Domestic Technical Standards and Specifications

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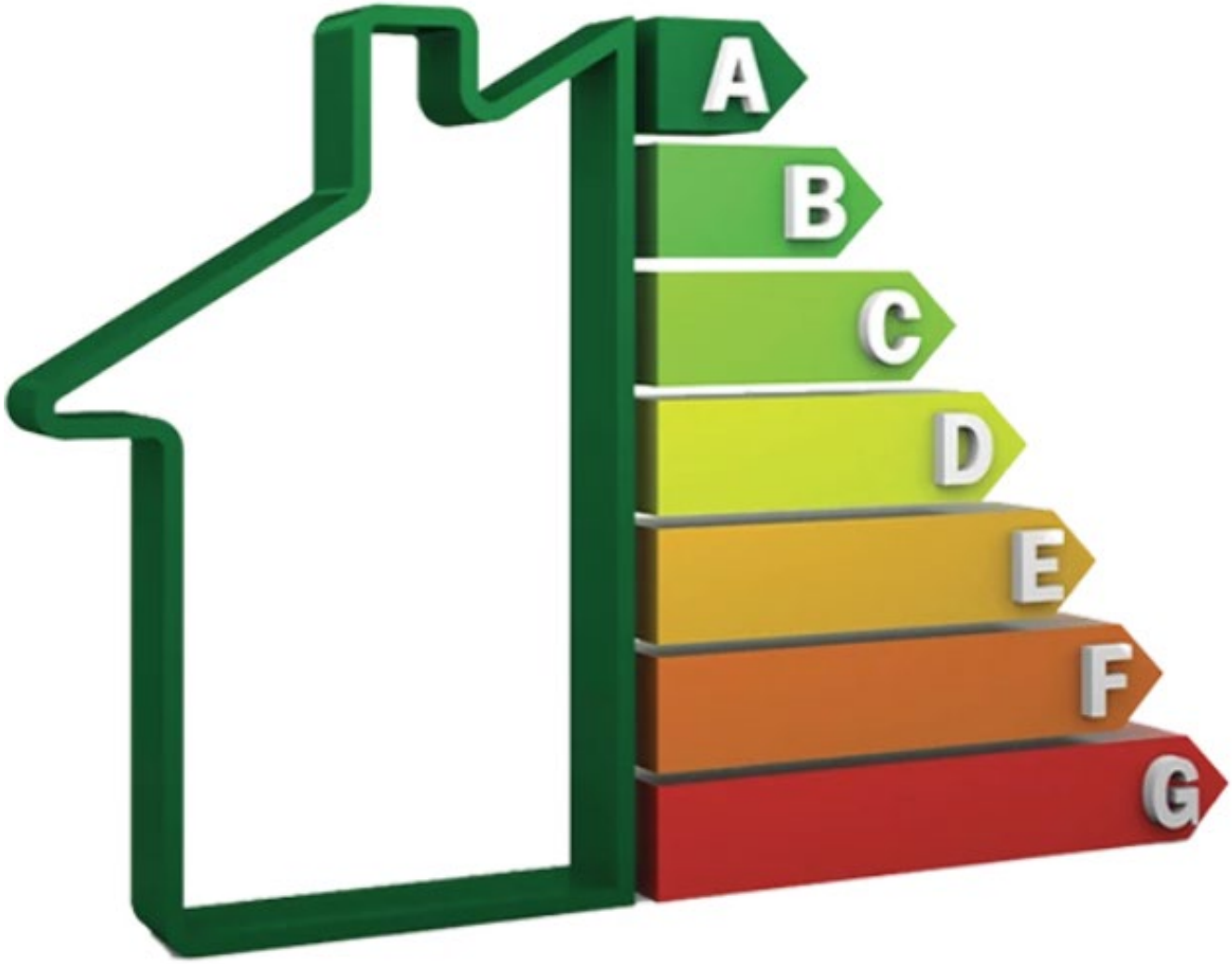

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Glossary of Key Terms

Air Leakage	Air Leakage is the uncontrolled flow of air through gaps, cracks and holes in the fabric of the building and is typically expressed in one of two ways: 1. Air changes per hour (ACH @ 50 Pa) i.e. the number of times an hour that all of the air inside the building is replaced with external air, or 2. Air permeability ($m^3/h.m^2$) i.e. meters cubed per hour, per meter square of surface area
Air Permeability	Air Permeability is the physical property used to measure the airtightness of the building fabric. It is defined as air leakage per hour per square metre of envelope area ($m^3/h.m^2$) at a test reference pressure difference across the building envelope of 50 Pascals (Pa) or (50 N/m^2) i.e. $m^3/h.m^2$ @ 50 Pa. Testing Air Tightness must be completed by a NSAI or INAB Accredited Tester.
Agrément	Irish Agrément Board (IAB) is responsible for Agrément assessment and certification to ensure certified products are 'proper materials' suitable for their intended use under Irish site conditions, and per the Building Regulations.
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.
Building Renovation Passport	A Building Renovation Passports (BRP) contains a Roadmap and a Logbook. The Roadmap is a masterplan for the deep energy retrofit of a dwelling which sets out the measures step by step. The associated Logbook is a repository of information relating to the fabric and performance of the building which includes a record of previous works.
Condensation, Interstitial	If a building is not airtight, warm humid air will leak into the external envelope of a building structure, often occurring in areas where there's a temperature difference across a construction element, such as at window and door reveals. When warm moist air comes into contact with a surface that is colder, it causes the moisture in the air to condense into liquid water within the structure rather than on the surface.
Contractor	Individual or company carrying out home 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.
Demand Controlled Ventilation (DCV)	Demand Controlled Ventilation (DCV) is a system that provides automatic regulation of the ventilation system by sensing the Indoor Air Quality (IAQ) and determining the required air change rate.
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	Earthing / bonding must be carried out in accordance with I.S. 10101 National Rules for Electrical Installations. Earthing provides a low-resistance path for fault currents to return to the source or the earth. Bonding connects all the metallic parts of the system to ensure electrical continuity and equipotential.
F-gas	It is 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.
HLI – Heat Loss Indicator	HLI, an output of DEAP, is the ratio of total heat loss from a dwelling quantified by the Heat Loss Coefficient (HLC) to total floor area which is calculated and termed the Heat Loss Indicator (W/(K.m^2), also called the HLI.
Intermittent Extract Ventilation	An Intermittent Extract Ventilation (IEV) system uses extractor fans in the kitchen and bathrooms which turn on and off. The fans can be controlled by a timer, light switch, or sensor.
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.
Major Renovation	'Major Renovation' is the renovation of a building where more than 25 % of the surface of the building envelope undergoes renovation. The 'surface area of the building thermal envelope' means the entire surface area of a building through which it can lose heat to the external environment or the ground, including all heat loss areas of walls, windows, floors and roof.
Measure	An Energy Efficiency Measure (EEM) is planned work undertaken to improve the energy performance of a dwelling by saving or generating energy.
Mechanical Ventilation with Heat Recovery (MVHR)	Mechanical Ventilation with Heat Recovery (MVHR) is a ventilation system in which air is recycled using ducts and can be reused within the building for heating or cooling purposes.
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.
Power Flush	Power Flushing removes debris and sludge from a central heating system with the use of a power flushing pump.
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 several SEAI Home Energy Upgrade programmes as detailed in Clause 1 of this document.
Proper Materials	Materials which are suitable for their intended use under Irish site conditions and certifies compliance with the requirements of the Building Regulations. As per TGD D "proper materials" includes materials which are in accordance with the provisions of the Construction Products Regulation, i.e.: (a) CE Mark; (b) comply with an appropriate harmonised standard or European Technical Assessment (ETA); or (c) comply with an appropriate Irish Standard or Irish Agrément Certificate or with an alternative national technical specification of any State which is a contracting party to the Agreement on the European Economic Area (EEA), which provides in use an equivalent level of safety and suitability.
QQI	QQI Quality and Qualifications Ireland (QQI) is an amalgamation of Further Education and Training Awards Council (FETAC); the Higher Education and Training Awards Council (HETAC); the Irish Universities Quality Board (IUQB) and the National Qualifications Authority of Ireland (NQAI). Awards made by QQI are recognised within the National Framework of Qualifications (NFQ).
REC	Registered Electrical Contractor
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.
Retrofit	A retrofit or home energy upgrade enhances the energy performance of a home. A deeper home energy retrofit involves carrying out multiple energy upgrade measures together, and may include wall and attic insulation, replacing windows and doors, addressing air tightness and ventilation and installing an efficient renewable heating system (such as a heat pump), as well as other renewable energy technologies (such as solar PV panels).
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
Thermal Bridge	A thermal or 'cold' bridge is essentially a 'thermal weak spot' in the fabric of a building, where heat can pass in or out more easily. It occurs at gaps between insulation materials or junctions between materials with different insulating properties. Heat loss occurs at different rates between the materials which can lead to issues such as condensation and mould.

Thermal Bypass	Thermal bypass (aka thermal looping) of the insulation material, through poor design/installation, occurs when gaps in the construction detail result in convective air current between the cold external and warmer internal layers reducing effectiveness of the insulation.
Thermal Conductivity	Thermal Conductivity (λ or k-value) is the quantity of heat transmitted through a unit thickness of a material.
Thermostatic Mixing Valve (TMV)	This valve is installed on the outlet of the hot water cylinder or a tap. This device mixes cold water with the hot water from the water supply 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 L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations.
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 vapour control layer (VCL) / airtight impermeable material on the warm (interior) side of the insulation 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 / showers.
Works	'Works' includes any act or operation in connection with the construction, extension, alteration, repair or renewal of a building.

