Existing Heating System

Contractor Requirements and Competency

Contractors undertaking a mechanically-assisted powered cleanse and flush (powerflushing) and installing a magnetic filtration system to the existing heating system must be suitably qualified in accordance with manufacturer's guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds.

Oil Boilers

Contractors undertaking a mechanically-assisted powered cleanse and flush (powerflushing) of a heating system and installing a magnetic filtration system to the existing oil-fired system must comply with requirements and competencies stated above. It is also recommended that the Contractor is registered with a professional organisation, *e.g.* OFTEC.

Gas Boilers

In addition to the above criterion, Contractors carrying out a mechanically-assisted powered cleanse and flush (powerflushing) and installing a magnetic filtration system to the existing heating system of a heating system to a Liquefied Petroleum Gas (LPG) or Natural Gas system under this measure must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3).

It is an offence for any person to carry out domestic Natural Gas or LPG works unless they are a registered gas installer with RGII. To align with this requirement all gas installers undertaking High Efficiency Gas Boiler and Heating Controls upgrade works must be on the RGII list. Details on how to register with RGII is available at www.rgii.ie.

Product Standard and Specification

Mechanically-assisted powered cleanse and flush (powerflushing) of system must be performed as per Section 6.22 of this document.

A boiler service must be provided where an existing boiler is installed. The boiler service should be to manufacturer's instructions or as per SEAI boiler servicing checklists

- https://www.seai.ie/resources/publications/Communities-Programme_Oil-Checklist.pdf
- https://www.seai.ie/resources/publications/Communities-Programme_Gas-Checklist.pdf

The installation of a magnetic filtration system to the existing heating system must be as per manufacturer's guidelines, Industry Best Practice and SR-50-1 (*draft*) *Code of practice for building services – Part 1: Domestic plumbing and heating* where applicable

Installation Standard and Specification

Mechanically-assisted powered cleanse and flush (powerflushing) of a heating system must be performed as per Section 6.22 of this document.

Installation of magnetic filtration system to an existing heating system must be performed in accordance with manufacturer's guidelines, Industry Best Practice and SR-50-1 (*draft*) *Code of practice for building services – Part 1: Domestic plumbing and heating* where applicable.

The heating system must be power flushed before the installation of the magnetic filtration unit.

The magnetic filtration unit should have the following properties:

- The filter should be installed on the return pipework and as close to the boiler as possible. Flexibility of filter orientation during installation is essential to accommodate all existing pipework layouts. The filter must be able to maximise the volume of magnetite collected on first pass with a recommendation that this level achieves more than 90% of suspended black iron oxide. This figure should increase to virtually 100% during subsequent passes.
- Recommended minimum capacity for a domestic filter is 130 g of iron oxide sludge for a standard 22 mm (3/4") system and 28 mm (1") over a period of at least 12 months. At capacity, the filter must allow unrestricted flow without loss of pressure.
- Domestic filter magnet strength should achieve a minimum gauss rating of 7,500 with an anticipated lifespan exceeding that of the central heating boiler. The filter should not be prone to blockage, even when full.

6.24 Chimney Draught Limiter

Contractor Requirements and Competency

Contractors installing a Chimney Draught Limiter must be suitably qualified in accordance with manufacturer's guidelines as a minimum.

Product Standard and Specification

The Chimney Draught Limiter conform to BS 1251 '*Specification for open-fireplace components*' and BS 3376 '*Specification for solid mineral fuel open fires with convection, with or without boilers*'

A permanent mechanically fixed chimney draught limiter alters the geometry of the chimney therefore altering the ventilation rate as per the DEAP methodology.

Temporary draught limiting devices, removed when a fire is lit, are **not** eligible under this measure. A temporary draft limiter is wholly reliant on its reinstatement whenever a fire is not lit, and they do not alter the geometry of a chimney within the DEAP methodology.

The design and installation of the recommended works must not compromise the ventilation, air quality, humidity (and the potential for condensation) and quality of living environment in the home. Care must be given to the potential impact on the living environment in the home resulting from any measures installed under the Programmes. The Contractor must prevent any detrimental changes to the living environment and recommend to the Customer any measures necessary to ensure there is no detrimental change to the living environment because of the works. (See Section 4)

Installation Standard and Specification

The Installation of chimney draft limiter shall be installed to manufacturer's recommendations.

The chimney draft limiter is installed in accordance with the design specification in their true relation to the appliance. The instructions of the appliance manufacturer shall be followed in conjunction with the design specification in accordance with BS 1251 - *Specification for open-fireplace components* and BS 3376 - *Specification for solid mineral fuel open fires with convection, with or without boilers*. All components must be installed in a way that allows installation, maintenance and repair / replacement. There shall be enough clearance, in accordance with the manufacturer's instructions, between the chimney draft limiter and the adjacent materials to allow for cleaning and maintenance. Components shall be placed, fixed and supported so that no harmful deformations occur and so that thermal expansion is possible.

On completion of installing and commissioning the system, the installer shall hand over the manufacturer's operating instructions to the user to provide full information regarding the operation and maintenance of the appliance.

6.25 Boiler Service

Contractor Requirements and Competency

Contractors performing a boiler service to an existing heating system must be suitably qualified in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds.

Oil Boilers

Contractors performing a boiler service must comply with requirements and competencies stated above. It is also recommended that the Contractor is registered with a professional organisation, *e.g.* OFTEC.

Gas Boilers

In addition to the above criterion, Contractors servicing a Liquefied Petroleum Gas (LPG) or Natural Gas boiler under this measure must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3).

It is an offence for any person to carry out domestic Natural Gas or LPG works unless they are a registered gas installer with RGII. To align with this requirement all gas installers undertaking High Efficiency Gas Boiler and Heating Controls upgrade works must be on the RGII list. Detail on how to register with RGII is available at www.rgii.ie.

Standard and Specification

A boiler service should be to manufacturer's instructions or as per SEAI boiler servicing checklists

The gas boiler checklist is published here:

https://www.seai.ie/resources/publications/Communities-Programme_Gas-Checklist.pdf

The oil boiler checklist is published here:

https://www.seai.ie/resources/publications/Communities-Programme_Oil-Checklist.pdf

The Homeowner shall be supplied with a certificate detailing that a boiler service was performed on the boiler and entered in the boiler logbook.

The boiler log book is an important document for the homeowner to retain as it records the following information:

- Details of the installing / commissioning Contractor;
- Can be necessary to validate the guarantee for the boiler;
- Gives details for future servicing.

It must be placed in a location accessible for the Homeowner and future boiler service technicians. The homeowner shall be advised that this material should be retained as an inspection of the system may be required. A duplicate of the certificate detailing that a boiler service was carried out on the boiler shall be retained by the installer for audit purposes.

6.26 LED domestic lighting

Contractor Requirements and Competency

Contractors installing LED lighting must be competent to complete the installation.

Standard and Specification

For LED luminaires and lamps:

LED luminaires and lamps installed must be in accordance with EC 244/2009: *Ecodesign requirements for non-directional household lamps* and EU 1194/2012 *Ecodesign requirements for directional lamps, light emitting diode lamps and related equipment*.

- EC244/2009 sets minimum lamp efficacy requirements in Annex II, Table 1, and functionality requirements for non-CFL's (Table 5).
- EU1194/2012 sets minimum energy efficiency requirements in Annex III Section 1.1, and functionality requirements in Table 2, 3 and 4.
- LED luminaires:
 - EN 13032-1 and 2 "*Light and lighting – Measurement and presentation of photometric data of lamps and Luminaires*"
- OR
- IES LM-79-08 "*Electrical and photometric measurements of Solid-State lighting products*".
- LED lamps:
 - IES LM-79-08 "*Electrical and photometric measurements of Solid-State lighting products*".

If the retrofit involves work to the mains wiring:

- All wiring must be in accordance with the latest edition of the ETCI National Rules for Electrical Installations ET101
- Contractors must be Registered Electrical Contractors (REC)

Please refer to Section 3.2 Important guidance notes for Electrical works for details.

6.27 Home Energy Reports

Contractors are required to submit a Home Energy Report in accordance with the Programme.

Standard and Specification

Natural Gas and Electricity Home Energy Reports for Behavioural Energy Efficiency

- Reports must include personalised comparison, comparing a consumer's energy use (based on natural gas or electrical consumption as dictated on the dwellings bi-monthly energy bill) against a group of no more than 200 similar households (*e.g.* by location, size, etc.)
- A minimum of six energy reports (three paper reports and three e-reports) shall be issued per year to the occupants of the dwelling. The energy reports should follow the issuing of an energy bill and reference the energy (Natural Gas/Electricity of the whole dwelling) usage during that period.
- Reports shall include advice for saving energy, potentially including but not limited to:
 - Savings behaviours that become habituated (*e.g.* turning off the lights),
 - Savings behaviours that are individually prompted (*e.g.* adjusting thermostat settings), and
 - Purchasing decisions (*e.g.* selection and installation of more energy efficient appliances)
 - Advice should be seasonally appropriate
- Advice for saving energy is personalised to the recipient. For example, the advice distinguishes homeowners from renters. Homeowners may receive more recommendations focused on installed measures, whereas renters may receive more behavioural prompts.
- Contact information for final customers' organisations, energy agencies or similar bodies, including website addresses, from which information may be obtained on available energy efficiency improvement measures, *e.g.* comparative end-user profiles and objective technical specifications for energy-using equipment.

6.28 Electricity Energy Monitors and Shower Energy Monitors

Energy monitors shall be installed to manufacturer's recommendations.

Metering heat and hot water energy is highly recommended as it gives the opportunity to review consumption, and this is mandatory under certain Programmes; refer to Programme-specific documentation for more details.

6.28.1 Electricity Energy Monitor

Standard and Specification

The electricity energy monitor must be complete with in-house display connected to electricity meter (*e.g.* linked via clamp-on transmitter).

It is an in-house display of real time energy and cost consumption:

- Individual single point energy monitors, *i.e.* three pin plug energy displays are not eligible as they do not display the overall energy consumption of the dwelling.
- Dwelling MPRN must be submitted with application for Energy Credits for energy monitors.

6.28.2 Shower Energy Monitor

Standard and Specification

The Shower energy monitor must be complete with display connected to a shower (*e.g.* connected to the shower hose). It must display real time energy consumption and should also display water usage and hot water temperature.

6.29 High Heat Retention Electric Storage Heaters

Contractor Requirements and Competency

High heat retention electric storage heaters should be installed by an electrical Contractor in accordance with manufacturer's guidelines as a minimum. The Contractor must be registered with the Register of Electrical Contractors of Ireland (RECI) or Electrical Contractors Safety and Standards Association (ECSSA).

To align with this requirement all registered electrical Contractors undertaking Electric Storage Heater upgrade works must be registered with RECI or ECSSA. Details on how to register are available at www.reci.ie and www.ecssa.ie

Product Standard and Specification

To qualify, the high heat retention electric storage heater must meet the following conditions:

1. It must be replacing an existing electric storage heater.
2. It must be a whole dwelling solution.
3. It must have a minimum heat retention not less than 45% as measured in accordance with BS EN 60531 (*Household Electric Thermal Storage Room Heaters – Methods for Measuring Performance*).
4. Heat retention must have been tested by an organisation accredited to test in accordance with BS EN 60531 or the testing must be endorsed by a body accredited to test in accordance with BS EN 60531.
5. It must include input and output controls.
6. It also must include a timer and a room thermostat, controllable by the user.

Installation Standard and Specification

A qualifying high heat retention electric storage heater must be sized appropriately for the room in which it is being installed. Suitable design methods for ensuring the heater is sized correctly are as per DOM 8, *Guide to the Design of Electric Space Heating Systems*, TEHVA or the manufacturer's sizing methodology.

The high heat retention electric storage heater should be installed by an electrical Contractor registered with RECI and in accordance with the applicable National Rules for Electrical Installations. Please refer to Section 3.2 Important guidance notes for Electrical works for details.

The high heat retention electric storage heater must also be installed in accordance with manufacturer's guidelines, NSAI's S.R. 54:2014 – *Code of practice for the energy efficient retrofit of dwellings* and the latest draft of the appropriate standard, as listed in Section 2.5 of the DHPLG and SEAI Document '*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008*'.

6.30 Solar Photovoltaic (PV) systems

Solar Photovoltaic (PV) modules shall be listed on the Triple E Product Register or meet the PV module requirements in the Solar PV Code of Practice.

The requirements for installation of Solar Photovoltaic (PV) systems are as detailed in SEAI's published Code of Practice for Solar PV <https://www.seai.ie/resources/publications/Code-of-Practice-Solar-PV-Grant.pdf>

The Solar PV Code of Practice includes sections on:

- Installer Requirements and Competency

- Solar PV System Design Requirements
- Component and Installation Requirements
- Energy Storage Systems
- Battery Energy Storage System
- Hot Water Diversion
- Space Heating and Electric Vehicle Diversion
- Inspection, Testing, Commissioning and Handover

6.31 Mechanical Extract Ventilation and Mechanical Ventilation with Heat Recovery

This measure is for continuous ventilation systems, including mechanical extract and balanced systems with heat recovery. It primarily focusses on centralised systems, although there is some reference to decentralised systems.

Contractors Requirements & Competency

This section outlines the general Standards & Specifications that Contractors, products and installation methods must conform to. The mechanical ventilation must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum.

Product Standard & Specification

All products must conform to the appropriate BS, EN or IS standard for the measure. As a minimum, the following Standards should be satisfied:

- COMMISSION DELEGATED REGULATION (EU) No 1254/2014 of 11 July 2014 *supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of residential ventilation units*
- I.S. EN 13141-1:2004 *Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices.*
- B.S. EN 13141-4:2011 *Ventilation for buildings. Performance testing of components/products for residential ventilation. Fans used in residential ventilation systems.*
- I.S. EN 13141-5:2004 *Ventilation for buildings. Performance testing of components/products for residential ventilation. Cowls and roof outlet terminal devices.*
- I.S. EN 13141-7:2011 *Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single-family dwellings.*
- I.S. EN 13141-11:2015 *Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 11: Supply Ventilation Units*
- I.S. EN 13141-6:2014 *Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 6: Exhaust Ventilation System Packages Used in a Single Dwelling*
- I.S. EN 13141-8:2014 *Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 8: Performance Testing of Un-ducted Mechanical Supply and Exhaust Ventilation Units (including Heat Recovery) for Mechanical Ventilation Systems Intended for a Single Room*
- BS EN 13141-9:2008 *Ventilation for buildings – Performance testing of components/products for residential ventilation. Externally mounted humidity controlled air transfer device*

- BS EN 13141-10:2008 *Ventilation for buildings – Performance testing of components/products for residential ventilation. Humidity controlled extract air terminal device*
- I.S. EN ISO 9972:2015 – *Thermal Performance of Buildings – Determination of Air Permeability of Domestic Buildings – (Single or Single & Multi) Fan Pressurization Method*
- BS 8233:2014: *Sound insulation and noise reduction for buildings Code of Practice.*
- I.S. EN ISO 9972:2015 – *Thermal Performance of Buildings – Determination of Air Permeability of Domestic Buildings – (Single or Single & Multi) Fan Pressurization Method*
- DHPLG *Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F 2009.*

Continuous Centralised Mechanical Extract Ventilation (MEV)

- The centralised mechanical extract ventilation system must be designed to provide ventilation for the entire dwelling.
- Continuous Mechanical Extract Ventilation includes Demand Control Ventilation.
- A MEV system should be considered where it is intended to achieve relatively low air leakage rates, typically 5 m³/hr/m² or less.
- Only MEV systems that are compliant with the Ecodesign Energy Labelling Directive with an SPI of no greater than 1.08 W/m³/h or included in SAP Appendix Q and that have a specific fan power (SFP) no greater than 0.3 W/(l/s) should be installed.
- Where continuous extract ventilation is proposed, the minimum ventilation rate provided should be in accordance with S.R. 54:2014.
- The sizing of ductwork should be in strict accordance with the size and type of ductwork that formed part of the SAP Appendix Q Product Characteristic Database (PCDB) testing of the ventilation unit. Note the specification of ductwork in PCDB is categorised as: ‘Flexible duct’, ‘Rigid duct’ or ‘No duct’. Where a semi-rigid duct is proposed, it must conform with PCDB requirements and listed as complying with “*Specification requirements applicable to the utilisation of Rigid duct performance data within the Standard Assessment Procedure (SAP) for dwellings with Semi-Rigid duct systems fitted to balanced whole-house mechanical ventilation systems*”.
- Air inlets should include humidity sensors so the system automatically adjusts air flow volume to ensure a comfortable indoor environment.
- Where an open-flued heat-producing appliance is in a dwelling that also contains continuous mechanical extraction.
- Background ventilation: A continuously running MEV system partially depressurises the dwelling. To allow for enough replacement air, each habitable room should be fitted with background equivalent ventilation area of at least 3,125 mm², as per S.R. 54:2014. Equivalent area is measured in accordance with the method specified in IS EN 13141-1: 2004. Background ventilation should not be installed in a wet room. Care should be taken to ensure adequate cross ventilation is provided throughout the dwelling.
- Purge ventilation for habitable rooms and wet rooms should be provided in accordance with S.R. 54:2014. In wet rooms the MEV system is acceptable as purge ventilation where the room does not have an external wall, although it may take longer for the MEV system (even at boost level of flow rate) to purge the room in question. For rooms only containing a WC, an opening

window is adequate for the purposes of purge ventilation. Where there is no window in the WC, the MEV system should provide extraction at the rate provided for in S.R. 54:2014.

Continuous Centralised Mechanical Ventilation with Heat Recovery (MVHR)

- A MEV system should be considered where it is intended to achieve relatively low air leakage rates, typically 3 m³/hr/m² or less.
- The MVHR system should be capable of an extract rate from each wet room at least equal to that specified in S.R. 54: 2014. It is not recommended to connect cooker hoods to Mechanical Ventilation with Heat Recovery systems. Where cooker hoods are connected, the guidance under fire precautions in BRE Digest 398 "*Continuous mechanical ventilation in dwellings*" should be followed.
- Where continuous extract ventilation is proposed, the minimum ventilation rate provided should be in accordance with S.R. 54:2014.
- The sizing of appropriate ductwork should be in strict accordance with the size and type of ductwork that formed part of the SAP Appendix Q (PCDB) testing of the ventilation unit. Note the specification of ductwork in PCDB is categorised as: 'Flexible duct', 'Rigid duct' or 'No duct'. Where a semi rigid duct is proposed, it must conform with PCDB requirements and listed as complying with "*Specification requirements applicable to the utilisation of Rigid duct performance data within the Standard Assessment Procedure (SAP) for dwellings with Semi-Rigid duct systems fitted to balanced whole-house mechanical ventilation systems*".
- Mechanical Ventilation with Heat Recovery (MVHR) systems are not designed to provide combustion air. Where open-flued appliances are installed, permanent dedicate combustion air supply is required. All extract points should be treated as if they were extract fans. Further guidance is available in BRE 398 "*Continuous Mechanical Ventilation in Dwellings*". It is recommended that a spillage test be carried out before and after installation of the ventilation system, with the appropriate spillage test procedure.
- The minimum capacity of a Mechanical Ventilation with Heat Recovery system should be based on the calculated general ventilation rate, adjusted to allow for air infiltration due to permeability of the building fabric, as per S.R. 54:2014.

Installation Standard & Specification

- a. It is essential that the original design is undertaken by a competent designer in accordance with manufacturers' guidance and established good practice.
- b. Ventilation systems must be installed in accordance with:
 - DHPLG document entitled *Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F 2009*.
 - Manufacturer's guidelines
 - S.R. 54:2014 *Code of Practice: Methodology for the energy efficient retrofit of existing dwellings*
 - The applicable National Rules for Electrical Installations. Please refer to Section 3.2 Important guidance notes for Electrical works for details.
- c. The suitability of connection of a continuous fan system to a cooker hood must follow the manufacturer's guidance.

- d. To ensure cross-ventilation, *i.e.* good transfer of air throughout the dwelling, there should be an undercut of minimum area 7600 mm² in all internal doors above the floor finish. This is equivalent to an undercut of 10 mm for a standard 760 mm width door.
- e. To meet extract requirements, the system may require a higher extract or boost capacity depending on the number of wet rooms (kitchens, bathrooms, utility room, etc.). The extract rate to be provided for each wet room is specified in S.R. 54.
- f. Ventilation systems shall be designed to minimise disturbance caused by noise. Fan units should be sized to run at their optimum speed and to provide suitable performance while minimising noise.

g. Fan unit

- The fan unit should be located as specified by the system designer.
- The fan unit should use no more than 0.50 W/l/s of specific fan power (SFP).
- Fan units should be installed to allow enough space to undertake routine maintenance on filters and heat exchanger block as appropriate and for replacement of the whole unit or key components at the end of its operational life.
- The fan unit should be installed on a suitable structure, which is stable and level. Locating the unit in an upper floor cupboard (insulated for sound proofing) should be considered.
- If the fan unit is not pre-insulated, insulation should be added to minimise the potential of condensation forming within, or on, the fan unit casing and should not create a fire risk.
- The fan unit should not exceed 35dB at full power.
- Where appropriate, a condensate drain should be installed from the fan unit to an appropriate drain location and should be adequately secured. The condensate pipe should be installed to have a minimum 5-degree fall from the fan unit. The condensate drain must also be adequately insulated to prevent freezing where passing through an unheated space.

h. Installation of ducts

- Where ducts pass through fire barriers, they must be appropriately fire stopped.
- Ducts should be sized to minimise pressure loss and noise generation. This is achieved by sizing of the ducts to limit the air velocity.
- A hole of a suitable dimension through the fabric of the building will be required for the installation of the duct. The hole will need a slight downward angle towards the outside to prevent water ingress.
- Where ductwork penetrates a building's air barrier, the continuity of the barrier must be maintained.
- The routing of ducts should aim to minimise overall duct length and minimise the number of bends required. It is particularly important to minimise bends in main ducts operating at higher air velocities.
- Where room air extract terminals/grilles are not fitted with filters, access to ducts for cleaning should be provided, where possible.
- Ducting should be insulated where it passes through unheated areas and voids (e.g. loft spaces), with material that has the equivalent of at least 25mm thickness and a thermal conductivity of < 0.04 w/(mK), to reduce the possibility of condensation forming. Ducting extending externally above roof level should be insulated or a condensate trap should be fitted just below roof level.
- Ducts within the building's heated envelope carrying cold air between the external supply/discharge terminals and the fan unit should be insulated and wrapped additionally with

a vapour barrier outside the insulation to prevent condensation occurring within the insulation material.

- Horizontal ducting, including ducting in walls, should slope slightly downwards away from the fan to prevent backflow of any moisture into the product. Vertical ducting will require a condensate trap to prevent backflow of any moisture into the product.
- Perforated insulated flexi duct should not be used between the fan unit and external discharge terminal to prevent condensation occurring within the insulation material.
- Ducts should not be installed where they can be damaged, for example run across open loft areas where they may be stood on or have items placed on them, breaking seals and possibly crushing the duct.
- Connection of components should not result in significant airflow resistance. Components should be proprietary and fit easily together without distortion.
- Rigid duct runs must be adequately supported. Flexible ductwork should be supported at suitable intervals to minimise sagging. It is especially important to support ductwork at the connections to the inlet terminal or onto the ventilation unit. Clips and supports for ductwork should be spaced at regular, equal distances and in accordance with the ductwork manufacturer's recommendations.
- Flexible duct should be pulled taught to ensure that the full internal diameter is obtained and flow resistance minimised. There should be no peaks and/or troughs in flexible ductwork.
- Bends in flexible duct should have a minimum inside radius equal to the diameter of the duct. If tighter bends are required, rigid bends should be used.
- It is recommended that ductwork be boxed in so the ductwork is still accessible to carry out any works.

i. Duct connections

- All duct connections require sealing to ensure the connections are airtight. Where ducts are installed against a solid structure, this can be difficult to achieve. In such locations, preassembly of duct sections should be considered. Connections should be permanent and suitable durable materials should be used to ensure the seal is maintained during installation. It is recommended to carry out leak testing on connections.
- Ducting should be adequately clamped to the inlet and outlet terminals to avoid detachment, which would result in warm, moist air being discharged into the space.
- All duct connections should be fully sealed to ensure no leakage of air can occur.
- Where access to ducts will not be possible after construction is complete, *i.e.* ductwork within floor and wall voids, permanent connection and sealing with an appropriate non-hardening sealant should be applied.
- Connection of lengths of flexible duct must use a rigid connector and jubilee clips or similar to ensure a long-term seal is achieved. Connections of lengths of flexible duct should not be taped-only

j. Supply and extract terminals/grilles

- All room air extract terminals should be installed as detailed by the system designer.
- Room air extract terminals should be installed as close to ceiling level as practical, to ensure warm moist air is removed from each space.

- Room supply air terminals must not be located adjacent to walls, unless designed to discharge air away from the wall, as this may result in down draughts.
- It is recommended that the supply and extract air terminals are separated by a minimum of 300mm horizontally if placed on the same façade of a building or per the manufacturer's instructions.
- The number and location of terminals installed in a space should ensure effective air distribution and ensure that air noise is not a nuisance when the system is operating at boost airflow rates.
- If the supply and extract air terminals are fixed, ensure that effective balancing of the system can be achieved. If this is not provided within the fan unit then dampers should be installed within the duct system to allow balancing when the system is commissioned.
- If terminals/grilles are adjustable, ensure each terminal/grille can be locked in its commissioned position once the system has been balanced.
- Acoustic attenuation should be incorporated into the supply terminal to reduce the impact of sound into the dwelling.
- The supply and extract air terminals should have an insect screen.

k. Supply and discharge terminals – roof and wall mounted

- Proprietary terminals should be used.
- Ensure that the free area¹ of the terminal opening is a minimum of 90% of the free area of the ducting being used.
- The location of the external discharge terminal should ensure that the potential for recirculation of extract air through the supply air terminal is minimised.

l. Controls

- Controls for ventilation systems should be suitable for continuous operation and should provide an indication to the occupant that the system is operating correctly or if there is a fault/maintenance required.
- Continuous ventilation systems should not allow the occupier to turn off the fan other than at the local isolator. Provision of an on/off function will result in the fans being operated intermittently and the required continuous airflow ventilation rates not being achieved.
- Where sensors are not integrated within the fan unit, only sensors specified by the manufacturer of the fan unit should be installed.
- If sensors are duct mounted, their location should be noted and provisions for access for maintenance or replacement made.
- If control of the fan speed is undertaken manually, the operation of the fan in boost mode should be made obvious to minimise the likelihood of it being left in this mode unnecessarily.
- In humidity-controlled systems, controls should be provided which allow for either manual or automatic switching to boost whenever a wet room is in use. Automatic controls should be set to switch to boost when relative humidity within the wet room reaches 70 %, and that the boost remains on until the relative humidity reduces to 50 %.

¹ As per Building Regulations (Part F), 'free area' is the geometric open area of a ventilator.

- Installation of room sensors should follow the manufacturer's guidance on positioning and in accordance with ETCl guidance.
- Where control of the fan speed is undertaken manually, switching should be provided locally to each of the spaces being served, e.g. bathrooms, kitchen, utility room, etc. Provision of a single centrally located switch is insufficient and will result in fans being left in inappropriate modes of operation.

m. Handover and Commissioning

- The installer must make good, to the satisfaction of the customer, any accidental damage sustained by a property where this is a direct result of their work or installation.
- Following installation, the ventilation system must be commissioned to verify that the installed system achieves the designed level of ventilation.
- Commissioning must be completed in accordance with the Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F 2009 and should include the following as a minimum:
 - Check that air flow direction is correct at each supply and extract terminal.
 - The system should be balanced to ensure that design airflow rates are achieved at each room terminal/grille.
 - Ensure all internal and external doors and windows are closed, including rooms in which measurements are being carried out.
 - Air flow measurements should be performed using a calibrated airflow device with proprietary hood attachment and results recorded in litres per second (l/s).
 - Record the airflow rate at each room terminal onto the commissioning sheet along with the design airflow rate for each terminal. Measurements should be taken at both maximum rate and minimum rate fan speeds.
 - The instrument should be calibrated annually and be capable of achieving an accuracy of $\pm 5\%$. Measurement of air flows should be performed using equipment that has been calibrated at an INAB (or equivalent) accredited calibration centre.
 - Upon completion of the installation, MVHR systems should be protected from dust during the retrofit of the dwelling. The system should be switched off and dust covers applied to air valves.
 - Prior to completion of the works, the system should:
 - be checked to ensure it is clear from dirt and dust that may have accumulated during construction. This includes all including ductwork and filters.
 - be commissioned to confirm performance
 - be adjusted by using the air valves and controls to achieve the correct balancing and airflow rates
 - have air valves locked in position after correct commissioning and balancing.
 - Any changes from the design should be referred to the designer and noted in the commissioning documentation.
- A digital copy of the commissioning documentation should be maintained.
- An operation and maintenance manual must be provided to the end user once the system has been fully installed and commissioned. The instructions in the manual should be presented in a clear and understandable way and relate directly to the installed system. The following information should be provided where relevant:

- Manufacturer's and installer contact details;
 - Use of air inlets for background ventilation;
 - Location of and setting automatic controls (e.g. humidity and timer controls);
 - Location and use of on/off settings for mechanical ventilation system;
 - Adjustable extract air terminals on vertical PSV ducts;
 - Instructions on how cleaning and maintenance should be carried out;
 - Location of filters if not installed within the fan unit. (If no filters installed on extract terminals, information on how ducts are accessed for replacement/cleaning and recommendations for how cleaning is to be undertaken);
 - Recalibration or checking of sensors and their location;
- The commissioning sheet and completion certificate, as described in *Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F 2009*, should be appended to the operation and maintenance manual.