Key Acronyms

ACA	Architectural Conservation Area
BEH	Better Energy Homes
BER	Building Energy Rating
BRE	Building Research Establishment
BV	Background Ventilation
CIBSE	Chartered Institution of Building Services Engineers
CRU	Commission for Regulation of Utilities
CWST	Cold Water Storage Tank
DEAP	Dwelling Energy Assessment Procedure
DHLGH	Department of Housing, Local Government and Heritage
DHW	Domestic Hot Water
DPC	Damp Proof Course
DPM	Damp Proof Membrane
DTSS	Domestic Technical Standards and Specifications
EEOS	Energy Efficiency Obligation Scheme
EHPA	European Heat Pump Association
EPA	Environmental Protection Agency
ETICS	External Thermal Insulating Composite Systems
EV	Electric Vehicles include battery electric and plug-in hybrid electric vehicles
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

HEULS	Home Energy Upgrade Loan Scheme
IAB	Irish Agrément Board (IAB)
IDHEE	Institute of Domestic Heating and Environmental Engineers
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MCS	Microgeneration Certification Scheme
MPRN	Meter Point Reference Number
MVHR	Mechanical Ventilation with Heat Recovery
NFQ	National Framework of Qualifications
NPWS	National Parks and Wildlife Service
NSAI	National Standards Authority of Ireland
OFTEC	Oil Firing Technical Association
OSS	One Stop Shop
PIR	Periodic Inspection Report
PV	Solar photovoltaic (PV) panels
QADP	Quality Assurance and Disciplinary Procedure
QQI	Quality and Qualifications Ireland
REC	Registered Electrical Contractor
RGI	Registered Gas Installer
RPS	Local Authority Record of Protected Structures
SCOP	Seasonal Coefficient of Performance
SEAI	Sustainable Energy Authority of Ireland
SPF	Seasonal Performance Factor
S.R. 54	S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings (NSAI)

TAS	Technical Assessment Specification
TGD	Technical Guidance Document
TMV	Thermostatic Mixing Valve
TRV	Thermostatic Radiator Valve
WEP	Window Energy Performance
WHS	Warmer Homes Scheme (WHS)

Domestic Technical Standards and Specifications (DTSS) - Purpose

The Domestic Technical Standards and Specifications (DTSS) document is a reference for Contractors carrying out home energy upgrade works supported by SEAI programmes under:-

- Better Energy Homes (BEH) and Solar PV under the Individual Energy Upgrade scheme
- Community Energy Grant scheme
- Energy Efficiency Obligation Scheme (EEOS)
- One Stop Shop (OSS) scheme which is a complete home energy upgrade solution
- Warmer Homes Scheme (WHS) under the Fully Funded Energy Upgrade programme

DTSS informs on the standards and specifications that Contractors are expected to adhere to, and the minimum level of competence required in carrying out home energy upgrade grant works supported by the Programmes. Homeowners may also reference this document when works are being carried out.

For most matters related to other aspects of home energy upgrade grant works, such as their conduct and practices, Contractors and other stakeholders should refer to programme-specific documentation and terms and conditions.

Domestic Technical Standards and Specifications (DTSS) - Clauses

Domestic Technical Standards and Specifications (DTSS) clauses set out the general approach on how home energy upgrade measures can be achieved. Whilst some sections of the DTSS may be more relevant to certain Contractors than others, it is the responsibility of **all** Contractors to read and understand the DTSS, SEAI home energy upgrade measures and each of their specific requirements, prior to commencing work.

Understanding the DTSS clauses is paramount when considering home energy upgrade works and Contractors are ***always*** required to read and adhere to the DTSS clauses as outlined below:

- Clause 1 describes each of the SEAI home energy upgrade grant programmes. Table 1 outlines the measures covered by each programme.
- Clause 2 describes general requirements and standards applicable to all Contractors and provides details for products and installations across multiple measures.
- Clause 3 provides an overview of relevant health and safety considerations for all Contractors.
- Clause 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). A Ventilation Validation Certificate is required for major renovations. All Contractors carrying out measures specified in Clause 4 must have a thorough understanding of this clause.
- Clause 5 provides guidance on Traditional Buildings, Protected Structures and Architectural Conservation Area. Implementation of some measures may be prohibited/restricted by the guidance in this clause.
- Clause 6 Home Energy Upgrades relates to best practice for specific energy efficiency measures. Clause 6 sets out the requirements for Contractors, products / systems and installations for each measure. Contractors must read and understand Clause 6 for each home energy upgrade measure.
- Appendices 1 and 2 summarise the relevant standards and references for the measures detailed in Clause 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 clauses outlined above.

SEAI advise all Contractors to carefully read, understand and adhere to the guidance in DTSS Clauses 1, 2, 3, 4 and 5 mentioned above and follow the guidance under Clause 6 for the measures on home energy upgrades.

Disclaimer

For all works detailed in this document and for each Home Energy Upgrade Programme, Contractors must carry out works in accordance with this Domestic Technical Standards and Specifications (DTSS) document, regardless of whether they are required to register with SEAI for a given scheme. Contractor registration is a mandatory requirement to carry out SEAI Home Energy Upgrade funded 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.

1. Introduction to the SEAI Home Energy Upgrade programmes

Sustainable Energy Authority of Ireland (SEAI) is Ireland's national sustainable energy authority established under the Sustainable Energy Act 2002. SEAI's mission is to be at the heart of delivering Ireland's energy revolution. SEAI's Home Energy Upgrade suite of programmes include domestic retrofit works under the following:

1.1 Better Energy Homes

1.2 One Stop Shop Service

1.3 Warmer Homes Scheme

1.4 Community Energy Grants

1.5 Home Energy Upgrade Loan Scheme and Energy Efficiency Obligation Scheme

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 Clause 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.

1.1 Better Energy Homes

Better Energy Homes (BEH) offer grants to homeowners under the Individual Energy Upgrade scheme. Homeowners apply for the grant, select home energy upgrade measures, select their preferred SEAI registered contractor, manage the project, and pay for the full costs of works and claim the grant afterwards. The measures supported include attic and wall insulation, heating system upgrades and controls, renewable energy technologies, heat pump, solar thermal and solar electricity (PV), see Table 1.

The Code of Practice for Contractors providing services on the scheme should be read in conjunction with the DTSS.

1.2 One Stop Shop

One Stop Shop (OSS), under the National Home Energy Upgrade Scheme (NHEUS), provides an end-to-end solution for homeowners from initial contact through to design, installation, commissioning and after care service for the homeowner. The OSS service is delivered by companies who are registered with SEAI. OSS manage a Home Energy Assessment (HEA), see Clause 6.29, provide advice to the homeowner on suitable options, apply for the grant, complete the works and then claim the grant from SEAI.

1.3 Warmer Homes Scheme

Warmer Homes Scheme (WHS), under the Fully Funded Energy Upgrade scheme, is a fully funded and fully managed solution for qualifying homeowners in receipt of certain Department of Social Protection payments to upgrade their home with measures identified from a home energy survey. The Programme and its eligibility criteria are detailed on the SEAI website.

SEAI manage the whole upgrade process from home energy survey, through contractor works, and follow up BER. SEAI's technical surveyor will determine which upgrades can be installed and funded.

The upgrades of an eligible property will depend on many factors, including age, size, type, and condition of the property. Apart from replacement windows funding, the covered home improvements

generally include attic insulation, cavity wall insulation, external as well as internal wall insulation, heating system upgrade, draught-proofing, ventilation and lagging jackets. These measures make the homes more comfortable, healthier and more cost effective to run. Table 1 lists the measures funded by the WHS.

1.4 Community Energy Grants

The Community Energy Grant (CEG) scheme supports the aggregation of a diverse set of energy upgrade projects from across the community, including home energy upgrades, community, public sector, and private projects. The projects are led by a project coordinator and involve a local sustainable energy community. The primary objective is to support the delivery of home energy upgrades alongside non-domestic energy projects, which support the engagement of communities to build low-carbon and sustainable communities.

The aggregated applications typically support energy upgrade projects across communities and geographic areas. A range of projects in a single application typically include a group of home energy upgrades, community buildings and business energy upgrade projects.

The project coordinators who aggregate and deliver these projects use the energy savings generated to receive a financial contribution from Obligated Parties under the Energy Efficiency Obligation Scheme (EEOS). This lowers the cost for participation particularly for homeowners and communities.

1.5 Home Energy Upgrade Loan Scheme and Energy Efficiency Obligation Scheme

The Home Energy Upgrade Loan Scheme (HEULS) and Energy Efficiency Obligation Scheme (EEOS) measures are detailed in Table 1. The requirements for implementation of these measures under all schemes are detailed in Clause 6.

Home Energy Upgrade Loan Scheme (HEULS)

HEULS is available for home energy upgrade works which qualify for a home energy upgrade grant from the SEAI following a Home Energy Assessment (HEA) with quotation for works. Strategic Banking Corporation of Ireland (SBCI) is responsible for delivering the Loan Scheme.

The relevant SEAI grant schemes and intermediaries in relation to the HEULS are:
· Better Energy Homes Scheme (using an Energy Partner/Counterparty)
· Community Energy Grant Scheme (using a Project Co-Ordinator)
· National Home Energy Upgrade Scheme (using a One Stop Shop)

Energy Efficiency Obligation Scheme (EEOS)

Under the Energy Efficiency Obligation Scheme (EEOS) energy suppliers and distributors (otherwise known as Obligated Parties) must support energy efficiency projects in businesses and homes across Ireland. All Obligated Parties are set annual energy efficiency targets based on their market share in the energy industry from selling gas, electricity, oil and/or solid fuel above a threshold volume level. There are sub-targets for energy savings from the residential sector and homes in energy poverty. Obligated Parties earn energy credits that contribute to their overall targets.

All users of energy can apply to their energy supplier for financial support for an energy-saving project. Every unit of energy saved by an energy saving project in conjunction with an obligated party has the potential to be reported as an energy credit. For an obligated party to claim energy credits, they must support the installation in some way, and they must be involved in the project before the energy saving measures were installed. If an obligated party fails to secure sufficient credits, they can trade or buy-out at a higher price.

The property owner must give written consent to the Obligated Party agreeing to assign energy credits to them (refer to https://www.seai.ie/publications/EEOS-Guidance-Document.pdf).

Further detail on each of these Home Energy Upgrade schemes are on the SEAI website: www.seai.ie.

BEH Better Energy Homes Scheme under the Individual Energy Upgrade scheme
EEOS Energy Efficiency Obligation Scheme
HEULS Home Energy Upgrade Loan Scheme
OSS One Stop Shop (OSS) service under the National Home Energy Upgrade Scheme
WHS Warmer Homes Scheme under the Fully Funded Energy Upgrade scheme

Click on the relevant clause number in Table 1 to go directly to the section of Clause 6 detailing requirements for a particular Home Energy Upgrade measure.

Table 1 : Home Energy Upgrade measures under SEAI grant funded schemes

Clause	Measure	BEH	OSS	WHS	Community Energy	HEULS / EEOS
6.1	Insulation : Cavity Wall Insulation	✓	✓	✓	✓	✓
6.2	Insulation : External Wall Insulation	✓	✓	✓	✓	✓
6.3	Insulation : Internal Wall Insulation	✓	✓	✓	✓	✓
6.4	Insulation : Roof Insulation - Ceiling Level	✓	✓	✓	✓	✓
6.5	Insulation : Roof Insulation - pitched roof at Rafter Level (Cold Roof)	✓	✓		✓	✓
6.6	Insulation : Floor Insulation		✓		✓	✓
6.7	Mechanical Extract Ventilation (MEV) and Mechanical Ventilation with Heat Recovery (MVHR)		✓	✓	✓	✓
6.8	Heat Pump Systems	✓	✓		✓	✓
6.9	High Efficiency Boilers			✓		
6.10	Boiler Service					✓
6.11	Biomass Boilers (with/without thermal storage)				✓	✓
6.12	Heating Controls – Fully Integrated	✓	✓	✓	✓	✓
6.13	Heating Controls with Remote Access – Fully Integrated				✓	✓
6.14	Heating Controls – Entry Level				✓	✓
6.15	Heating Controls with Remote Access – Entry Level				✓	✓
6.16	Stoves : Solid Multi-Fuel Heating System				✓	✓
6.17	Gas Fired Room Heater					✓
6.18	Storage Heaters - High Heat Retention					✓
6.19	Power Flush of Heating System			✓	✓	✓
6.20	Power Flush and Magnetic Filter of Heating System				✓	✓
6.21	Domestic Hot Water Storage : High Heat Retention Cylinders					✓
6.22	Draught-Proofing			✓		
6.23	Chimney Draught Limiter					✓
6.24	Door Replacement		✓		✓	✓
6.25	Window Replacement		✓	✓	✓	✓
6.26	Window Secondary Glazing				✓	✓
6.27	Window Glazing Low E-Film					✓
6.28	Lighting - LED			✓	✓	✓
6.29	Home Energy Assessment (HEA) Reports		✓			✓
6.30	Electricity Energy Monitors				✓	✓
6.30	Shower Energy Monitors					✓
6.31	Solar Electricity	✓	✓		✓	✓[1]
6.32	Solar Water Heating	✓	✓		✓	✓
6.33	Electric Vehicle Chargers[2]					

[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 the Code of Practice.

[2] Funding for the EV Home Charger scheme is provided by Zero Emission Vehicles Ireland (ZEVI) based in the Department of Transport. SEAI operates this grant scheme on behalf of ZEVI.

2. General Requirements

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

- 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 Code of Practice for the Energy Efficient Retrofit of Dwellings (S.R. 54), are referenced throughout this document, are ***to be considered mandatory*** unless explicitly stated otherwise.

  S.R. 54 is available, free of charge, from both the NSAI and SEAI websites:
  - NSAI https://shop.standards.ie/
  - SEAI https://www.seai.ie

For any Programme exceptions, see the individual Code of Practice or other Programme documentation.

Clauses 4, 5 and 6 detail the Contractor, product and installation standards and specifications required for the measures covered by this document. DTSS Appendix 2 summarises these standards and specifications.

2.1 Building Regulations

The Building Regulations apply to the design and construction of buildings. Guidance on compliance with the various parts of the Building Regulations is given in the associated Technical Guidance Documents (TGD). There is extensive detail in the Technical Guidance Documents (TGD) and Building Regulations on the DHLGH www.housing.gov.ie website. For works outlined in this document the relevant sections include Building Regulations set out in 12 parts (classified as Parts A to M) as follows:-

- Part A Structure
- Part B Fire Safety
- Part C Site Preparation and Resistance to Moisture
- Part D Materials and Workmanship
- Part E Sound
- Part F Ventilation
- Part G Hygiene
- Part H Drainage and Waste Water Disposal
- Part J Heat Producing Appliances
- Part K Stairways, Ladders, Ramps and Guards
- Part L Conservation of Fuel and Energy
- Part M Access and Use

The contractor must always adhere to the most recent amendment to and version of Building Regulations at all times. All works to which these Building Regulations apply shall be carried out with proper materials and in a workmanlike manner.

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 Grant 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 Clause 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 herein, which include, but are not limited to:

- Building Regulations and Technical Guidance Documents (TGD)
- S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings
- CE Mark or Irish Agrément Certificates (or equivalent)
- Irish, European or British Standards Guides
- System Supplier/ Product Manufacturer Guidelines

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

- Building Regulations and associated Technical Guidance documents (TGD) published by the Department of Housing, Local Government and Heritage (DHLGH) www.housing.gov.ie
- Irish Standards (annotated I.S.) shop.standards.ie
- National Standards Authority of Ireland (NSAI) www.nsai.ie
- Chartered Institution of Building Services Engineers (CIBSE) www.cibse.org
- Commission for Regulation of Utilities www.cru.ie
- British Standards (annotated B.S.) knowledge.bsigroup.com
- UK Building Research Establishment www.bre.co.uk
- UK Energy Saving Trust www.energysavingtrust.org.uk

2.4 General Contractor Requirements

For all SEAI home energy upgrade grant 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 standard relating to each home energy upgrade measure, supported by all SEAI grant Programmes, are detailed under each measure in Clause 6.

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

2.5 Building Energy Rating (BER)

Building Energy Rating (BER) assessments are carried out by independent registered BER assessors. A BER will give an energy usage for the dwelling expressed as primary energy consumption per unit floor area per year (kWh/m^2/yr). The better the BER rating the lower the energy consumption per m^2.

A BER energy rating calculation uses the Dwelling Energy Assessment Procedure (DEAP) software. DEAP takes into account a range of factors that contribute to annual energy usage:

- Size, geometry and exposure of the dwelling
- Material used for construction of the dwelling
- Thermal insulation of the different elements of the building fabric
- Ventilation characteristics of the dwelling and ventilation equipment
- Lighting types
- Efficiency, responsiveness and control characteristics of the heating system(s)
- Hot water (DHW) use and any wastewater heat recovery (WWHR)
- Solar gains through glazed openings of the dwelling
- Thermal storage (mass) capacity of the dwelling
- Fuels used to provide space and water heating, ventilation and lighting
- Renewable and alternative energy generating technologies incorporated into the dwelling

BER assessor gathers all the information during an assessment of a dwelling to complete a BER. Documentation includes certifications, receipts, invoices and/or specification documents from the architect, engineer or contractor who managed the home energy upgrade measures.

In accordance with the DEAP methodology, a BER assessor may use default values for an assessment when there is insufficient documentary evidence of home energy upgrade measures on a home. Default values are based on construction type and the age of the building and are conservative estimates of the energy performance and may result in a home receiving a lower BER rating than expected.

BER assessor can obtain data to support the use of non-default values in a BER assessment e.g.

- Heating System (e.g. boiler, heat pump, solar space heating etc)
  - SEAI HARP database for home space heating appliances
  - Heat pump Ecodesign technical data and designer sign-off with heat emitter details
  - Photographs of the heating system
  - Heating system manuals or installation certificates
- Photographs of nameplates with make and model number to identify a product
- Non-default thermal performance values certificates stating U-value and solar transmittance values for the installed windows/doors.

SEAI's website provides information on BER, supports for BER assessors, DEAP calculations and methodology and details of the requirements for proof of a dwelling's home energy upgrade measures.

2.6 U-value calculations

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). The higher the U-value, the greater the heat loss.

Calculation of the correct U-value is essential in determining if U-value targets specified in DTSS Clause 6 have been met. The minimum acceptable U-values for the building fabric are shown in the tables of Appendix A of the Building Regulations TGD to Part L and Annexes A, B and C of S.R. 54.

U-value can be calculated from the thermal conductivity (W/mK) of a material and the thickness of the material (m). When more than one material is being used (e.g. common wall construction may 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 (the measure of heat loss through the fabric of the building).

Where more than 25% of the surface area of the building envelope undergoes renovation, the whole building must be improved to "Cost Optimal" level where this is technically, functionally and economically feasible. The "Cost Optimal" performance level requires the building to achieve a set energy performance level calculated in DEAP (see Clause 2.5) which may include upgrading roofs insulated at ceiling level to the average U-value (see relevant technical guidance document for details).