Additional Guidance

- Good Practice Guide 268, Energy efficient ventilation in dwellings – a guide for specifiers (Energy Saving Trust)

6.32 High Heat Retention Cylinders

Contractor Competency

High-heat retention cylinders must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. If 'Controlled Works', as defined by the CRU document '*Definition of the Scope of Controlled Works*' are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued.

Product Standards and Specification

All high-heat retention cylinders must comply with the following requirements:

- High heat retention cylinder as per the *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008* document: (i.e. that the heat loss from the cylinder will not exceed $1.6 \times (0.2 + 0.051V^{2/3})$ kWh per 24 hours, where V is the nominal cylinder capacity in litres), or a standing loss less than 0.5W/l per hr
- Tested to the relevant standard:
 - BS 1566: 2002 *Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods* and/or
 - Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of BS 1566-1:2000 '*Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system*' or BS 3198 '*Specification for copper hot water storage combination units for domestic purposes*'
 - Unvented systems should comply with BS EN 12897 *Water supply. Specification for indirectly heated unvented (closed) storage water heaters* and/or be certified by Irish Agrément Board; or equivalent.

Installation Standards and Specifications

- a) Install as per manufacturer's guidelines.
- b) Hot water storage cylinders having factory-applied thermal insulation shall not be fitted with insulating jackets.
- c) The specification details of the installed hot water cylinder must be visible after insulation, or a self-adhesive label shall also be applied to the cylinder at an accessible position stating the name of the cylinder the Standard references (as outlined above) and performance details.
- d) Water services should be operated at temperatures that prevent Legionella growth. Hot water storage cylinders (calorifiers) should store water at 60°C or higher. Hot water should be distributed at 50°C or higher. Ensure that hot water draw offs have temperature mixing/blending valve(s) to prevent scalding.

The following standards and guidance documents are also useful:

- BS EN 14336:2004 '*Heating systems in buildings. Installation and commissioning of water-based heating systems' and the requirements of the system suppliers*'
- IS EN 12828 '*Heating systems in buildings. Design for water-based heating systems*'
- Micro generation Installation Standard: MIS 3004 '*Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Solid Biofuel Heating Systems*'

- CIBSE – *Domestic Heating Design Guide*

6.33 Electric Vehicle Chargers

Full details of this measure are detailed on the SEAI website: <https://www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-home-charger-grant/>

Contractor Competency

Contractors must be registered on RECI's Safe Electric list: <https://safeelectric.ie/find-an-electrician/>

Product Standards and Specification

The Home Charger system must meet the following criteria:

- 93/465/EEC – *The affixing and use of the CE conformity marking*
- IEC 61851 – *Electric vehicle conductive charging system*
- IEC 62196 – *Plugs, socket-outlets, vehicle couplers and vehicle inlets – Conductive charging of electric vehicles*
- 89/336/EEC – *Electromagnetic Compatibility Directive*
- WEEE (2002/96/EC) – *Waste Electrical and Electronic Equipment Directive*

Building Regulations

Works must be carried out in accordance with Irish Building Regulations. There is extensive detail in the Technical Guidance Documents and Building Regulations on the DHPLG website.

Installation Standards and Specifications

- a) All systems must be installed to manufacturer's guidelines.
- b) Only one charger may be installed per property under this measure.
- c) All electrical work must comply with the applicable National Rules on Electrical Installation. A Safe Electric Ireland Certificate Number 3 is required as evidence of compliance.
- d) The Customer should have an electrical survey of the home done before finally deciding on the EV and home charger combination prior to purchase and installation. This includes investigating the power requirement of the charger and quality of home wiring with respect to the current safe electrical standards and the proposed power demand from the Electric Vehicle. This may result in wiring upgrade recommendations such as one or more of:
 - Improving the Earthing connection.
 - Increasing the wire size of the connection between the fuse board and electricity meter.
 - Improving the electrical bonding between the metal pipes in the dwelling.

APPENDIX 1: REFERENCE DOCUMENTS

This Appendix lists the key reference guidance documents and standards and the measures to which they apply. For all measures bear in mind that:

- All measures must be installed as per the Manufacturer's Installation guidelines
- Building Regulations apply extensively to measures as detailed in Section 6 and are not referenced in depth in this Appendix. Contractors must comply with relevant parts of Building Regulations for all measures.
- This Appendix does not detail standards and references for Solar Photovoltaic Systems. These are covered in the document <https://www.seai.ie/resources/publications/Code-of-Practice-Solar-PV-Grant.pdf>

Domestic Technical Standards and Specifications

Reference (Publisher)	Cavity Wall	External Wall	Internal Wall	Ceiling-Level	Rafters/ flat roof	Floor	Heating Control with/without remote access	Boiler
NSAI Agrément Certificate (NSAI)	●	●	●		●	●		
BR 443 (BRE) Conventions for U-value calculations	●	●	●	●	●	●		
BS EN 60598-1 Luminaires. General requirements and tests				●	●			
ET101:2008 ETCI National Wiring Rules for Electrical Installations, https://www.etcie.ie/safety/nationalruleselectricalinstallations.html							●	●
CE 29 Domestic Heating by Oil: Boiler Systems (Energy Saving Trust)							●	●
CE 30 Domestic Heating by Gas: Boiler Systems (Energy Saving Trust)							●	●
GBG 301: Controls for Domestic Heating and Hot Water (Energy Saving Trust)								●
GBG 302: Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers (Energy Saving Trust)							●	
BS EN 60730 Automatic Electrical Controls for Household and similar use							●	
BS EN 215 Thermostatic Radiator Valves. Requirements and Test Methods							●	
CRU: Definition of the Scope of Controlled Works							●	●
BR 262 Thermal insulation avoiding risks	●	●	●	●	●			
BS 8215:1991: Design and installation of damp-proof courses in masonry construction (BSI)	●	●				●		
BS 7671: 2018: Requirements for Electrical Installations (BSI)							●	●
BS 5449: Specification for forced circulation hot water central heating systems for domestic premises (BSI)							●	●
BS 7478: Selection and Use of Thermostatic Radiator Valves (BSI)							●	
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHPLG and SEAI)							●	●
Guide to the Condensing Boiler Installation Assessment Procedure for Existing Dwellings (DHPLG and SEAI)								●
I.S. 813 Domestic Gas Installations (NSAI)								●
CER/09/083: The Regulation of gas installers with respect to safety (CER/CRU)								●
CIBSE – Domestic Heating Design Guide							●	●
GBG 28 Part 1 Domestic floors: construction, insulation and damp-proofing (BRE)						●		
GBG 45 Insulating ground floors (BRE)						●		
CP 102:1973 Protection of buildings against water from the ground						●		
BS 8102:2009 Code of practice for protection of below ground structures against water from the ground						●		
PD CEN/TR 12872:2014 – Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs						●		
S.R. 54:2014 Code of Practice	●	●	●	●	●	●	●	●

Domestic Technical Standards and Specifications

Reference (Publisher)	Solar water heating	Draught Proofing	Insulation of pipework and CWST	Window Replacement	Ex door replacement	Window Glazing Envelope Replacement	Window Glazing Low e-Film
CIBSE Solar heating design and installation guide	●						
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHPLG and SEAI)	●						
NSAI SR 50-2:2010 Code of practice for building services – Part 2: Solar panels	●						
ET101:2008 ETCI National Wiring Rules for Electrical Installations, https://www.etcie.ie/safety/nationalruleselectricalinstallations.html	●						
BS7386:1997 Specification for draught strips for the draught control of existing doors and windows in housing		●					
BS 5970 Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C			●				
BS 5422 Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within a temperature range -40°C to +700°C			●				
BS 8213-4:2016 Code of practice for the survey and installation of windows and external doorsets				●	●	●	
EN 14351-1:2006 Windows and doors – Product standard, performance characteristics				●	●		
EN 1279-1 Glass in building. Insulating glass units. Generalities, dimensional tolerances and rules for the system description				●		●	
EN 1279-2 Glass in building. Insulating glass units. Long term test method and requirements for moisture penetration				●		●	
IS EN ISO 12567 Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors				●	●		
IS EN ISO 10077 (Parts 1 and 2) Thermal performance of windows, doors and shutters				●	●		
BS 6262 Glazing for buildings. Code of practice for safety related to human impact				●	●	●	
BS 8000-0 Workmanship on construction sites. Introduction and general principles				●	●	●	
BS 8206-2:2008 Lighting for buildings. Code of practice for daylighting				●	●	●	●
PAS 24:2016 Enhanced security performance requirements for doorsets and windows in the UK. Doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk				●	●		
BS EN 410:2011 Glass in building. Determination of luminous and solar characteristics of glazing						●	●
BS EN 673:2011 Glass in building. Determination of thermal transmittance (U value). Calculation method						●	●
BS EN 12898:2001 Glass in building. Determination of the emissivity						●	

Reference (Publisher)	Multi Fuel Stoves	Powerflushing of heating systems	Magnetic filtration	Chimney Draught Limiter	Boiler Service	LED

Domestic Technical Standards and Specifications

BS 8303: Parts 1, 2 and 3 Installation of domestic heating and cooking appliances burning solid mineral fuels	●					
CE 47 Domestic Heating: Solid fuel systems	●					
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHPLG and SEAI)	●					
ET101:2008 ETCI National Wiring Rules for Electrical Installations, Fourth Edition https://www.etc.ie/safety/nationalruleselectricalinstallations.html	●					●
BS 7671: 2018 Requirements for electrical installations	●					
I.S. 813 Domestic Gas Installations (NSAI)	●					
Commission Regulation (EU) 2015/1185 of 24 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel local space heaters (Text with EEA relevance)	●					
BS 7593:2006 Code of practice for treatment of water in domestic hot water central heating systems		●				
SR-50-1 (draft)Code of practice for building services – Part 1: Domestic plumbing and heating where applicable			●			
BS 1251 Specification for open-fireplace components				●		
BS 3376 Specification for solid mineral fuel open fires with convection, with or without boilers				●		
SEAI gas boiler checklist					●	
SEAI oil boiler checklist					●	
EN 13032-1 and 2 Light and lighting – Measurement and presentation of photometric data of lamps and Luminaires						●
IES LM-79-08 Electrical and photometric measurements of Solid-State lighting products						●

Domestic Technical Standards and Specifications

Reference (Publisher)	Heat Pumps	Biomass Boilers (with or without thermal storage)
Micro generation Installation Standard: MIS 3005 Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Micro generation Heat Pump Systems	●	
DHPLG and SEAI document, Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L	●	
IS EN 15450 Heating Systems in Buildings – Design of Heat Pump Heating Systems	●	
ETCI National Wiring Rules for Electrical Installations ET101:2008 https://www.etcie.ie/safety/nationalruleselectricalinstallations.html	●	●
B.S. 5449: Forced circulation hot water central heating system for domestic installation	●	
IS EN 12831 Heating systems in buildings – method for calculation of design heat load	●	●
B.S. EN 12828+A1 Heating systems in buildings. Design for water-based heating systems	●	
EN 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to EN 806.	●	
The Heat Emitter Guide for Domestic Heat Pumps (MCS 021)	●	
Domestic Building Services Compliance Guide (Section 9)	●	
TR30 Guide to Good Practice – Heat Pumps (Building and Engineering Services Association)	●	
CIBSE Guide A – Environmental Design	●	
Good Practice Guide 339/CE 82, Domestic Ground Source Heat Pumps, Design and Installation of Closed-Loop System	●	
FB 59 – Design of Low-Temperature Domestic Heating Systems – a Guide for System Designers and Installers (BRE Trust)	●	
EPA “Summary Guidance for Compliance with the ODS and F-Gas Regulations”	●	
H.P.A.I. Heat Pump installation guidelines	●	
SEAI DEAP Heat Pump Methodology	●	
I.S. EN 378-1 and I.S. EN 378-3: Refrigerating systems and heat pumps – Safety and environmental requirements -Part1: Basic requirements, definitions, classification and selection criteria and -Part3: Installation site and personal protection	●	
CIBSE TM 51 Ground Source Heat Pumps	●	
I.S EN 17628 – Geotechnical Investigation and Testing – Geothermal Testing	●	
Environmental good practice guide for ground source heating and cooling (GEHO0311BTPA-E-E) by the UK Environment Agency	●	
GSI Geothermal Collector suitability Maps	●	
GSI Ground Source Heat and Shallow Geothermal Energy Homeowner Manual	●	
CIBSE – Domestic Heating Design Guide	●	●
BS 1566-1:2000 ‘Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system’		●
BS 3198 ‘Specification for copper hot water storage combination units for domestic purposes’		●
IS. EN. 12897 ‘Water supply. Specification for indirectly heated unvented (closed) storage water heaters’		●

Domestic Technical Standards and Specifications

Reference (Publisher)	Heat Pumps	Biomass Boilers (with or without thermal storage)
BS EN 14336:2004 'Heating systems in buildings. Installation and commissioning of water-based heating systems' and the requirements of the system suppliers'		●
IS EN 12828 'Heating systems in buildings. Design for water-based heating systems'		●
Micro generation Installation Standard: MIS 3004 Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Solid Biofuel Heating Systems		●
TR38 Guide to Good Practice – Installation of Biofuel Heating (Heating and Ventilation Contractors' Association)		●