Prior to commencing home energy upgrade measures, consult with the product manufacturer or supplier to establish the best product to use for the given construction type to achieve the required U-value.

Sources of U-Values

U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - Conventions for U-value calculations.

2.7 Product Certification : Agrément Certificate

Part D (Material and Workmanship) of the Building Regulations sets out an overarching requirement that all works are carried out using proper materials, which are fit for the use for which they are intended and for the conditions in which they are to be used within Ireland. It further notes that proper materials include materials which:

a. bear a CE Marking in accordance with the provision of the Construction Products Regulation (CPR No. 2024/3110);
b. comply with an appropriate Harmonised European Standards (hEN) or European Technical Assessment (ETA) in accordance with the provision of the Construction Products Regulation;
   or
c. comply with an appropriate Irish Standard or Irish Agrément Certificate
   or
   with an alternative national technical specification of any EEA country, which provides in use an equivalent level of safety and suitability.

The Agrément process is designed specifically for new innovative building materials, products and systems that do not yet have a long history of use and for which there may be no national standard, harmonised European product standard (hEN) or European Technical Assessment (ETA). The assessment is carried out by an independent third party, such as the Irish Agrément Board (IAB).

Irish Agrément Certificates establish proof that certified products are 'proper materials' suitable for their intended use under Irish site conditions and certifies compliance with the requirements of the Irish Building Regulations. Each Agrément Certification process involves a five (5) year review. A Technical Assessment Specification (TAS) sets out the technical criteria for the assessment and testing of the system, which can include laboratory test results, on-site evaluations, and on-site inspection plans. The TAS is developed with reference to the Irish Building Regulations Parts A to M and the TGDs.

To install an Irish Agrément certified system, the contractor must be an Approved Installer of the relevant system and registered with NSAI. NSAI maintain an up-to-date web register of Approved Installers[3].

Irish Agrément Certificate or 'equivalent' refers to products which are certified to the Irish Agrément Certification standards or to an alternative national technical specification of any State which is a contracting party to the Agreement on the European Economic Area (EEA), which provides in use an equivalent level of safety and suitability.

[3] Agrément Registered Installers https://www.nsai.ie/certification/agrement-certification/agrement-registered-installers/

3. Health and Safety Requirements

Construction Regulations prescribe the main requirements for the protection of the safety, health and welfare of persons working on construction sites.

Under the Safety, Health and Welfare at Work (Construction) Regulations 2021, a Client is a person for whom a construction project is carried out. This now includes a person having construction work carried out on their own home. In the case of clients for domestic type projects there are duties on project supervisors, designers and contractors to demonstrate to the clients that they are competent to do the work.

Contractors are obligated under the Safety, Health and Welfare at Work Act to carry out risk assessments of their specific operations and places of work to identify the key hazards relevant to them and to ensure the safety, health and welfare of persons present at their facilities or on their sites.

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 information to relevant regulations, legislation and guidance on its website:

- Safety, Health and Welfare at Work (…) Act 2024
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2023
- Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021
- Safe System of Work Plan (SSWP)
- Guide for Contractors and Project Supervisors Carrying out Construction Work on Private Domestic Dwellings
- Guide for Homeowners - Getting Construction Work Done Safely

Solar Panel Installation

Commission for Regulation of Utilities (CRU) has set standards and guidelines that must be followed by all those who wish to install solar panels on their property to ensure that the solar panel system is safe, efficient, and reliable. These standards cover various aspects of solar panel installation, such as safety measures, wiring, and mounting requirements. All installations must meet certain safety criteria like having proper grounding, using high-quality materials and components, and being installed by qualified professionals.

For further information refer to:
https://safeelectric.ie/contractors/tech-information/focus-on-photovoltaic-installations/

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 DHLGH publication Radon in Existing Buildings – Corrective Options should be consulted. For further information refer to:
  www.gov.ie/en/publication/97ca0-radon-in-existing-buildings-corrective-options/

- **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 alarm 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:
  http://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/list/1/environ/pest-control

  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:
  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 Electrical Installations: Best Practice

Electrical installations should be designed and installed in accordance with the I.S. 10101 National Rules for Electrical installations.

The Health and Safety Authority (HSA) has published guidance notes on Periodic Inspection and Testing of Electrical Installations. Refer to:-

- https://www.hsa.ie/eng/publications_and_forms/publications/information_sheets/guidance-note_on_periodic_inspection_and_testing_of_electrical_installations

The purpose of the Periodic Inspection Report (PIR) is to accurately access the condition of the electrical installation and shall be given to the person ordering the inspection or a person authorized to act on their behalf. Any electrical alterations or additions to the installation should be made by a Registered Electrical Contractor (REC).

Where existing Earthing and Bonding are not in accordance with I.S. 10101 *National Rules for Electrical Installations*, these must be rectified to meet this standard ***before grant works are started***.[4]

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

- All electrical works must be in accordance with I.S. 10101 National Rules for Electrical Installations.

- The installer must ensure that any part of the existing installation, e.g. mains tails, distribution boards and earthing and bonding, being utilized by the new installation or circuits must be verified as compliant and capable of dealing with the new circumstances safely.
  Refer to I.S. 10101 Clause 6.4.1.5
  "It shall be verified that an extension, addition or alteration to an existing installation complies with I.S. 10101 and does not impair the safety of that installation, and that the safety of the new installation is not impaired by the existing installation."

- Earthing and Bonding must be in accordance with I.S. 10101 Clause 134.1.9
  "*In case of an addition or alteration to an existing installation … the earthing and bonding arrangements, if necessary for the protective measure applied for the safety of the addition or alteration, shall be adequate.*"

- SEAI recommends
  "*Before commencing new work, the installer should assess the existing electrical 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 electrical 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 homeowner* ***must*** *be informed in writing thereof. No new work should commence until these defects have been made good.*"

  'Electrical safety notice to the Homeowner' is available:
  www.seai.ie/sites/default/files/publications/Electrical_Safety_Notice_to_Homeowners_2017

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

4. Ventilation

The primary purpose of a residential ventilation system is to supply air to and extract air from the rooms in a dwelling 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 pollutants [5]

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

Table 2 : Home Energy Upgrade measures referencing 'Ventilation'

Clause	Measure
6.1	Insulation : Cavity Wall Insulation
6.2	Insulation : External Wall Insulation
6.3	Insulation : Internal Wall Insulation
6.4	Insulation : Roof Insulation - Ceiling Level
6.5	Insulation : Roof Insulation – pitched roof at Rafter Level (Cold Roof)
6.6	Insulation : Floor Insulation
6.7	Mechanical Extract Ventilation (MEV) and Mechanical Ventilation with Heat Recovery (MVHR)
6.16	Stoves : Solid Multi-Fuel Heating System
6.17	Gas Fired Room Heater
6.22	Draught-Proofing
6.23	Chimney Draught Limiter
6.24	Door Replacement
6.25	Window Replacement
6.26	Window Secondary Glazing
6.27	Window Glazing Low E-Film

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.

[5] World Health Organisation (WHO) publishes guidelines for indoor air quality and information on biological, chemical and combustion indoor air pollutants.

Requirements for provision of adequate ventilation

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 TGD F and permanent ventilation for heat-producing appliances in TGD J published by DHLGH.

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.

4.1 Assessment of Ventilation Provision

A detailed ventilation assessment is required to identify any existing issues and determine whether the current ventilation system is adequate or if upgrades are needed prior to any works commencing. Any new or upgraded ventilation system installed must be commissioned (i.e. tested and adjusted) to ensure it achieves the correct balancing and airflow rates. Proper documentation of ventilation assessments, air tightness tests, and system commissioning is essential for demonstrating that the retrofit project complies with Part F of the Building Regulations.

The approved installer should inform the homeowner if there is insufficient ventilation or no wall vents. Depending on the measure installed, the same applies for attic ventilation, sub-floor ventilation or other ventilation provisions.

For any home energy upgrade measures where insulation or airtightness are proposed e.g. wall insulation, floor insulation, roof and attic insulation, draught stripping or replacement windows, the Contractor shall ensure that the retrofit design includes details of how adequate ventilation is to be maintained or provided to confirm good internal air quality and minimize surface and interstitial condensation risk.

It is recommended that a spillage test be carried out before and after installation of the mechanical ventilation system, with the appropriate spillage test procedure, in accordance with Building Regulations (Part J).

S.R. 54 must be followed for each measure. Reference S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings, Clause 10 Ventilation for the choice of appropriate ventilation systems.

However, in certain circumstances, SEAI home energy upgrade programmes may require additional requirements e.g. SEAI mandates ventilation measures that are only advisory in S.R. 54. Consult with relevant specified Programme-specific documentation for further details.

4.2 Ventilation Validation Certificate

The primary purpose of a ventilation system is to supply air to and extract air from the rooms in a dwelling. Where a ventilation system is installed as part of a Major Renovation then the system should be designed, installed, commissioned and validated. All ventilation systems are to be validated by a competent independent third party certified by NSAI[6] (or equivalent) to verify that a ventilation system has been installed, balanced and commissioned to meet the minimum requirements of Part F Ventilation of the Building Regulations.

TGD F gives guidance on the minimum ventilation design for dwellings i.e.

- Natural Ventilation comprising of background ventilators with intermittent extract fans (IEV)
- Mechanical Extract Ventilation (MEV)
- Mechanical Ventilation with Heat Recovery (MVHR)

To demonstrate compliance with the Building Regulations (Part L and Part F) for ventilation systems:-

a. Ventilation validator is provided with ventilation design airflow rates and installers commissioning certificate.
b. Ventilation validator assesses the ventilation design against the minimum requirements of TGD F.
c. Ventilation Validator takes measurements to establish that the commissioned ventilation system complies with the intended design airflow rates and leakage of the ductwork.
    - All instrumentation must be calibrated by an accredited laboratory such as INAB.
    - Equipment must be correctly configured to record accurate air flow rate readings. The measured air flow rates will be compared with the respective design values. Compliance with the design will be met if the measured air flow rates for each are equal to, or greater than, the design value.
    - A flow straightener must be used
d. Airtightness test result has an air permeability index < 5 $m^3/(h.m^2)$
    - Natural Ventilation with intermittent extract fans (IEV) is suitable for dwelling with an air permeability index greater than > 3 $m^3/(h.m^2)$ and less than < 5 $m^3/(h.m^2)$
    - If the Air permeability index is less than < 3 $m^3/(h.m^2)$ either mechanical extract ventilation (MEV) or mechanical extract with heat recovery (MVHR) is required
e. Ventilation validator issues a "Ventilation Validation Certificate"

Note: The independent ventilation validator is not responsible for inspecting installation or confirming Part F Ventilation compliance. This is the responsibility of Local Building Control.

Further information is available on DHLGH's "*Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F*" and the NSAI "*Ventilation Validation Registration Scheme Master Document*".

[6] NSAI Ventilation Validation Scheme https://www.nsai.ie/certification/agrement-certification/ventilation-validation-registration-scheme/

4.3 Ventilation System Design Strategy Considerations

The contractor shall confirm the adequacy of the existing ventilation (if any) of the dwelling and, if necessary, include in the design a specification for upgrading the ventilation system of the dwelling by selecting the appropriate ventilation system type and designing ductwork or airflow pathways. Additional purpose provided ventilation will control the moisture content and limit harmful pollutants within the dwelling.

Ventilation guidelines are dependent on the air permeability (see Figure 1) and thermal conditions of a dwelling resulting from retrofit measures (e.g. insulation, new windows, new heating system, installation of additional ventilation measures).

An acceptable, complete ventilation system for a dwelling shall be:

a. natural ventilation with an intermittent extract ventilation (IEV) system consisting of correctly sized extract fans in all wet rooms and correctly sized background ventilators (to admit fresh external air) in all rooms including habitable rooms, bedrooms and wet rooms where air permeability is greater than > 3 $m^3/(h.m^2)$ (refer to Clause 4.3.1).

b. continuous mechanical extract ventilation (MEV) system that extracts moist, stale air from all wet rooms combined with correctly sized background ventilators (to admit fresh external air) in habitable rooms and bedrooms (but not in wet rooms) where air permeability is less than < 5 $m^3/(h.m^2)$, and has been properly commissioned (refer to Clause 4.3.2); or

c. whole-dwelling supply and extract mechanical ventilation with heat recovery (MVHR) system that extracts moist stale air from all wet rooms, supplies fresh external air to all living spaces and bedrooms, where air permeability is less than < 5 $m^3/(h.m^2)$, and has been properly commissioned and balanced (refer to Clause 4.3.2).

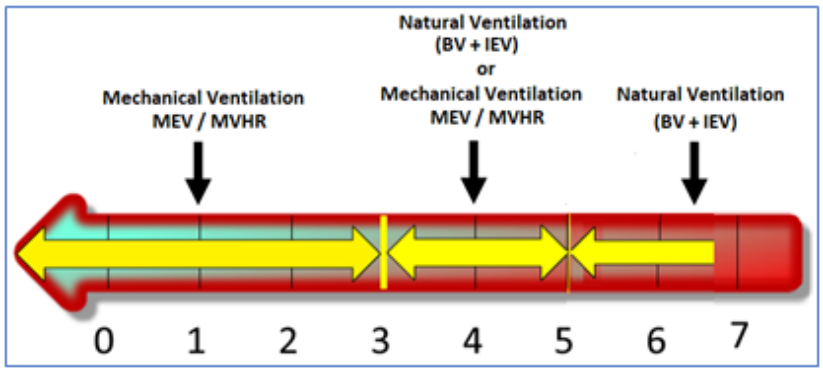


Figure 1 : 0-7 Air Permeability $m^3/(h.m^2)$ rate and Ventilation Requirements

Where ventilation is to be upgraded and the air permeability of the building envelope, after installation of the proposed home energy upgrade measures, is not less than > 5 $m^3/(h.m^2)$ the Contractor must refer to S.R. 54 Table 30 and S.R. 54 Table 31 on guidance for the provision of natural ventilation with background and intermittent extract ventilation (refer to Table 3 and Table 4 respectively).

Where any of the guidance detailed in S.R. 54 Table 30 is not adhered to by the Contractor, the Contractor ***must*** retain, in writing, the reasoning for not adhering to S.R. 54 Table 30 (see Table 3). When in doubt, Contractors must contact the SEAI Technical Team[7] to verify the correct approach and retain the answer in writing. Always follow Irish Agrément requirements, where applicable, for any measure being installed.

[7] See the "Contact Us" section on the SEAI Support for Contractors page.

If the air permeability index is less than < 3 $m^3/(h.m^2)$, natural ventilation will not be acceptable, and some form of mechanical ventilation and the ventilation validation certificate is required.

Table 3: Guidance for the provision of natural ventilation
i.e. background and intermittent extract ventilation for retrofit works with air permeability levels > 5 $m^3/h.m^2$

		Existing Dwelling Condition		
Retrofit Works		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	No requirement to provide further ventilation
2.	Replacement of Windows	It is advised to provide Intermittent Extract Ventilation (IEV) in wet rooms in accordance with Column 3, Table 31	It is advised to provide Intermittent Extract Ventilation (IEV) in wet rooms in accordance with Column 3, Table 31	
3.	Sealing/insulating of timber suspended floors	Where evidence of inadequate ventilation exist (e.g. mould, condensation) Intermittent Extract Ventilation should be provided in all wet rooms in accordance with Column 3, Table 31	Where evidence of inadequate ventilation exist (e.g. mould, condensation) Intermittent Extract Ventilation should be provided in all wet rooms in accordance with Column 3, Table 31	
4	Two or more of the above measures done in combination or separately	Background ventilation and Intermittent Extract Ventilation should be provided in accordance with Table 31	No requirement to upgrade background ventilation Intermittent Extract Ventilation should be provided in all wet rooms in accordance with Table 31	No requirement to provide further ventilation

(source: S.R. 54 Table 30)

If the proposed energy efficiency improvement measures are either intended to reduce the air permeability of the building envelope less than < 5 $m^3/(h.m^2)$, or might do so, then the existing ventilation system may either need to be upgraded to a continuous mechanical system (refer to Clause 4.3.2) or expert advice should be sought for the sizing and position of background and intermittent extract ventilators.

Guidance in S.R. 54 Table 28 gives a list of measures that, if most or all are adopted, will likely lead to a refurbished dwelling achieving an air permeability below < 5 $m^3/(h.m^2)$.

Purge Ventilation

Purge ventilation is achieved by openable windows or external doors. A system for purge should be provided for each habitable room.

Purge ventilation removes pollutants and water vapour through openings such as doors/windows and mechanical extract ventilation in wet rooms.

4.3.1 Natural Ventilation with Background Ventilation and Intermittent Extract Ventilation

Natural ventilation relies on the natural forces of wind and weather to get fresh air into a building. Pre-retrofit ventilation scenarios in S.R. 54 Table 30 and Table 31 (refer to Table 3 and Table 4 respectively) provide guidance where the air permeability is expected to be above > 5 $m^3/(h.m^2)$.

Where ventilation is to be upgraded and after installation of the proposed home energy upgrade measures the air permeability of the building envelope is greater than > 3 $m^3/(h.m^2)$, then an acceptable system of ventilation is intermittent extract ventilation (IEV) in all wet rooms combined with background ventilation (BV) in all living spaces and bedrooms (refer to Table 5).

Where there is no existing background ventilation (BV) and intermittent extract ventilation (IEV) then this should be provided when two or more measures (e.g. wall, window, floor) are done in combination or separately.

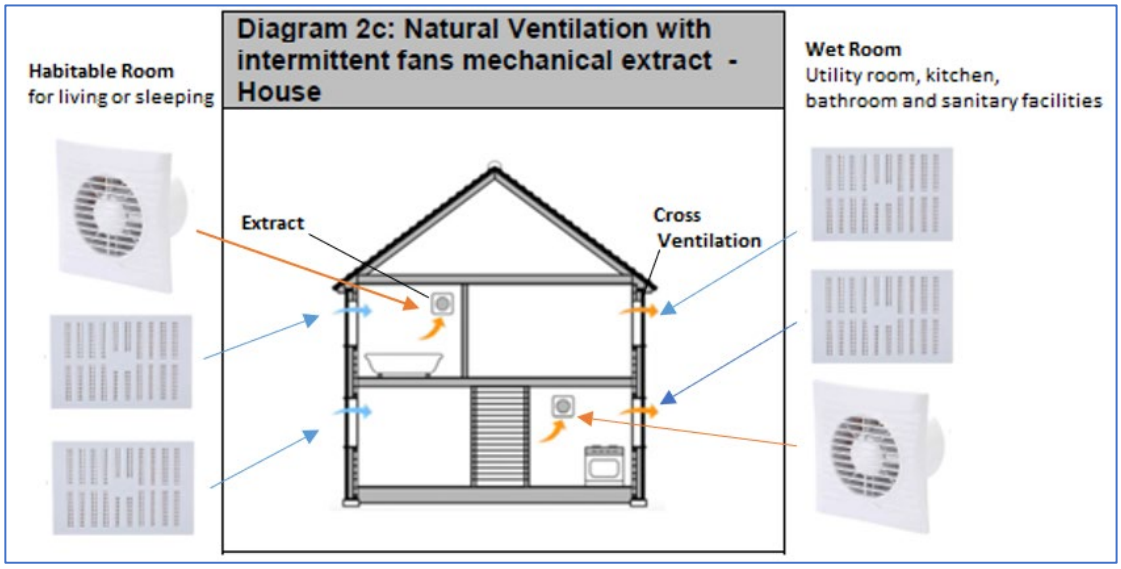


Figure 2 : Natural Ventilation with background and intermittent extract ventilation when air permeability is expected to be above > 3 $m^3/(h.m^2)$
(source: TGD F Ventilation_2019)

- Background ventilation (BV) is a whole house ventilation system that allows the introduction of fresh outside air into a habitable room without opening a window. Background ventilation is generally located in a wall (sleeved wall ventilator) or window (trickle vent) incorporating a controllable ventilation grill which can be fully closed (refer to Figure 2, Table 4, Table 5).