Reference (Publisher)	Gas fired room heaters	high heat retention electric storage heater	High-heat retention cylinders
I.S. 813. Domestic Gas Installation	●		●
DHPLG and SEAI Document 'Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008'	●		
BS 7977-1:2009+A1:2013 'Specification for safety and rational use of energy of domestic gas appliances. Radiant/convectors'	●		
ETCI National Rules for Electrical Installations ET101 https://www.etci.ie/safety/nationalruleselectricalinstallations.html	●	●	
BS EN 60531 (Household Electric Thermal Storage Room Heaters – Methods for Measuring Performance)		●	
DOM 8, Guide to the Design of Electric Space Heating Systems, TEHVA or the manufacturer's sizing methodology		●	
BS 1566: 2002 Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods			●
IS EN 12897:2016 Water supply. Specification for indirectly heated unvented (closed) storage water heaters			●

Reference (Publisher)	Electric vehicle Chargers
93/465/EEC – The affixing and use of the CE conformity marking	●
IEC 61851 – Electric vehicle conductive charging system	●
IEC 62196 – Plugs, socket-outlets, vehicle couplers and vehicle inlets – Conductive charging of electric vehicles	●
89/336/EEC – Electromagnetic Compatibility Directive	●
WEEE (2002/96/EC) – Waste Electrical and Electronic Equipment Directive	●

Domestic Technical Standards and Specifications

Reference (Publisher)	Mechanical Extract Ventilation and Mechanical Ventilation with Heat Recovery
COMMISSION DELEGATED REGULATION (EU) No 1254/2014 of 11 July 2014 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of residential ventilation units	•
I.S. EN 13141-1:2004 Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices.	•
B.S. EN 13141-4:2011 Ventilation for buildings. Performance testing of components/products for residential ventilation. Fans used in residential ventilation systems.	•
I.S. EN 13141-5:2004 Ventilation for buildings. Performance testing of components/products for residential ventilation. Cowls and roof outlet terminal devices.	•
I.S. EN 13141-7:2011 Ventilation for buildings. Performance testing of components/products for residential ventilation. Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single-family dwellings.	•
I.S. EN 13141-11:2015 Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 11: Supply Ventilation Units	•
I.S. EN 13141-6:2014 Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 6: Exhaust Ventilation System Packages Used in a Single Dwelling	•
I.S. EN 13141-8:2014 Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 8: Performance Testing of Un-ducted Mechanical Supply and Exhaust Ventilation Units (including Heat Recovery) for Mechanical Ventilation Systems Intended for a Single Room	•
BS EN 13141-9:2008 Ventilation for buildings – Performance testing of components/products for residential ventilation. Externally mounted humidity controlled air transfer device	•
BS EN 13141-10:2008 Ventilation for buildings – Performance testing of components/products for residential ventilation. Humidity controlled extract air terminal device	•
I.S. EN ISO 9972:2015 – Thermal Performance of Buildings – Determination of Air Permeability of Domestic Buildings – (Single or Single & Multi) Fan Pressurization Method	•
BS 8233:2014: Sound insulation and noise reduction for buildings Code of Practice.	•

APPENDIX 2: SUMMARY TABLE OF COMPETENCIES AND STANDARDS

This Appendix summarises competencies, and installer/product standards and specifications for all measures. For all measures bear in mind that:

- Measures must be installed as per the manufacturer’s installation guidelines
- Contractors must adhere to the detailed guidance in Section 6. The “Measure” column below links to each relevant part of Section 6.
- Building Regulations apply extensively to measures as detailed in Section 6 and are not referenced in depth in this appendix. Contractors must comply with relevant parts of Building Regulations for all measures.

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Cavity wall insulation	NSAI Agrément approved	<ul style="list-style-type: none"> • The insulation system must be approved by the NSAI Agrément • Must help achieve a U-value of 0.35 W/m²K for external walls in as much as is physically and economically possible. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<ul style="list-style-type: none"> • The insulation system must be installed as per the conditions specified in the NSAI Agrément certificate and system supplier specifications. • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
External Wall Insulation	<p>Trained by manufacturer in the installation of the system.</p> <p>NSAI Agrément certified installer on ETICS. To facilitate full ETICS certification a Contractor can complete a maximum of one job if they have validly applied to NSAI Agrément to become a registered installer of this system.</p>	<ul style="list-style-type: none"> • The insulation system must be approved by the NSAI Agrément or equivalent. • Must help achieve a U-value of 0.27 W/m²K for external walls in as much as is physically and economically possible. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<ul style="list-style-type: none"> • The insulation system must be installed as per the manufacturer’s technical guidance and specifications and the NSAI Agrément certificate. • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Internal Wall Insulation	<ul style="list-style-type: none"> • Must be competent to install insulation in accordance with S.R. 54 – 2014 (Code of practice for the energy efficient retrofit of dwellings). • Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list 	<ul style="list-style-type: none"> • The insulation system must be approved by the NSAI Agrément or equivalent. • Must help achieve a U-value of 0.27 W/m²K for external walls in as much as is physically and economically possible. Where a U-value of 0.27 W/m²K is not achievable due to space restrictions (e.g. minimum stair space). At these locations, the internal insulation systems must achieve a maximum U-value less than 0.6 W/m²K. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<ul style="list-style-type: none"> • The insulation system must be installed as per NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Ceiling-Level Attic Insulation	Must be competent to install insulation in accordance with S.R. 54 – 2014 (Code of practice for the energy efficient retrofit of dwellings).	<ul style="list-style-type: none"> • Must help achieve a U-value of 0.16 W/m²K in as much as is physically and economically possible. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<ul style="list-style-type: none"> • The insulation must be installed as per NSAI’s S.R. 54:2014 <i>Code of Practice</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Rafter-Level Attic or Flat Roof Insulation	<ul style="list-style-type: none"> Must be competent to install insulation in accordance with S.R. 54 – 2014 (Code of practice for the energy efficient retrofit of dwellings). Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list 	<ul style="list-style-type: none"> The insulation system must be approved by the NSAI Agrément or equivalent. Must help achieve a U-value of 0.20 W/m²K for rafter insulation or 0.22W/m²K for flat roof insulation in as much as is physically and economically possible. U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<ul style="list-style-type: none"> The insulation must be installed as per NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Floor Insulation	<p>Must be competent to install insulation in accordance with</p> <ul style="list-style-type: none"> <i>Domestic floors: construction, insulation and damp-proofing</i> (GBG 28 Part 1) published by BRE <i>Insulating ground floors</i> (GBG 45), published by BRE 	<ul style="list-style-type: none"> The insulation system must be approved by the NSAI Agrément or equivalent. Must help achieve a U-value of 0.36 W/m²K or 0.15 W/m²K (underfloor heating) for floors in as much as is physically and economically possible. U-values are calculated according to the standards detailed in the DEAP methodology, TGD Part L and BR 443 – <i>Conventions for U-value calculations</i> 	<p>The insulation must be installed as per</p> <ul style="list-style-type: none"> <i>Domestic floors: construction, insulation and damp-proofing</i> (GBG 28 Part 1) published by BRE <i>Insulating ground floors</i> (GBG 45), published by BRE CP 102:1973 <i>Protection of buildings against water from the ground</i> BS 8102:2009 <i>Code of practice for protection of below ground structures against water from the ground</i> <i>Design and installation of damp-proof courses in masonry construction</i> (BS 8215:1991) PD CEN/TR 12872:2014 – <i>Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs</i> S.R. 54:2014 <i>Code of Practice</i>
New Boiler (Boiler must be installed complete with heating controls as outlined below)	<ul style="list-style-type: none"> High efficiency boilers must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the ‘minor’ electrical works involved in specific control measures. If ‘Controlled Works’, as defined by the CRU document ‘Definition of the Scope of Controlled Works’ are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. For gas boiler installation, Contractors must hold a Gas Contractors Domestic Certificate (GID, GI2 or GI3) 	<ul style="list-style-type: none"> Seasonal efficiency >= 90% https://www.seai.ie/energy-in-business/ber-assessor-support/harp-database/harp-database-search/ Carbon equivalent efficiency of new boiler must be better than existing boiler 	<ul style="list-style-type: none"> Manufacturer’s guidelines CE 29 <i>Domestic Heating by Oil: Boiler Systems</i> CE 30 <i>Domestic Heating by Gas: Boiler Systems</i> Building Regulations Technical Guidance Document J – Home Heating Appliances DHPLG and SEAI <i>Guide to the condensing boiler installation assessment procedure for Existing Dwellings</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
	<ul style="list-style-type: none"> For Natural Gas and LPG works the Contractor must be RGII registered 		<ul style="list-style-type: none"> <i>Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008</i> <i>CIBSE – Domestic Heating Design Guide</i> <i>ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008</i> <i>BS 5449 Specification for forced circulation hot water central heating systems for domestic premises</i> <i>Energy Saving Trust Good Practice Guide 301 Controls for Domestic Heating and Hot Water – Choice of Fuel and System Type</i> <i>I.S. 813 Domestic Gas Installations</i> <i>CRU Criteria Document - The Regulation of gas installers with respect to safety</i> <i>CRU Decision Paper – Definition of the Scope of Controlled Works</i>
2 Separate Zones with 24 hour 7-day Programmer (incl. remote access controls) – incorporating a room thermostat, DHW cylinder thermostat, motorised control valve and boiler interlock.	<ul style="list-style-type: none"> Heating controls must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the ‘minor’ electrical works involved in specific control measures. If ‘Controlled Works’, as defined by the CRU document ‘Definition of the Scope of Controlled Works’ are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. 	<p>BS EN 60730 <i>Automatic Electrical Controls for Household and similar Use</i></p>	<ul style="list-style-type: none"> Manufacturer’s guidelines Good Practice Guide 302 <i>Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers</i> Energy Saving trust <i>CIBSE - Domestic Heating Design Guide</i> <i>ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008</i> <i>BS 5449 Specification for forced circulation hot water central heating systems for domestic premises</i> <i>Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
			<ul style="list-style-type: none"> • CE29 <i>Domestic Heating by Oil: Boiler Systems – Guidance for Installers and Specifiers</i> Energy Saving Trust • CE30 <i>Domestic Heating by Gas: Boiler Systems – Guidance for Installers and Specifiers</i> Energy Saving Trust • CRU Decision Paper – Definition of the Scope of Controlled Works • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Additional Heating Zone Measure and Entry-level Heating Controls Measure	As above	As above	As above
Thermostatic Radiator Valves	<ul style="list-style-type: none"> • This control measure must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. • In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds 	BS EN 215 <i>Thermostatic Radiator Valves. Requirements and Test Methods</i>	<ul style="list-style-type: none"> • Manufacturer’s guidelines • BS 7478 <i>Selection and Use of Thermostatic Radiator Valves</i> • CIBSE - <i>Domestic Heating Design Guide</i> • Good Practice Guide 302 <i>Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers</i> Energy Saving Trust • DHPLG and SEAI Document <i>Heating and Domestic Hot Water Systems for Dwellings - Achieving Compliance with Part L</i> • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Time and Temperature Control of Electric Immersion Heater	<ul style="list-style-type: none"> • This control measure must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. • In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module 	BS EN 60730 <i>Automatic Electrical Controls for Household and similar Use</i>	<ul style="list-style-type: none"> • Manufacturer’s guidelines • Good Practice Guide 302 <i>Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers</i> Energy Saving Trust

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
	<p>during their course to carry out the ‘minor’ electrical works involved in specific control measures.</p> <ul style="list-style-type: none"> • If ‘Controlled Works’, as defined by the CRU document ‘Definition of the Scope of Controlled Works’ are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. 		<p>CIBSE – <i>Domestic Heating Design Guide</i></p> <ul style="list-style-type: none"> • <i>ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008</i> • CRU Decision Paper – Definition of the Scope of Controlled Works • <i>Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008</i> • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Additional Control Measures	<ul style="list-style-type: none"> • Additional control measures must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. • In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the ‘minor’ electrical works involved in specific control measures. • If ‘Controlled Works’, as defined by the CRU document ‘Definition of the Scope of Controlled Works’ are required, then these works must be carried out by a Registered Electrical Contractor and a Completion Certificate must be issued. 	<ul style="list-style-type: none"> • BS EN 60730 <i>Automatic Electrical Controls for Household and similar Use</i> • Other Relevant IS, BS or EN Standards (if available) 	<ul style="list-style-type: none"> • Manufacturer’s guidelines • Energy Saving trust – Good Practice Guide 302 <i>Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and installers</i> • CIBSE – <i>Domestic Heating Design Guide</i> • <i>ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008</i> • <i>Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008</i> • DHPLG and SEAI Document <i>Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L</i> • CRU Decision Paper – Definition of the Scope of Controlled Works • NSAI’s S.R. 54:2014 <i>Code of Practice</i>
Heat Pump Systems	<ul style="list-style-type: none"> • Fetac/QQI Level 6 Advanced Craft in Plumbing, including a module on minor electrical works, or equivalent • Certificate of competence from the specific manufacturer of the heat pumps installed, based on an adequate training programme • Fetac/QQI Level 6 Heat Pump Systems (Course Code C30263) and supplemental Domestic Heat Pump Installation (Code 700606) or equivalent 	<p>See Section 6.9.3 Product and installation requirements detailing:</p> <ul style="list-style-type: none"> • Heat pump types and minimum efficiency requirements • Ecodesign compliant • CE marking requirement • SEAI Triple E register • Adequate data for DEAP Heat Pump calculations 	<p>See Section 6.9.3 Product and installation requirements. Some of the key points are as follows:</p> <ul style="list-style-type: none"> • The heat pump system must be designed to meet all the space heating demand and at least 80% of the water heating demand based on DEAP calculations.