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

- An Intermittent Extract Ventilation (IEV) system uses extractor fans in the kitchen (cooker hood) and wet rooms (intermittent extract fan) which turn on and off and can be controlled by a timer, light switch, or sensor and operate with a 15-minute overrun (refer to Figure 2, Table 4, Table 5).

All wet rooms, such as a bath, shower room or utility room, should be fitted with an intermittent extract fan.

Where a room, kitchen/utility, has no external wall, and background and purge ventilation cannot be provided then the intermittent extraction fan should operate with a 15-minute overrun.

Note: Recirculating cooker-hoods are not recognised as intermittent extract ventilation.

The minimum flow rate for an intermittent extract fan varies depending on the type of room in which it is installed. S.R. 54 Table 31 and Table 32 provides further guidance on Background Ventilation and Intermittent Extract Ventilation (refer to Table 4 and Table 5 below).

Table 4 : Minimum levels of background and intermittent extract ventilation when air permeability is expected to be above > 5 $m^3/(h.m^2)$

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. The above values should be multiplied by 0,8 to obtain equivalent areas.

(source: S.R. 54 Table 31)

Where the intended air permeability of the dwelling is greater than > 3 $m^3/(h.m^2)$ and less than < 5 $m^3/(h.m^2)$ thus making the dwelling more airtight refer to Table 5 which summarises the minimum provisions of general background ventilation and intermittent extract ventilation for the various spaces.

Table 5 : Minimum levels of background and intermittent extract ventilation when air permeability is expected to be greater than > 3 $m^3/(h.m^2)$ and less than < 5 $m^3/(h.m^2)$

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. The above values should be multiplied by 0,8 to obtain equivalent areas.

d) The minimum total equilavent area of background ventilators providing general ventilation should be 42 000 mm^2 with an additional 7 000 mm^2 for each additional 10 m^2 floor area above the first 70 m^2 of floor area measured. For single storey dwellings situated at ground level or on any storey up to four storeys, an additional 7 000 mm^2 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.

(source: S.R. 54 Table 32)

4.3.2 Mechanical Extract Systems where air permeability is below 5 $m^3/(h.m^2)$

Mechanical extract ventilation systems use fans and ducts to control airflow (see Figure 3). Where a mechanical extract ventilation system is installed then the system should be designed, installed and commissioned by a competent person. When commissioned and balanced the system should then be validated by an independent competent person to ensure the mechanical extract ventilation system achieves the design flow rates.

Mechanical Extract Ventilation - MEV

Where ventilation less than < 5 $m^3/(h.m^2)$ the acceptable type of ventilation system is continuous Mechanical Extract Ventilation (cMEV) combined with background ventilators in all living spaces and bedrooms to admit a balancing supply of fresh external air. A MEV only removes air from a building. A continuous MEV system consists of one or more fans continuously extracting moist, stale air from wet rooms via ducts, and exhausts it to the exterior via another duct, using a single central fan that is usually located in a roof space or the top of a service cupboard.

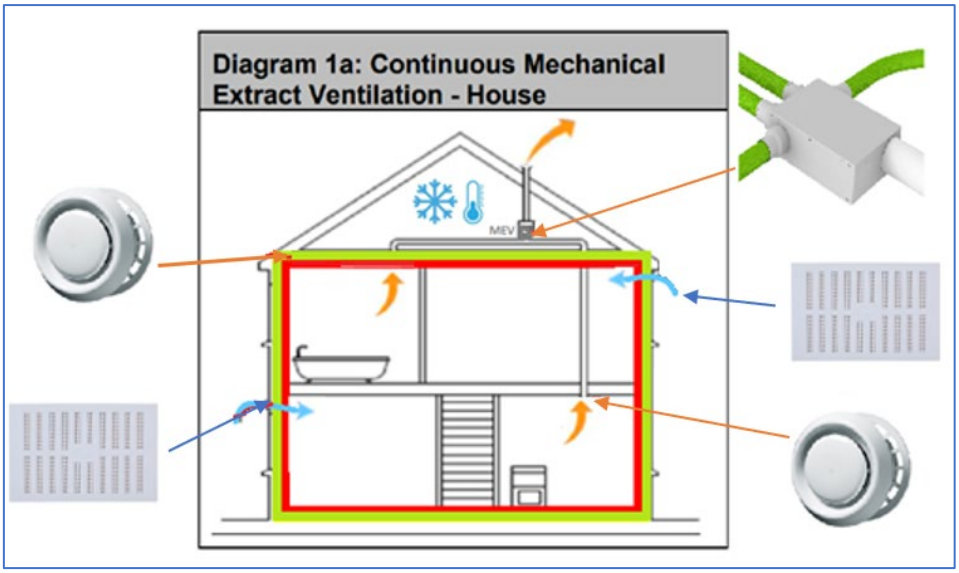


Figure 3 : continuous Mechanical Extract Ventilation – MEV when air permeability is less than < 5 $m^3/(h.m^2)$ (source: TGD F Ventilation_2019)

For mechanical extract ventilation (MEV) systems each habitable room should be provided with minimum background ventilation of 3,125 mm^2 free area (equates to an equivalent area of 2,500 mm^2). Where the window opening size is 10 % of the floor area of the sanitary accommodation (WC) and is relied upon to provide extract ventilation then this should not be included in the sum of total extraction rate calculation.

Though the flow rates may be manually or automatically boosted when needed, the minimum continuous ventilation rate and capacity of the system should be calculated by a competent person and be based on the calculated general ventilation rate. The calculated general ventilation rate to be provided by the MEV at all times is determined as the greater of:

a. 5 l/s plus 4 l/s per person, e.g. 25 l/s for an occupancy level of 5 persons.
   or
b. 0.3 l/s per m^2 internal floor area, e.g. 30 l/s for a 100 m^2 dwelling.

In order to meet extract requirements, the system may require a higher extract or boost capacity depending on the number of wet rooms (kitchens, bathrooms, etc.) and sanitary accommodation. The minimum boost extract ventilation rates in litres per second (l/s) for continuous mechanical extract ventilation (cMEV) systems are given in Table 6[8].

Table 6 : Minimum extract ventilation rates in litres per second (l/s) for cMEV and MVHR systems

Table 1: Centralized continuous mechanical extract ventilation systems: minimum boost extract rates[1]	
Wet rooms	**Minimum extract rate (l/s)**
Kitchen	13[2]
Utility room	8
Bathroom	8
Sanitary accommodation (no bath or shower)	6[3]
Notes: 1 The above are minimum boost extract rates and may need to be increased to achieve the general ventilation rate. 2. Excludes cooker hood extract. 3. As an alternative, an opening window provided for purge ventilation may be relied on for extract.	

(source: TGD F Table 1 and Table 2)

The mechanical extract ventilation system should be able to provide a capacity of at least:

i. 25% over the calculated general ventilation rate; and
ii. the overall minimum extract boost rate.

The calculated general ventilation rate calculated should be distributed in proportion to the extract rates of each wet room in Table 6. For more information refer to TGD F Ventilation available on gov.ie website.

[8] As per Building Regulations (Part F), 'free area' is the geometric open area of a ventilator and is typically 25% greater than its equivalent area.

Mechanical Extract Ventilation Heat Recovery - MVHR

Mechanical Extract Ventilation Heat Recovery (MVHR) may be used where an air permeability of less than 5 $m^3/(h.m^2)$ is achieved (see Figure 4). As the airtightness of the dwelling improves the energy efficiency of the whole-dwelling MVHR improves. Unlike MEV, MVHR systems combine supply and extract ventilation in one system. MVHR system both removes and returns air by continuously extracting warm, moist stale air from wet rooms via ducts, passes it through a heat exchanger and exhausts it to the exterior via another duct.