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
	<ul style="list-style-type: none"> Registration on the SEAI Renewable Energy Installers Register for heat pumps 		<ul style="list-style-type: none"> Manufacturer installation requirements must be followed Installer must ensure that documentation requirements are met
Heat Pumps (BEC)	<ul style="list-style-type: none"> Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures or the installer shall be listed on an approved manufacturer installers list. 	<ul style="list-style-type: none"> Qualifying heat pumps must be listed on the SEAI Home-heating Appliance Register of Performance (HARP) database or one of the European Heat Pump Association (EHPA) database, the European Commission's Ecolabel catalogue or have Eurovent Certification. IS EN 15450:2007 <i>Heating Systems in Buildings – Design of Heat Pump Heating Systems</i>. Section 8.1 of the DHPLG and SEAI document - <i>Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L</i> 	<ul style="list-style-type: none"> Manufacturer's guidelines, Microgeneration Installation Standard: MIS 3005 <i>Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Microgeneration Heat Pump Systems</i>, Industry best practice, Building Regulations Technical Guidance Document J – Home Heating Appliances, <i>The ETCI National Wiring Rules for Electrical Installations, Fourth Edition</i> ET101:2008 and B.S. 5449: <i>Forced circulation hot water central heating system for domestic installation</i> (or equivalent Irish standard) where applicable. <i>The Heat Emitter Guide for Domestic Heat Pumps</i> (MCS 021) IS EN 15450:2007 <i>Heating Systems in Buildings – Design of Heat Pump Heating Systems</i> <i>Domestic Building Services Compliance Guide</i> (Section 9) <i>TR30 Guide to Good Practice – Heat Pumps</i> (Building and Engineering Services Association) <i>CIBSE Guide A – Environmental Design</i> FB 59 – <i>Design of Low-Temperature Domestic Heating Systems – a Guide for System Designers and Installers</i> (BRE Trust) Good Practice Guide 339/CE 82, <i>Domestic Ground Source Heat</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Biomass boilers (with/without thermal storage)	<ul style="list-style-type: none"> Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the ‘minor’ electrical works involved in specific control measures. 	<ul style="list-style-type: none"> Minimum gross efficiency of 77% with thermal store of 82% without thermal store as listed on SEAI HARP database or equivalent. Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of BS 1566-1:2000 ‘<i>Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system</i>’ or BS 3198 ‘<i>Specification for copper hot water storage combination units for domestic purposes</i>’ Vented cylinders in materials other than copper should comply with the heat loss and heat exchanger requirements of BS 1566 Unvented hot water storage system products should: <ul style="list-style-type: none"> comply with IS. EN. 12897 ‘<i>Water supply. Specification for indirectly heated unvented (closed) storage water heaters</i>’; or be certified by the Irish Agrément Board; or be certified by another accredited body as complying with Building Regulations Unvented systems should not be used with gravity circulation Section 5.3 of the DHPLG and SEAI document – “<i>Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L</i>” must be adhered to. 	<p style="text-align: center;"><i>Pumps, Design and Installation of Closed-Loop System</i></p> <ul style="list-style-type: none"> BS 1566-1:2000 ‘<i>Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system</i>’ BS 3198 ‘<i>Specification for copper hot water storage combination units for domestic purposes</i>’ IS. EN. 12897 ‘<i>Water supply. Specification for indirectly heated unvented (closed) storage water heaters</i>’ BS EN 14336:2004 ‘<i>Heating systems in buildings. Installation and commissioning of water-based heating systems</i>’ and the requirements of the system suppliers’ IS EN 12828 ‘<i>Heating systems in buildings. Design for water-based heating systems</i>’ Micro generation Installation Standard: <i>MIS 3004 Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Solid Biofuel Heating Systems</i> TR38 <i>Guide to Good Practice – Installation of Biofuel Heating (Heating and Ventilation Contractors’ Association)</i> IS EN 12831 <i>Heating systems in buildings – method for calculation of design heat load</i> CIBSE – <i>Domestic Heating Design Guide</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Solar heating system	<ul style="list-style-type: none"> National Craft Certificate in a relevant trade (Electrical, Plumbing or Fitting) or a Level 6 qualification in a related area such as Building Services, G.I.D. etc. Accredited training providers are listed on the SEAI website: https://www.seai.ie/energy-in-business/register-with-seai/renewable-energy-installer 	<p>The product must be registered on the SEAI Solar Thermal Registered Product List www.seai.ie/resources/publications/Solar-Thermal-Registered-Product-List.pdf</p> <p>Requirements for this list are the provision of a product registration questionnaire and an EN 12975 Performance Test Report and an EN 12975 Durability Test, or the latest version of this standard, BS EN ISO 9806:2013.</p> <p>Each Homeowner must be supplied with a warranty (product and labour) of at least 5 years.</p>	<ul style="list-style-type: none"> ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008 NSAI document 'Irish guidelines (SR 50-2:2010 Code of practice for building services – Part 2: Solar panels, ETCI National Wiring Rules for Electrical Installations, Fourth Edition ET101:2008 Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L 2008 Solar Heating Design and Installation Guide – CIBSE Guide A Standard Solar Commissioning Report (SCR) as available on the Better Energy Homes website must be completed and a copy provided to each Homeowner.
Draught Proofing	<p>Must be competent to install draught proofing in accordance with BS 7386:1997 <i>Specification for draught strips for the draught control of existing doors and windows in housing.</i></p>	<ul style="list-style-type: none"> The draught proofing system must be manufactured to relevant IS, BS or EN standard Installed as per manufacturer's instructions Measures include: <ul style="list-style-type: none"> Letterbox seals Door-bottom brushes Window draught stripping Door draught stripping Attic hatch draught proofing 	<p>The insulation must be installed as per manufacturer's guidelines. Section 6.12 details a several steps for each of the types of draught proofing to be installed.</p>
Insulation of pipework and water storage tanks	<p>Must be competent to install Insulation of pipework and water storage tanks in accordance TGD part G of the Building Regulations</p>	<ul style="list-style-type: none"> BS 5970 <i>Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C</i> and BS 5422 <i>Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C.</i> 	<p>The insulation must be installed as per manufacturer's guidelines</p>
Window Replacement	<p>Must be competent to install windows in accordance with <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016) and the manufacturer's guidelines as a minimum requirement.</p>	<ul style="list-style-type: none"> U-value requirement of 1.4W/m²K or better as much as is physically and economically feasible. EN 14351-1:2006 (<i>Windows and doors – Product standard, performance characteristics</i>). Glazing must conform to EN 1279-1 (<i>Glass in building. Insulating glass units. Generalities, dimensional tolerances and rules for the system description</i>) 	<p>The window must be installed as per</p> <ul style="list-style-type: none"> Manufacturer's guidelines <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016)

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
		<ul style="list-style-type: none"> • EN 1279-2 (<i>Glass in building. Insulating glass units. Long term test method and requirements for moisture penetration</i>) • NSAI Window Energy Performance (WEP) certification, British Fenestration Rating Council • U-values derived according to IS EN ISO 12567 <i>Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors</i> or IS EN ISO 10077 (Parts 1 and 2) <i>Thermal performance of windows, doors and shutters</i> • BS 6262 <i>Glazing for buildings. Code of practice for safety related to human impact</i> • BS 8000-0 <i>Workmanship on construction sites. Introduction and general principles</i> • BS 8206-2:2008 <i>Lighting for buildings. Code of practice for daylighting</i> 	
External Door Replacement	Must be competent to install doors in accordance with <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016) and the manufacturer’s guidelines as a minimum requirement.	<ul style="list-style-type: none"> • U-value requirement of 1.4W/m²K or better as much as is physically and economically feasible. • EN 14351-1:2006 (<i>Windows and doors – Product standard, performance characteristics</i>). • PAS 24:2016 – <i>Enhanced security performance requirements for doorsets and windows in the UK. Doorsets and windows intended to offer a level of security suitable for dwellings and other buildings exposed to comparable risk</i> U-values derived according to IS EN ISO 12567 <i>Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors</i> or IS EN ISO 10077 (Parts 1 and 2) <i>Thermal performance of windows, doors and shutters</i> • BS 6262 <i>Glazing for buildings. Code of practice for safety related to human impact</i> • BS 8000-0 <i>Workmanship on construction sites. Introduction and general principles</i> • BS 8206-2:2008 <i>Lighting for buildings. Code of practice for daylighting</i> 	The external door must be installed as per <ul style="list-style-type: none"> • Manufacturer’s guidelines • <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016)
Window Glazing Envelope Replacement	Must be competent to install window Glazing Envelope in accordance with <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016) and the manufacturer’s guidelines as a minimum requirement and BS 8000-0 <i>Workmanship on construction sites. Introduction and general principles</i>	<ul style="list-style-type: none"> • U-value requirement of 2.1W/m²K or better as much as is physically and economically feasible. • Window Glazing Envelope must conform to EN 1279-1 (<i>Glass in building. Insulating glass units. Generalities, dimensional tolerances and rules for the system description</i>) • EN 1279-2 (<i>Glass in building. Insulating glass units. Long term test method and requirements for moisture penetration</i>) • BS 6262 <i>Glazing for buildings. Code of practice for safety related to human impact</i> 	The Window Glazing Envelope must be installed as per <ul style="list-style-type: none"> • Manufacturer’s guidelines • <i>Code of practice for the survey and installation of windows and external doorsets</i> (BS 8213-4:2016)

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
		<ul style="list-style-type: none"> • BS 8000-0 <i>Workmanship on construction sites. Introduction and general principles</i> • BS EN 410:2011 <i>Glass in building. Determination of luminous and solar characteristics of glazing</i> • BS EN 673:2011 <i>Glass in building. Determination of thermal transmittance (U value). Calculation method</i> • BS 8206-2:2008 <i>Lighting for buildings. Code of practice for daylighting</i> • BS EN 12898:2001 <i>Glass in building. Determination of the emissivity</i> 	
Window Glazing – Low e-film	<ul style="list-style-type: none"> • Must be competent to complete the installation • Must complete the work in accordance with the manufacturer’s guidelines. • Must be trained and registered by the manufacturer. 	<ul style="list-style-type: none"> • U-value requirement of 2.4W/m²K or better for double glazing 3.5W/m²K or better for single glazing as much as is physically and economically feasible. • BS EN 410:2011 <i>Glass in building. Determination of luminous and solar characteristics of glazing</i> 	<p>The Window Glazing Envelope must be installed as per</p> <ul style="list-style-type: none"> • Manufacturer’s guidelines • BS 8206-2:2008 <i>Lighting for buildings. Code of practice for daylighting</i>
Multi fuel stoves	<ul style="list-style-type: none"> • Must be competent to install Multi Fuel Stoves in accordance document <i>Installation of domestic heating and cooking appliances burning solid mineral fuels</i> (BS 8303: Parts 1, 2 and 3) and in accordance with <i>Domestic Heating: Solid fuel systems</i> (CE 47) published by the Energy Saving Trust • Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list 	<ul style="list-style-type: none"> • BS EN 13240 (Room heaters fired by solid fuel. Requirements and test methods) • https://www.seai.ie/energy-in-business/ber-assessor-support/harp-database/harp-database-search/ • Deep Retrofit Programme mandates biomass (not including peat) stoves with efficiency greater than or equal to 70%. These stipulations are recommended but not mandatory for BEC, BEF and EEOS Programmes. • Ecodesign Regulation EC 2015/1185 	<p>Multi Fuel Stoves must be installed as per</p> <ul style="list-style-type: none"> • Manufacturer’s guidelines • <i>Installation of domestic heating and cooking appliances burning solid mineral fuels</i> (BS 8303: Parts 1, 2 and 3) • <i>Domestic Heating: Solid fuel systems</i> (CE 47) published by the Energy Saving Trust • BS 7671: 2018 <i>Requirements for electrical installations</i> • <i>ETCI National Wiring Rules for Electrical Installations, Fourth Edition</i> (ET101:2008). • I.S. 813 <i>Domestic Gas Installations</i>
Gas fired room heaters	<p>Gas-fired room heaters must be installed by suitably qualified individuals in accordance with manufacturer’s guidelines and industry best practice as a minimum. Contractors installing Liquefied Petroleum Gas (LPG) or Natural Gas boilers must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3) and be registered with RGI.</p>	<ul style="list-style-type: none"> • Minimum gross efficiency of 65% from accredited test body, HARP database or manufacturer’s declaration. • I.S. 813 <i>Domestic Gas Installation</i>. • Section 2.5 of the DHPLG and SEAI Document <i>‘Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008’</i> • BS 7977-1:2009+A1:2013 <i>‘Specification for safety and rational use of energy of domestic gas appliances. Radiant/convector’</i> and • BS EN 613:2001 – <i>Independent gas-fired convection heaters</i> 	<ul style="list-style-type: none"> • I.S. 813. <i>Domestic Gas Installation</i> • DHPLG and SEAI Document <i>‘Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008’</i> • BS 7977-1:2009+A1:2013 <i>‘Specification for safety and rational use of energy of domestic</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
			<p style="text-align: right;"><i>gas appliances.</i></p> <p><i>Radiant/convector's</i></p> <ul style="list-style-type: none"> ETCI National Rules for Electrical Installations ET101
Mechanically-assisted powered cleanse and flush (powerflushing) of a heating system	<ul style="list-style-type: none"> Mechanically-assisted powered cleansing and powerflushing of a heating system must be carried out by suitably qualified individuals in accordance with manufacturer's guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. For gas/LPG systems, must hold Gas Contractors Domestic Certificate For oil systems, should be registered with professional organisation such as OFTEC 	<p>BS 7593 <i>Code of practice for treatment of water in domestic hot water central heating systems</i></p>	<p>Mechanically-assisted powered cleanse and flush (powerflushing) of a heating system must be performed as per</p> <ul style="list-style-type: none"> Manufacturer's guidelines BS 7593 <i>Code of practice for treatment of water in domestic hot water central heating systems</i>
Installation of magnetic filtration system to existing heating system	<ul style="list-style-type: none"> Must be competent to install magnetic filtration system to existing heating system. Must be installed by suitably qualified individuals in accordance with manufacturer's guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds For gas/LPG systems, must hold a Gas Contractors Domestic Certificate For oil systems, should be registered with professional organisation such as OFTEC 	<p>SR-50-1 (draft)<i>Code of practice for building services – Part 1: Domestic plumbing and heating</i> where applicable</p>	<p>Magnetic filtration system to existing heating system must be installed as per</p> <ul style="list-style-type: none"> Manufacturer's guidelines SR-50-1 (draft)<i>Code of practice for building services – Part 1: Domestic plumbing and heating</i> where applicable
Chimney Draught Limiter	<p>Must be competent to install a Chimney Draught Limiter. Must be installed by suitably qualified individuals in accordance with manufacturer's guidelines and industry best practice as a minimum.</p>	<ul style="list-style-type: none"> BS 1251 '<i>Specification for open-fireplace components</i>' and BS 3376 '<i>Specification for solid mineral fuel open fires with convection, with or without boilers</i>' 	<ul style="list-style-type: none"> Chimney Draught Limiter must be installed as per manufacturer's guidelines Temporary draught limiters are not included in this measure.
Boiler Service	<ul style="list-style-type: none"> Must be competent to service a boiler and must be suitably qualified in accordance with manufacturer's guidelines and industry best practice as a minimum. In addition, they must hold a Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. For gas/LPG systems, must hold a Gas Contractors Domestic Certificate 	<ul style="list-style-type: none"> Manufacturer's guidelines SEAI boiler service checklists I.S. 813 <i>Domestic Gas Installations</i> (where applicable) 	<p>Boiler must be serviced as per</p> <ul style="list-style-type: none"> Manufacturer's guidelines SEAI boiler service checklists I.S. 813 <i>Domestic Gas Installations</i> (where applicable)

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
	<ul style="list-style-type: none"> For oil systems, should be registered with professional organisation such as OFTEC 		
LED	Contractors installing LED lighting must be competent to complete the installation.	<ul style="list-style-type: none"> Ecodesign regulation EU 1194/2012 LED luminaires: <ul style="list-style-type: none"> EN 13032-1 and 2 <i>“Light and lighting – Measurement and presentation of photometric data of lamps and Luminaires”</i> OR IES LM-79-08 <i>“Electrical and photometric measurements of Solid-State lighting products”</i>. <p>LED lamps:</p> <ul style="list-style-type: none"> IES LM-79-08 <i>“Electrical and photometric measurements of Solid-State lighting products”</i>. 	LEDs must be installed as per manufacturer’s guidelines
Home Energy Reports		<ul style="list-style-type: none"> Personalised comparison of dwelling energy use from energy bills against a group of similar households Minimum of six reports per year Includes energy saving advice personalised to the recipient 	
Electric Energy and Shower Energy Monitors	Energy monitors shall be installed to manufacturer’s recommendations.	<p>Electricity Energy Monitor:</p> <ul style="list-style-type: none"> Includes inhouse display connected to electricity meter (e.g. linked via clamp-on transmitter) of real time energy and cost consumption: Individual single point energy monitors i.e. three pin plug energy displays are not eligible as they do not display the overall energy consumption of the dwelling <p>Shower Energy Monitor</p> <ul style="list-style-type: none"> Energy monitor complete with display connected to a shower (e.g. connected to the shower hose) Must display real time energy consumption and should display water usage and hot water temperature. 	<ul style="list-style-type: none"> MPRN must be submitted with application for Energy Credits for electricity energy monitors Install to manufacturer’s recommendations. ETCI National Wiring Rules for Electrical Installations ET 101
High heat retention electric storage heater	<ul style="list-style-type: none"> High heat retention electric storage heaters must be installed by an electrical Contractor in accordance with manufacturer’s guidelines and industry best practice as a minimum. Must be registered with the Register of Electrical Contractors of Ireland (RECI) or Electrical Contractors Safety and Standards Association (ECSSA). 	<ul style="list-style-type: none"> It must be replacing an existing electric storage heater. It must be a whole dwelling solution. It must have a minimum heat retention not less than 45% as measured in accordance with BS EN 60531 (<i>Household Electric Thermal Storage Room Heaters – Methods for Measuring Performance</i>) Heat retention must have been tested by an organisation accredited to test in accordance with BS EN 60531 or the testing must be endorsed by a body accredited to test in accordance with BS EN 60531 It must include input and output controls 	<p>High heat retention electric storage heater Installation must be installed as per</p> <ul style="list-style-type: none"> Manufacturer’s guidelines DOM 8, <i>Guide to the Design of Electric Space Heating Systems</i>, TEHVA or the manufacturer’s sizing methodology. ETCI <i>National Rules for Electrical Installations</i> ET101. S.R. 54:2014 – <i>Code of practice for the energy efficient retrofit of dwellings</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
		<ul style="list-style-type: none"> It also must include a timer and a room thermostat, controllable by the user. 	<ul style="list-style-type: none"> DHPLG and SEAI Document '<i>Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L 2008</i>'.
Solar Photovoltaic (PV) Systems	<p>Solar Photovoltaic (PV) modules shall be listed on the Triple E Product Register or meet the PV module requirements in the Solar PV Code of Practice.</p> <p>The requirements for installation of Solar Photovoltaic (PV) systems are as detailed in SEAI's published Code of Practice for Solar PV https://www.seai.ie/resources/publications/Code-of-Practice-Solar-PV-Grant.pdf</p>	<p>Solar Photovoltaic (PV) modules shall be listed on the Triple E Product Register or meet the PV module requirements in the Solar PV Code of Practice.</p> <p>The requirements for installation of Solar Photovoltaic (PV) systems are as detailed in SEAI's published Code of Practice for Solar PV https://www.seai.ie/resources/publications/Code-of-Practice-Solar-PV-Grant.pdf</p>	<p>Solar Photovoltaic (PV) modules shall be listed on the Triple E Product Register or meet the PV module requirements in the Solar PV Code of Practice.</p> <p>The requirements for installation of Solar Photovoltaic (PV) systems are as detailed in SEAI's published Code of Practice for Solar PV https://www.seai.ie/resources/publications/Code-of-Practice-Solar-PV-Grant.pdf</p>
Mechanical Ventilation and Heat Recovery Systems	<p>Must be carried out by suitably qualified individuals in accordance with manufacturer guidelines and industry best practice at a minimum.</p>	<ul style="list-style-type: none"> Detailed list of relevant standards and performance criteria in Section 6.31. 	<ul style="list-style-type: none"> System must be designed by competent designer in accordance with manufacturer's guidance and industry best practice S.R. 54:2014 – <i>Code of practice for the energy efficient retrofit of dwellings</i> <i>ETCI National Rules for Electrical Installations</i> ET101. Undercut of internal doors to ensure adequate cross ventilation System must minimise noise, with fans sized to run at optimum speed and performance Fan location, installation of ducts, duct connections, supply/extract terminals, controls all detailed in Section 6.31 System handover and commissioning as per Section 6.31.
High Heat Retention Cylinders	<ul style="list-style-type: none"> Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds. Plumbers must have completed an electrical module during their course to carry out the 'minor' electrical works involved in specific control measures. 	<ul style="list-style-type: none"> Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of BS 1566-1:2000 '<i>Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl chloride) (PVC-C). Specification for pipes, fittings and the system</i>' or 	<ul style="list-style-type: none"> BS 1566-1:2000 '<i>Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Chlorinated poly (vinyl</i>

Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
		<p>BS 3198 'Specification for copper hot water storage combination units for domestic purposes'</p> <ul style="list-style-type: none"> Vented cylinders in materials other than copper should comply with the heat loss and heat exchanger requirements of BS 1566 Unvented hot water storage system products should: <ul style="list-style-type: none"> comply with IS. EN. 12897 'Water supply. Specification for indirectly heated unvented (closed) storage water heaters'; or be certified by the Irish Agrément Board; or be certified by another accredited body as complying with Building Regulations Unvented systems should not be used with gravity circulation Section 5.3 of the DHPLG and SEAI document – "Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L" must be adhered to. 	<p>chloride) (PVC-C). Specification for pipes, fittings and the system'</p> <ul style="list-style-type: none"> BS 3198 'Specification for copper hot water storage combination units for domestic purposes' IS. EN. 12897 'Water supply. Specification for indirectly heated unvented (closed) storage water heaters' BS EN 14336:2004 'Heating systems in buildings. Installation and commissioning of water-based heating systems' and the requirements of the system suppliers' IS EN 12828 'Heating systems in buildings. Design for water-based heating systems' Micro generation Installation Standard: MIS 3004 Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Solid Biofuel Heating Systems TR38 Guide to Good Practice – Installation of Biofuel Heating (Heating and Ventilation Contractors' Association) IS EN 12831 Heating systems in buildings – method for calculation of design heat load CIBSE – Domestic Heating Design Guide
<p>Electric Vehicle Chargers</p>	<p>Contractors must be registered on RECI's Safe Electric list: https://safeelectric.ie/find-an-electrician/</p>	<p>The Home Charger system must meet the following criteria:</p> <ul style="list-style-type: none"> 93/465/EEC – The affixing and use of the CE conformity marking IEC 61851 – Electric vehicle conductive charging system IEC 62196 – Plugs, socket-outlets, vehicle couplers and vehicle inlets – Conductive charging of electric vehicles 89/336/EEC – Electromagnetic Compatibility Directive WEEE (2002/96/EC) – Waste Electrical and Electronic Equipment Directive 	<ul style="list-style-type: none"> All systems must be installed to manufacturer's guidelines. Only one charger may be installed per property. All electrical work must comply with National Rules on Electrical Installation. A Safe Electric Ireland

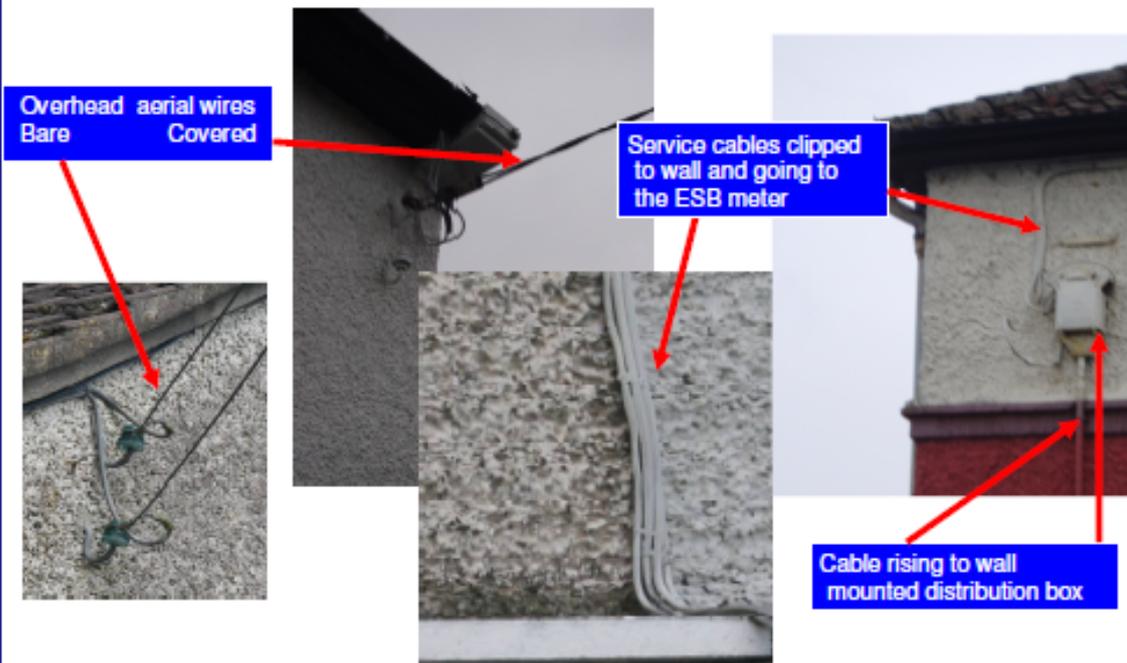
Domestic Technical Standards and Specifications

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
			<p>Certificate Number 3 is required to evidence this compliance.</p> <ul style="list-style-type: none"> The Customer should have an electrical survey of the home done before finally deciding on the EV and home charger combination prior to purchase and installation.
Outline of Ventilation Section	<p>Key section referenced for several measures. See Section 5.</p>	<p>Key section referenced for several measures. See Section 5.</p>	<ul style="list-style-type: none"> Ventilation must be considered at planning and execution stages when thermal envelope being altered or other measures being carried out that could have a bearing on ventilation. NSAI's S.R. 54:2014 <i>Code of Practice (particularly Sections 4.5, 10.2.2.1 and Tables 30, 31, 32, 35)</i> BS 5250:2011 - <i>Code of practice for control of condensation in buildings</i> I.S. EN ISO 13788:2012 - <i>Hygrothermal Performance of Building Components and Building Elements - Internal Surface Temperature to Avoid Critical Surface Humidity and Interstitial Condensation - Calculation Methods</i> I.S. EN 15026:2007 - <i>Hygrothermal Performance of Building Components and Building Elements - Assessment of Moisture Transfer by Numerical Simulation</i>

APPENDIX 3: ESB NETWORKS GUIDANCE DOCUMENTS

Introduction

Houses which are suitable for external wall insulation are in most instances connected to the ESB network by either, an overhead aerial wire(s) or a wall mounted distribution box. Surface mounted service cables are then used to complete the connection to the Electricity Meter position. Examples of each are shown in the following photographs:

**Safety**

For Health and Safety reasons - including fire safety, External Wall Insulation or other materials MUST NOT be placed over ESB Networks electricity cables or fixtures.

Where the electricity supply to a house is attached to external walls or soffits, as shown in the photographs above, ESB Networks must be contacted to arrange for the required alteration. The insulation contractor or other third party must not attempt to remove or touch any service cable, aerial wires or other fixtures belonging to ESB Networks. Only ESB trained and approved personnel are permitted to alter or work on these cables/wires.

Sustainable Energy Authority of Ireland (SEAI)

SEAI's Terms and Conditions for grant approvals require compliance with this Guideline.

SEAI's 'Contractors Code of Practice and Standards and Specification Guidelines' under the 'Better Energy Homes Scheme' also specifies the need for full compliance with this Guideline. A set of drawings showing technical specifications titled 'External Wall Insulation' also form part of the Code of Practice and should be referred to for guidance.

Charge for Service Alterations

ESB Networks apply a standard charge where the service cables / aerial wires etc. to a domestic house have to be altered. This charge, which is approved by the Commission for Energy Regulation, is €397 payable in advance and is subject to change.

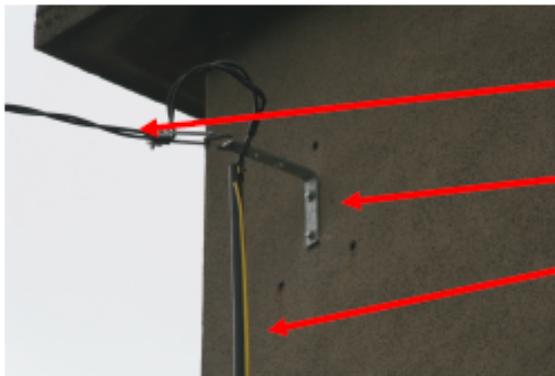
Contacting ESB Networks

ESB Networks can be contacted by calling **1850-372-757**. The **Meter Point Reference Number (MPRN)** for the property where the work is being carried out is required by the Call Centre when logging a service alteration request. The **MPRN** number can be found on your electricity bill directly beneath the ESB Networks emergency phone number. **ESB Networks require a minimum notice of 5 working days from receipt of payment for a site visit.**

Site Visit

As part of the initial site visit, ESB Networks will carry out all preliminary work **to allow the wall insulation work to commence**. This preliminary work will include:

- **Unclipping of existing service cables** (and replacement of cables where required)
- **Removal of anchor insulators and the fitting of a new extended aerial bracket**
- **Installation of new covered "bundle" aerial wire** if the existing aerial wire is bare or PVC covered (See photograph below)
- **Fit lead in pipe if required**



New covered "bundle" aerial wire

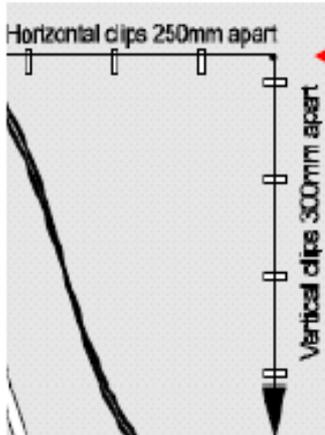
New aerial wall bracket installed

Service cables unclipped, temporary cover may be fitted over service cables to provide additional mechanical protection if required while installation of wall insulation is in progress

Reinstatement of Service Cables

The homeowner or contractor must notify ESB Networks as soon as the work is complete. The contractor is required to fit non load bearing fixing elements for cable clips along the service route to enable ESB Networks to re-clip the service. These fixing elements should be spaced at 250mm intervals for horizontal runs and 300mm for vertical runs. They must have sufficient strength to support the service cable. The contractor shall mark the location of these fixing elements on the finished render to avoid the risk of damage to the render during re-clipping. For Safety reasons ESB Network service cables **must not** come into contact with un-rendered insulation materials. A lead in pipe is required where the service cables pass through insulation to the meter position. ESB Networks will supply and fit this where required.