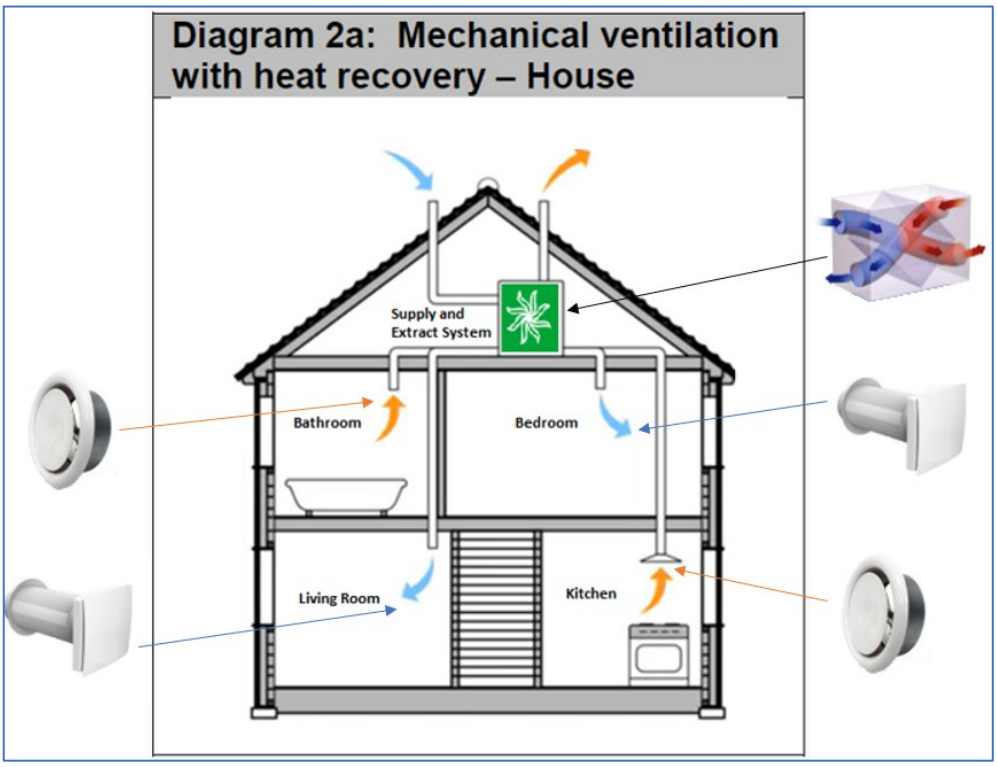


Figure 4 : Mechanical Extract with Heat Recovery – MVHR when air permeability is less than < 5 $m^3/(h.m^2)$ (source: TGD F Ventilation_2019)

Supply and extract rates should be balanced, so that air supply rates are greater than or equal to extract rates. A balancing supply of fresh air is drawn from outside via other ducts, filtered and passed through the heat exchanger to warm it, and supplied to the living spaces and bedrooms via further ducts. Background ventilators are not needed, but door undercuts are necessary to allow airflow through the dwelling.

Minimum boost extract ventilation rates in litres per second (l/s) for Mechanical Extract Ventilation Heat Recovery (MVHR) are given in Table 6[9].

The verification of intended design flowrates by an independent third party e.g. Irish National Accreditation Board (INAB), NSAI Certified or equivalent, should be included as part of the ancillary certificate issued for the dwelling ventilation system (see Clause 4.2). Refer to guidance document "*Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F …*" published by DHLGH, I.S. EN 14134 and BSRIA "*Domestic Ventilation Systems - a guide to measuring airflow rates* (BG 46/2022)".

[9] As per Building Regulations (Part F), 'free area' is the geometric open area of a ventilator and is typically 25% greater than its equivalent area.

Where new mechanical extract ventilation systems with heat recovery (MVHR) are installed as part of a Major Renovation then the system should be designed, installed, commissioned and validated e.g. NSAI Ventilation Validation registration scheme.

MVHR systems require that the filters be cleaned or replaced one month after handover, and subsequently at intervals of not more than one year (preferably six months); blocked filters stop MVHR systems operating effectively, and can lead to condensation and mould, and health problems for occupants.

4.3.3 Demand Controlled Ventilation (DCV)

Demand Controlled Ventilation (DCV) is an approach to managing ventilation and indoor air quality (IAQ) by adjusting the amount of extracted air or fresh air supplied to a space based on real-time conditions.

DCV systems monitor relevant external stimulus, e.g. humidity, pollutant level such as CO_2, occupancy and adjust the flow of air accordingly to deliver adequate indoor air quality. DCV utilises local (room), zonal, or whole building level controlled extract units which provide high levels of ventilation when a room is occupied, or pollution is being created. In times of low occupancy a DCV can provide lower levels of ventilation.

Demand Controlled Ventilation (DCV) systems require an Irish Agrément Certificate as a DCV system can reduce airflow rate below minimum levels set out in guidance and in this document. To ensure the DCV system does not impact IAQ the system must still achieve the minimum general ventilation rate as required by TGD F.

A DCV system needs to be carefully planned to ensure the DCV system achieves certain performance criteria, such as the removal rate of moisture or indoor pollutants. Once a Demand Controlled Ventilation (DCV) system has been installed it requires testing and commissioning to validate system performance. Where a DCV system is installed as part of a Major Renovation then the system should be designed, installed, commissioned, and validated by a competent independent third party certified by NSAI (or equivalent), refer to Clause 4.2, for guidance.

4.3.4 Ventilation Extract Fans and ductwork

MEV or MVHR unit requires a network of ducting, termination in multiple rooms and electrical wiring.

A fan should always be sited in the furthest window or wall from the main source of air replacement to avoid short-circuiting the airflow. It should be located as high as possible in the window or wall nearest to smells or steam, but not directly above eye-level grills or cooker hoods.

Any ventilation installation needs to offer easy access for maintenance such as replacing filters (if applicable), cleaning ducting and the fan unit, general maintenance or replacing the unit. The fan unit should be installed on a suitable stable and level structure.

Fans and ductwork located in or passing through unheated voids or attic spaces should be insulated to reduce condensation risk. Ducting should be insulated to prevent condensation within the ducts. This insulation should be the equivalent of at least 25 mm of mineral wool having a thermal conductivity ≤ 0.040 W/mK. The condensate drain(s) should be adequately secured and adequately insulated to prevent freezing.

Where an open-flued heat producing appliance is in a dwelling that also contains mechanical extraction, it should be installed and commissioned in line with the recommendations in S.R. 54

Clause 10.2.1.4 Combustion Appliances/spillage tests. The room where the heat producing appliance is located should be supplied with permanent ventilation.

4.3.5 Permanent Ventilation

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. The correct level of permanent ventilation must be installed as per TGD J Heat Producing Appliances of the Building Regulations. Refer to S.R. 54 Table 35 on Guidance for the provision of adequate supply of air for combustion products.

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.

Introducing mechanical extract ventilation may cause spillage of combustion products where either an open-flued (non-room sealed) heat producing appliance or a solid-fuel 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 generated pollutant gases and fine particulate matter such as PM 2.5.

The ventilation system should be designed to ensure the likelihood of spillage occurring is reduced to an absolute minimum. This is achievable by ensuring that enough fresh air is continuously and permanently available in the room where the heat-producing appliance is located.

The relevant installation Standards for the fuel/product type should be followed. All new permanent ventilators should be tested to I.S. EN 13141-1 and installed to manufacturer's instructions.

4.4 Ventilation and Wall Insulation

When home energy upgrade measures are installed in any existing building it is essential to take account of the fact that some measures can impact on the performance of other measures or can themselves be impacted by those measures.

In addition to Clause 4 points 1, 2, 3 and 4, 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 (EWI) systems, however both cavity wall insulation (CWI) and internal wall insulation (IWI) can also cause issues. 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 Irish 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.

4.5 Condensation and moisture risk

Moisture can damage the structure and internal environment of a building. In cases where moisture flow is being evaluated in a building and for condensation risk assessments (also known as hygrothermal evaluation), see Clause 4.5 of S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings, as well as the following standards referenced in S.R. 54:

- BS 5250 - Management of moisture in buildings. Code of practice
- I.S. EN ISO 13788 - 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 - Hygrothermal Performance of Building Components and Building Elements – Assessment of Moisture Transfer by Numerical Simulation

4.6 Improving airtightness

Improvement of the airtightness of the building envelope reduces wind-driven air infiltration and air leakage. 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:

- The overall airtightness of a building can be assessed with a pressure test. An airtightness test may be carried out before works to identify leakages and/or to identify the most appropriate ventilation strategy for the dwelling.

- Where the dwelling has draught-proofing measures installed (see Clause 6.22), 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 (see Clause 2.5).

- If a heat pump grant is being sought, an airtightness test may be necessary to achieve the required Heat Loss Indicator (HLI) as per Clause 6.8.1, particularly if home energy upgrade 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 Clause 4.7 of S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings.

- If mechanical ventilation measures such as those detailed in Clause 6.7 are being carried out, then the dwelling airtightness should be improved (see Figure 1). 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 Team[10].

Airtightness test results are only considered valid by SEAI if carried out by an NSAI registered airtightness tester[11] or equivalent.

Refer to NSAI Certified Air Tightness Tester Scheme https://www.nsai.ie/certification/agrement-certification/air-tightness-testing/

[10] See the "Contact Us" section on the SEAI Support for Contractors page.

[11] NSAI Certified Air Tightness Tester Scheme https://www.nsai.ie/certification/agrement-certification/air-tightness-testing/

5. Traditional Buildings, Protected Structures and Architectural Conservation Area

The planning system aims to ensure that the right development takes place in the right locations and at the right time.

Any work carried out to improve the energy efficiency of historic, or traditional buildings requires an appropriate approach in terms of materials and insulation regardless of any statutory protection that may apply. Further detailed guidance is set out in

- "*Improving Energy Efficiency in Traditional Buildings*" published by the Department of Housing, Local Government and Heritage (DHLGH)
  https://www.seai.ie/publications/Energy_Efficiency_in_Traditional_Buildings.pdf

Where a building is a protected structure (or has been proposed for protection) or where a building is located within an Architectural Conservation Area (ACA), the usual exemptions from the requirement for planning permission may not apply.

Protected structure requires that any works which would materially affect its character will require planning permission. Legal protection also extends to the interior of the building and to other structures and features within the curtilage of a protected structure, such as outbuildings, boundary walls, paving, railings, etc.