Alternatively: The service cable can be placed in a 50mm by 50mm UPVC trunking. **The contractor is responsible for supplying and fitting this trunking.** The trunking must be securely fixed with non load bearing fixing elements. **Trunking fixed with an adhesive backing is not acceptable.**



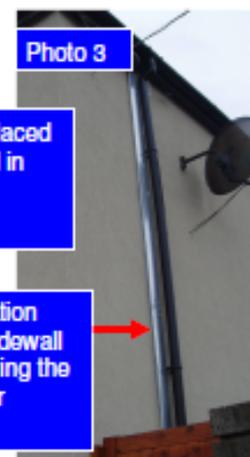
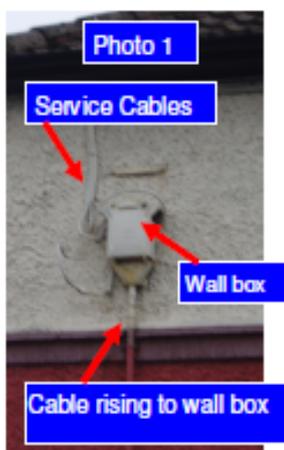
Spacing of non load bearing fixing elements for reinstating service cables to finished render.

Alternatively the service cables can be enclosed in UPVC trunking.



Wall Distribution Box

In some urban situations a Wall Distribution Box will be found at an elevated level instead of overhead aerial wire(s). **ESB Networks must be contacted to remove this box before external wall insulation is fitted.** The three photographs below show the stages involved in replacing a Wall Distribution Box. Photo 1 shows an existing Wall Distribution Box. The Wall Box is connected to the ESB underground network by a surface mounted cable. The electricity supply to a number of houses is taken from the box. Photos 2 and 3 show the existing surface mounted cable and Wall Distribution Box replaced with a new cable enclosed in a 100 x 100mm steel trunking (supplied by ESB Networks). The steel trunking is mounted on a timber backing. **The timber backing must be supplied and fitted by the contractor carrying out the external wall insulation.** The wall insulation and finished render cover the sidewall of the steel trunking. The lid of the trunking must not be covered as this provides access for ESB to their cables (photo 3). Ground excavation for connecting the cable is normally located on the property, but it may be necessary to locate this trench on the public footpath.



Outdoor Meter Cabinet

Where an outdoor meter cabinet exists, the ESB Networks equipment in the meter cabinet may be connected to the Network by:

1. **Overhead aerial wires and service cable or a wall mounted box and service cable** (see photos on Page 1)
2. **An underground service cable** (from a pole or ground mounted pillar or buried mains cable)

Where the connection to the cabinet is by means of an underground service cable which runs within the wall cavity along its full length from the cabinet to the network, then it is not necessary to contact ESB Networks before proceeding with the external wall insulation. However, care must be exercised when drilling or attaching fixings under or in the vicinity of the cabinet, to ensure that electric cables within the cavity are not damaged.

In any situation where the connection from the ESB network to the meter involves any cables, wires or other fixtures that are attached to an external wall or soffit, then ESB Networks must be contacted to carry out the required alteration.

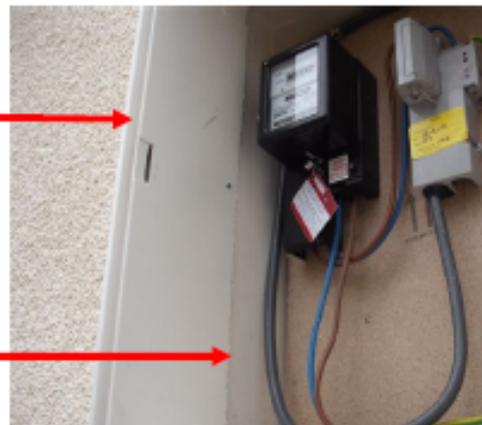
Do not attempt to move the existing cabinet. Doing so will disturb the existing connections and increase the risk of damage to the cables creating a potential fire hazard.

Meter Cabinet Door

The contractor must modify the existing meter cabinet in order to fill the recess created by the fitting of external wall insulation. This is done by removing the door from the existing cabinet and cutting away the back from a new cabinet. The new cabinet is then placed in the recess with the sidewalls of the new and old cabinets overlapping. Accurate fitting is essential to "seal off" the wall insulation from the inner cabinet. The photograph below shows a modified cabinet fitted to an existing meter cabinet.

New meter cabinet with back removed is placed into existing cabinet.

The sidewalls of the new cabinet overlap the sidewalls of the existing cabinet to seal off the wall insulation from the inner cabinet



Meter cabinets are manufactured to a specific standard to give protection in the event of fire. Do not use alternative materials to modify the meter cabinet.

A4 CAD	1	2	3	4	5	6	7	8	9	10	11	12
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SERVICE CABLES UNCLIPPED AND LEFT SAFE UNTIL THE FINISHED RENDER COAT IS APPLIED

NEW AERIAL WALL BRACKET INSTALLED (CODE 3417080) ('L' BRACKET FOR POLE MOUNTED SINGLE PHASE FUSE COMBINATION UNIT)

NEW "BUNDLED" AERIAL CONDUCTOR

INSULATION PIERCING CONNECTORS

M12 x125MM RAWLBOLT

PVC / PVC SERVICE CABLE

175

FINISHED JOB SEE SHEET 3

SHEET 1 OF 5

REFER TO ESB NETWORKS DOCUMENT TITLED "EXTERNAL WALL INSULATION GUIDELINES FOR HOMEOWNERS AND CONTRACTORS ON ESB NETWORKS REQUIREMENTS AND CHARGES"

NOTES:

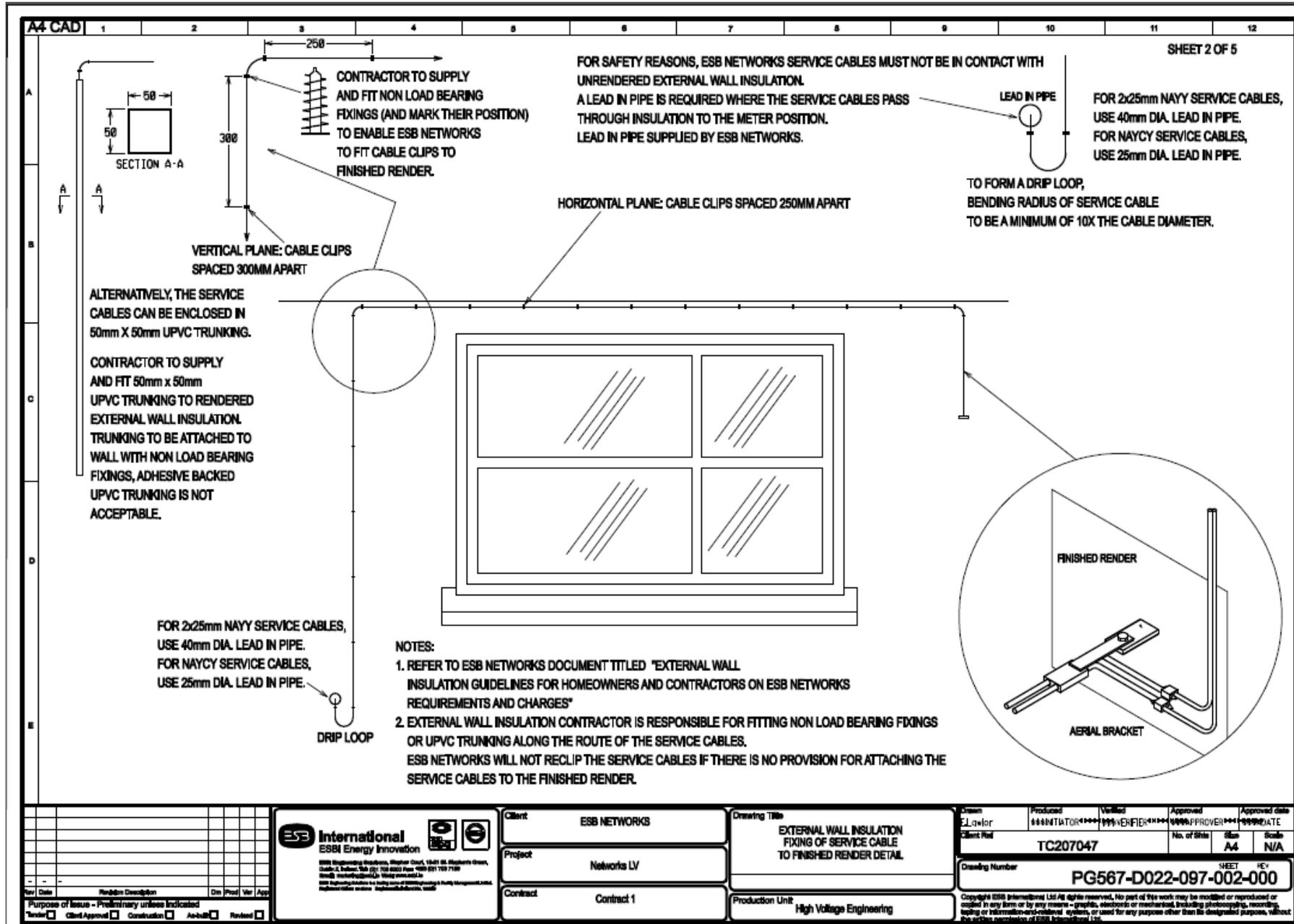
1. ON FIRST SITE VISIT, ESB NETWORKS WILL:

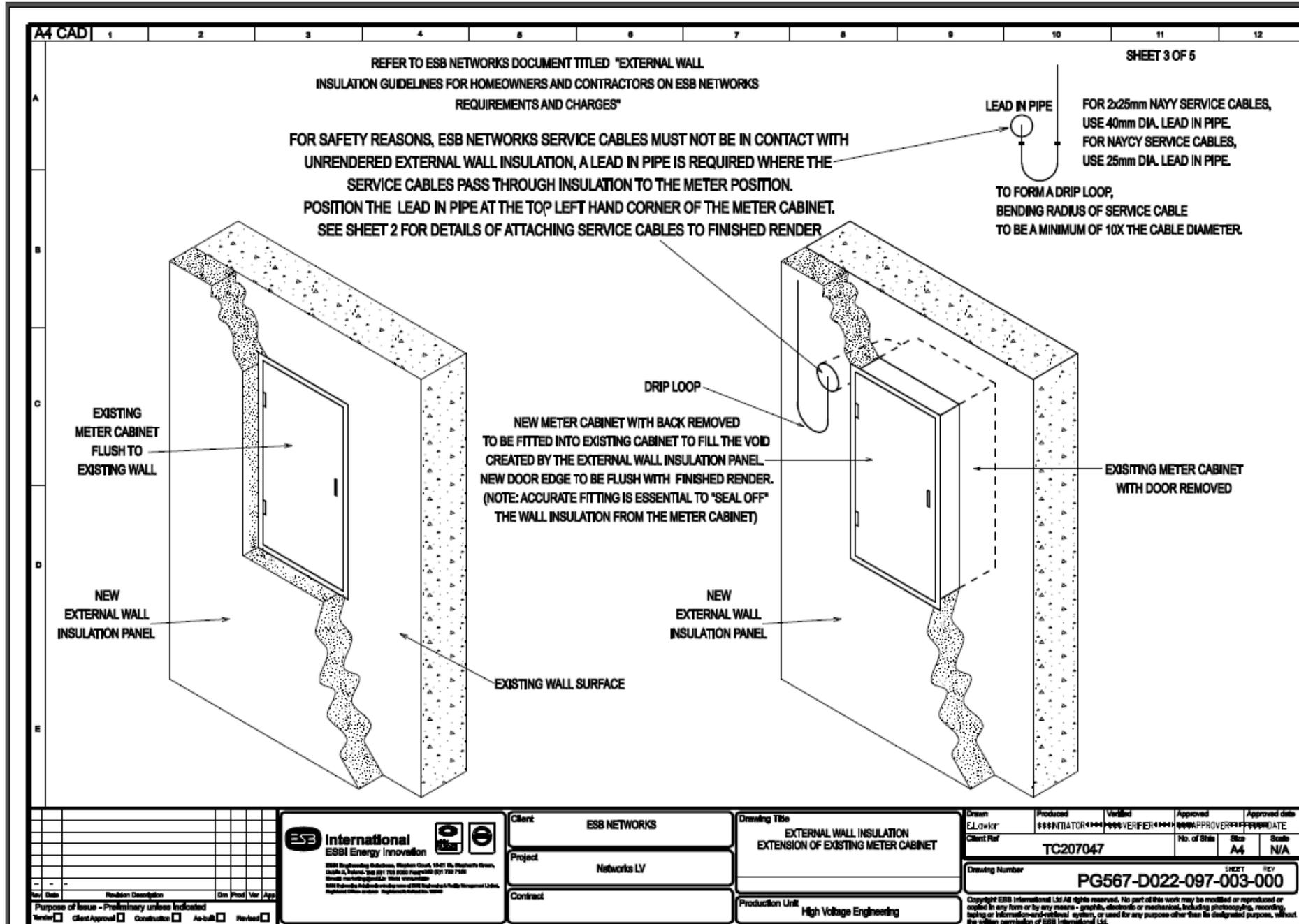
- (a) REPLACE EXISTING SWAN NECK OR "D" BRACKET ANCHORS AND NON-INSULATED AERIAL CONDUCTORS WITH A NEW "L" BRACKET ANCHOR AND INSULATED AERIAL BUNDLE CONDUCTOR.
- (b) ESB NETWORKS WILL ATTACH THE SHORT SIDE OF THIS BRACKET TO THE WALL (RATHER THAN THE LONG SIDE AS SHOWN IN THIS DRAWING) WHERE PROPOSED INSULATION THICKNESS IS GREATER THAN 130mm
- (c) UNCLIP EXISTING SERVICE CABLES (AND REPLACEMENT OF CABLES WHERE REQUIRED)
- (d) IF EXISTING SERVICE CABLE IS UNDERSIZED, REPLACE WITH PVC / PVC SERVICE CABLE.
- (e) SECURE SERVICE CABLE TEMPORARILY TO THE FACIA OR SOFFIT BOARD UNTIL THE FINISHED RENDER COAT IS APPLIED. ADDITIONAL TEMPORARY MECHANICAL PROTECTION MAY BE FITTED IF REQUIRED.
- (f) FIT LEAD IN PIPE IF REQUIRED.

2. SEE SHEET 2 FOR DETAILS OF FINAL FIXING OF SERVICE CABLES.

	ESB International ESB Energy Innovation	Client ESB NETWORKS	Drawing Title EXTERNAL WALL INSULATION AERIAL BRACKET DETAIL	Created E.L. Taylor	Produced *****TAYLOR*****	Verified *****FERGUSON*****	Approved *****FERGUSON*****	Approved date *****DATE*****	
		Project Networks LV			Drawing No. TC207047	No. of this sheet 1	Scale A4	Status N/A	
		Contract Contract 1 Contract 2	Production Unit High Voltage Engineering	Drawing Number PG567-D022-097-001-000					SHEET 1 OF 5
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Business Form No. BF-040-005-005-001





Rev	Date	Revision Description	Des	Prod	Ver	App

Purpose of Issue - Preliminary unless indicated
 Tender Client Approval Construction As-built Revised

ESB International
 ESB Energy Innovation

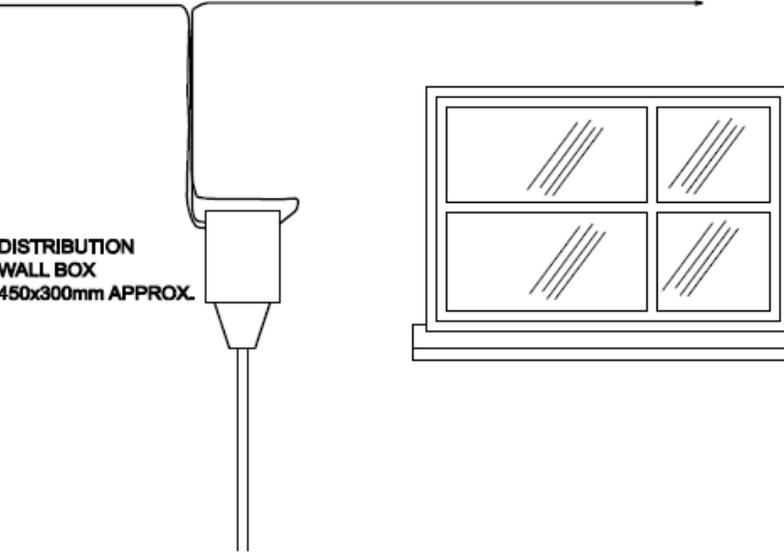
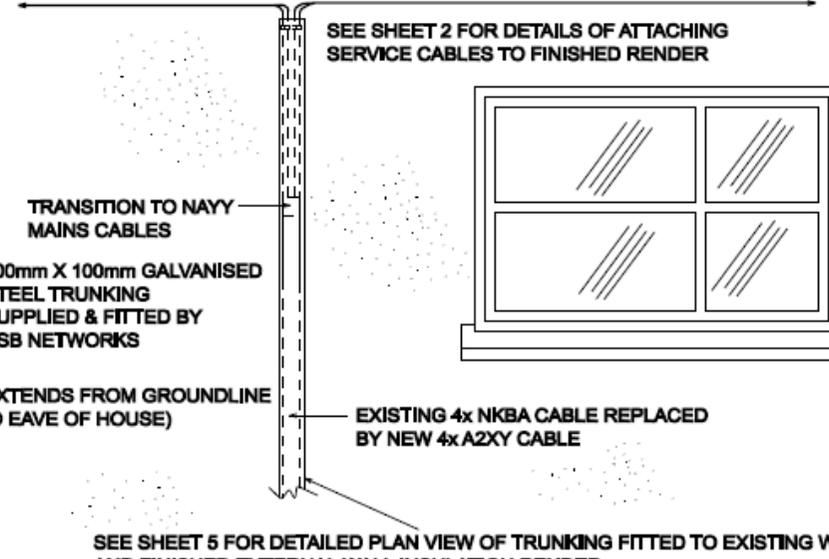
ESB Engineering Solutions, Rishin Court, 10-11 St. Stephen's Green, Dublin 2, Ireland. Tel: 01 708 0000 Fax: 01 708 7100
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Client	ESB NETWORKS
Project	Networks LV
Contract	

Drawing Title	EXTERNAL WALL INSULATION EXTENSION OF EXISTING METER CABINET
Production Unit	High Voltage Engineering

Drawn	ELowlor	Produced	*****INITIATOR****	Verified	*****VERIFIER****	Approved	*****APPROVER****	Approved date	*****DATE****
Client Ref	TC207047	No. of Sites	A4	Scale	N/A	Drawing Number PG567-D022-097-003-000 SHEET REV			

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A4 CAD	1	2	3	4	5	6	7	8	9	10	11	12																																																		
<p>REFER TO ESB NETWORKS DOCUMENT TITLED "EXTERNAL WALL INSULATION GUIDELINES FOR HOMEOWNERS AND CONTRACTORS ON ESB NETWORKS REQUIREMENTS AND CHARGES"</p> <p style="text-align: right;">SHEET 4 OF 5</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <h3 style="text-align: center;">EXISTING CONNECTION TO ESB NETWORK</h3> <p>ESB NETWORKS DISTRIBUTION WALL BOX, MAINS & SERVICE CABLES SURFACE MOUNTED ON EXISTING WALL.</p> <p>SERVICE CABLES TO MULTIPLE HOUSES CONNECTED TO DISTRIBUTION WALL BOX.</p>  <p style="text-align: center;">EXISTING WALL BOX, MAINS CABLE FROM UNDERGROUND NETWORK & SERVICE CABLES TO A NUMBER OF HOUSES</p> </div> <div style="width: 45%;"> <h3 style="text-align: center;">NEW CONNECTION TO ESB NETWORK</h3> <p>SURFACE MOUNTED DISTRIBUTION WALL BOX REMOVED, MAIN CABLE ENCLOSED IN 100mm X 100mm GALVANISED STEEL TRUNKING, TRUNKING PROJECTS A MINIMUM OF 15mm BEYOND FINISHED RENDER.</p> <p>SERVICE CABLES FOR MULTIPLE HOUSES CONNECTED TO MAINS CABLES IN TRUNKING.</p> <p>SEE SHEET 2 FOR DETAILS OF ATTACHING SERVICE CABLES TO FINISHED RENDER</p>  <p style="text-align: center;">WALL BOX REPLACED BY GALVANISED TRUNKING & MAINS CABLE FROM UNDERGROUND NETWORK & SERVICE CABLES TO A NUMBER OF HOUSES</p> </div> </div>																																																														
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"></td> <td style="width: 20%;">ESB International ESB Energy Innovation</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> </tr> <tr> <td colspan="5" style="font-size: x-small;"> ESB International, Wellington, Wharfedale Street, 15/21 St. Matthews Street, Dublin 2, Ireland. Tel: (01) 708 0000 Fax: (01) 708 7100 Email: enquiries@esb.ie www.esb.ie ESB Energy Innovation is a trading name of ESB Networks & Energy Management Limited. Registered in Ireland. </td> </tr> </table> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 20%;">Client</td> <td style="width: 20%;">ESB NETWORKS</td> <td style="width: 20%;">Drawing Title</td> <td style="width: 20%;">EXTERNAL WALL INSULATION REPLACEMENT OF DISTRIBUTION BOX, & FITTING 100mm X 100mm GALVANISED TRUNKING</td> <td style="width: 10%;">Drawn</td> <td style="width: 10%;">ELowlor</td> <td style="width: 10%;">Produced</td> <td style="width: 10%;">*****INITIATOR*****</td> <td style="width: 10%;">Verified</td> <td style="width: 10%;">*****VERIFIER*****</td> <td style="width: 10%;">Approved</td> <td style="width: 10%;">*****APPROVER*****</td> <td style="width: 10%;">Approved date</td> <td style="width: 10%;">*****DATE*****</td> </tr> <tr> <td>Project</td> <td>Networks LV</td> <td>Client Ref</td> <td>TC207047</td> <td>No. of this</td> <td>1</td> <td>Scale</td> <td>A4</td> <td>Scale</td> <td>N/A</td> <td colspan="3"></td> </tr> <tr> <td>Contract</td> <td></td> <td>Production Unit</td> <td>High Voltage Engineering</td> <td>Drawing Number</td> <td colspan="3">PG567-D022-097-004-000</td> <td>SHEET</td> <td>4</td> <td>OF</td> <td>5</td> <td></td> </tr> </table> <p style="font-size: x-small; margin-top: 5px;"> Purpose of Issue - Preliminary unless indicated Tickler <input type="checkbox"/> Client Approval <input type="checkbox"/> Construction <input type="checkbox"/> As-built <input type="checkbox"/> Revised <input type="checkbox"/> </p> <p style="font-size: x-small; margin-top: 5px;"> Copyright ESB International Ltd All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphic, electronic or mechanical, including photocopying, recording, taping or information and retrieval systems, or used for any purpose other than its designated purpose, without the written permission of ESB International Ltd. </p>														ESB International ESB Energy Innovation				ESB International, Wellington, Wharfedale Street, 15/21 St. Matthews Street, Dublin 2, Ireland. Tel: (01) 708 0000 Fax: (01) 708 7100 Email: enquiries@esb.ie www.esb.ie ESB Energy Innovation is a trading name of ESB Networks & Energy Management Limited. Registered in Ireland.					Client	ESB NETWORKS	Drawing Title	EXTERNAL WALL INSULATION REPLACEMENT OF DISTRIBUTION BOX, & FITTING 100mm X 100mm GALVANISED TRUNKING	Drawn	ELowlor	Produced	*****INITIATOR*****	Verified	*****VERIFIER*****	Approved	*****APPROVER*****	Approved date	*****DATE*****	Project	Networks LV	Client Ref	TC207047	No. of this	1	Scale	A4	Scale	N/A				Contract		Production Unit	High Voltage Engineering	Drawing Number	PG567-D022-097-004-000			SHEET	4	OF	5	
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APPENDIX 4: Outline of changes since last published Code of Practice

The following list summarises the most significant changes to this document since the last published version, “Better Energy Programmes Contractors Code of Practice and Standards and Specifications Guidelines Version 7.3 2018”. A red-line version is available on request from SEAI:

- Document renamed as “Domestic Technical Standards and Specifications (DTSS)”
- Improvements throughout the document to readability and accessibility
- Added Section “Purpose of this Document and recent changes”
- Added Section “How to Use this Document: Identifying Relevant Sections”
- Added Acronyms section and expanded Glossary
- Removed detail on penalty points and sanctions – these are covered in the QADP
- Removed detail on Code of Conduct – these will be covered in Programme-specific documentation
- Added links to relevant Health and Safety legislation and guidance
- Added Sections on “Guarantees” and updated specific guidance on “Radon”
- Added general Section on “Building Regulations” and removed repeated text from the individual measures
- Added Section 3.2 “IMPORTANT GUIDANCE NOTES FOR ELECTRICAL WORKS” rather than repeating the same text on this across multiple sections, and added references to this section as required throughout the document
- Reference to the Deep Retrofit (DR) and Warmth and Wellbeing (WW) Programmes added to Section 1. Table 1 updated to ensure measures/Programme correlation is accurate.
- Programme-specific references from Sections 3-6 were removed where possible.
- Added guidance on requirements for BER assessment evidence and U-value derivation in Section 2.
- Code of Conduct section was removed, as this aspect is covered in Programme-specific documents
- Added condensation risk and airtightness guidance in Section 4
- Updated details on Ventilation to improve clarity on requirements
- Added links to relevant planning and architectural conservation and guidance
- Details added to various Heating Controls sections to summarise requirements
- Flat roof guidance moved from Section 6.3 to Section 6.5. Added relevant SR54 reference for flat roof.
- Addition of the following measures: Solar PV, MV/MVHR, Electric shower monitors, High heat retention cylinders, EV chargers
- Corrected outdated standards references.
- Deleted references to obsolete standards/documents that have not been replaced.
- Updated Construction Products Directive references to CPR (Construction Products Regulation, 305/2011)
- Expanded detail on additional draught proofing measures such as door bottom brushes, letterbox sealing and attic hatch sealing. Section 6.12.
- Updated Appendix 2 to cover all measures
- Transferred the following information to the Code of Practice from the following section of “Additional information for Contractors” document and/or ensured the information is not unnecessarily repeated in “Additional Information for Contractors”:

- Section 2.2 on solar compliance note and calculator, solar thermal commissioning report and solar water heating safety notice
- Section 4.6 note on attic insulation: woodworm infestation
- Section 4.8: dealing with polystyrene, installing EWI and CWI in cold weather
- Implemented changes related to Stoves:
 - Removed guidance on installation of stoves with back-boilers as not supported by any of the SEAI Programmes covered by this document.
 - This measure is not funded by the WHS.
 - Stoves must comply with Ecodesign requirements (EC 2015/1185)
 - Stoves funded by the Deep Retrofit Programme must have a gross efficiency minimum of 70% and be fuelled by biomass only.
- Implemented changes on Heat Pump Systems:
 - Note on phase-out of HFCs added to the Heat Pump Systems section
 - Section 7.10 Heat Pump from the previous document was removed as it is no longer applicable
 - Simplified competency requirements
 - Requirement for Triple E register postponed
 - DOW documentation requirements removed and inserted in BEH-specific “Code of Practice” document
 - Insulation of hot water pipework required
 - Added paragraph on thermal store/buffer
 - Clarifications in text throughout