Architectural Conservation Area requires that any works to the exterior of a building which would materially affect the character of the area also require planning permission. In this context, however, works to the interior may not require planning permission, as they would do in the case of a protected structure.

The Record of Protected Structures (RPS) forms part of the development plan of each planning authority and will contain details, including maps, of any designated Architectural Conservation Area (ACA). A property might be in an area of architectural conservation but might not be a protected structure. If a building is a protected structure, or if it is in an Architectural Conservation Area, the Architectural Conservation Officer in the relevant local authority should be consulted. For further information

- *"Architectural Heritage Protection Guidelines for Planning Authorities"* published by the Department of Housing, Local Government and Heritage (DHLGH).

The works being undertaken must be carried out by a SEAI approved contractor.

The Contractor shall satisfy 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.

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. Home Energy Upgrades : Best Practice for specific energy efficiency measures

An energy efficiency measure is planned work undertaken to improve the energy performance of a dwelling by saving or generating energy. Domestic home energy upgrade / retrofit projects range from the installation of single improvement measures to whole-dwelling projects involving multiple measures installed at the same time.

Implementation and Governance

The following clauses detail the competency and standards expected by SEAI for each of the specific measures. A summary list of guides and standards referred to are detailed in Appendix 1: Reference Documents and each measure is summarised in Appendix 2: Summary Table of Competencies and Standards.

Where this document prescribes Standards / Specifications of products / systems or certification requirements for contractors, the manufacturer or supplier 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 contact the SEAI Technical Team[12], 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.

Building Fabric

The building fabric consists of the walls, roof, floors, windows and doors. The fabric is a major area of heat loss which can be reduced by adding internal or external wall insulation, attic and floor insulation, and replacement of windows and doors. An additional way to reduce heat loss is to improve airtightness and ensure adequate ventilation is maintained. Services (such as heating and domestic hot water systems, lighting, renewable energy, controls) work with the insulation, airtightness and ventilation of a home to provide comfort and convenience.

6.1 Insulation : Cavity Wall Insulation

Contractor Competence

Cavity wall insulation (CWI) Contractors must be approved by the Irish Agrément scheme or equivalent. Contractors carrying out Cavity wall insulation works must be on the Agrément Registered Installers[13] directory (or equivalent) 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 Irish Agrément Board or equivalent, see Clause 2.7.

Cavity Wall Insulation must be installed to fill the full depth of the cavity. The objective of this measure is to install materials that will achieve a satisfactory level of performance in the home. Thus, the target U-value[14] of 0.35 W/m^{2}K or better for cavity wall improved with cavity insulation is achieved. Minimum

[12] See the "Contact Us" section on the SEAI Support for Contractors page.

[13] Agrément Registered Installers https://www.nsai.ie/certification/agrement-certification/agrement-registered-installers/

[14] U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details.

cavity depths apply depending on the product as per Irish Agrément (or equivalent), and residual cavity depths must never be less than 40 mm.

Grants for wall insulation are given based on 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 Irish Agrément Certificate or equivalent and S.R. 54 Clause 7.3.4.

b. The insulation material must be suitable as per S.R. 54 Clause 7.3.4.2.5 and 7.3.4.2.6.

c. Please refer to manufacturer's instructions and the system's Irish Agrément Certificate or equivalent 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[15], refer I.S. EN ISO 15927-3. Cavity wall insulation is certified for use in masonry walls up to 12 m 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 Irish Agrément Certificate or equivalent 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 S.R. 54 Clause 7.3.4.3.

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

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

[15] Distribution of driving rain in Ireland - Met Éireann https://www.met.ie/distribution-of-driving-rain-in-ireland

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 Clause 4). Gas, oil and solid fuel appliances must be correctly ventilated as per TGD F Ventilation and TGD J Heat Producing Appliances. 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 Clause 4 Ventilation.

k. The Irish Agrément Certificate (or equivalent) 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.

NOTE: Timber frame homes cannot be cavity insulated.

6.2 Insulation : External Wall Insulation

Contractor Requirements and Competence

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

Product Standards and Specification

The external wall insulation system must be certified by the Irish Agrément Board or equivalent. This measure must only be installed on the wall types specified in the Irish Agrément Certificate or equivalent, see Clause 2.7.

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 achieve a U-value[16] of 0.27 W/m^{2}K or better for external walls.

External Wall Insulation 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 S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings.

b. Where the system supplier/manufacturer operates an Approved installer programme, the Contractor must carry appropriate identification stating they are an Approved Installer. The Contractor shall be NSAI ETICS registered (or equivalent) before carrying out work.

c. The Contractor must always comply with the requirements of the system supplier specifications.

[16] U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details.

d. All ventilation requirements must be met. 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 Clause 4 Ventilation, TGD F Ventilation and TGD J Heat Producing Appliances.

e. The suitability of insulation depends mainly on the local exposure to driving rain and the condition of the existing construction[17], refer I.S. EN ISO 15927-3. 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.

f. 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.

g. 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.

h. 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.

i. The pre-installation survey should identify homes where electricity service alterations will be required. Works must not commence until any necessary pre-installation alterations have been completed by ESB Networks (ESBN).

j. 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.

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

l. 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.

m. 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.

[17] Distribution of driving rain in Ireland - Met Éireann https://www.met.ie/distribution-of-driving-rain-in-ireland

n. 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.

o. 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.

p. 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.

q. 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.

r. 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.

s. 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.

t. The external insulation system is applied in accordance with the current installation instructions of the system supplier/manufacturer.

u. As per S.R. 54 and NSAI Agrément ETICS Scheme, 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.

v. 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.

w. The rigid 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. Coat the boards with an adhesive mortar (called a 'render base coat') in which a reinforced mesh is embedded to prevent cracking due to building movement. Any gaps at joints should be sealed e.g. thermal insulation mortar. Gaps of larger than 3 mm should be filled with slivers of insulation. Surface irregularities must be removed by planning with a rasp over the whole surface.

x. 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 thermal bridge (cold bridge) at the wall roof junction removal of the soffit may be required.

y. 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 e.g. fit a flashing to the underside of the sill to allow any moisture to drain away. 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 windowsills may be installed at this point. They should prevent water ingress as per Irish Agrément or equivalent certificate. For additional guidance, see Acceptable Construction Details on the DHLGH website.

z. 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.

aa. 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.

bb. 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.

cc. Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.

dd. 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.

ee. All rendering shall be applied in accordance with I.S. EN 13914-1 and BS 8000-0.

ff. Movement joints should be provided in accordance with the system supplier's technical specifications.

gg. 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.

hh. 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.

ii. On completion of the insulation, all external fittings shall be fixed as per applicable per Irish Agrément cert or equivalent.

jj. The Irish Agrément Certificate (or equivalent) 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.

kk. 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 Irish Agrément Certificate or equivalent in relation to this issue.

ll. There is no external insulation systems certified 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.

6.2.1 External Wall Insulation, Health & Safety 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 1800 372 757

6.2.2 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 1800 372 757

6.2.3 External Wall Insulation and Natural Gas Supply

Gas Networks Ireland (formerly Bord Gáis Networks) has 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:
www.seai.ie/Bord Gais External Wall Insulation & Domestic Gas Installations Guidelines_2017

Where Contractors have specific queries in relation to gas installations then they should contact Gas Networks Ireland directly on 1800 464 464

6.2.4 External Wall Insulation and Thermal Bridging

It is recommended that thermal bridging be addressed as part of SEAI home energy upgrade grant works. Refer to S.R. 54 Annex H (Informative) Thermal Bridging Details for construction details.

6.3 Insulation : Internal Wall Insulation

Contractor Competence

Internal wall insulation (IWI) 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. 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 carried out using proper materials with a CE Mark or approved by the Irish Agrément Board (or equivalent) and installed by suitably qualified people in accordance with the Irish Agrément Certificate (or equivalent).

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 proper materials, as referred to in TGD D Materials and Workmanship. When incorporating such a product, material or system into construction works it must be suitable for their intended use under Irish site conditions and be CE Marked. For products or components for which no appropriate standard exists then the insulation must be certified to Irish Agrément (or equivalent), refer to Clause 2.7.

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 achieve a U-value of 0.27 W/m^{2}K for internal walls.

There may be some locations where a U-value[18] of 0.27 W/m^{2}K 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/m^{2}K.

Internal Wall Insulation 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 internal wall insulation installation and associated works should be carried out in accordance with the manufacturer's specifications and NSAI's S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings.

- Refer to Clause 5 Traditional Buildings, Protected Structures and Architectural Conservation Area[19]

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. All ventilation requirements must be met. 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 Clause 4 Ventilation, TGD F Ventilation and TGD J Heat Producing Appliances.

f. The internal wall insulation fixing method depends on the existing internal wall construction:

[18] U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details.

[19] 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, refer to Clause 5 Traditional Buildings, Protected Structures and Architectural Conservation Area. 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: www.seai.ie/resources/publications/Energy Efficiency in Traditional Buildings.

- The suitability of insulation depends mainly on the local exposure to driving rain and the condition of the existing construction[20], refer I.S. EN ISO 15927-3.
- 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 not plastered 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.

g. When removing existing plaster, the exposed surface of the wall should be pointed/cement washed to seal any holes/cracks.

h. 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.

i. 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.

j. 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.

k. 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.

l. Composite insulated dry-lining boards should be installed in accordance with good dry-lining practice and the manufacturer's instructions.

m. 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.

[20] Distribution of driving rain in Ireland - Met Éireann https://www.met.ie/distribution-of-driving-rain-in-ireland

n. 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.

o. 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.

p. When mechanically fixing insulated dry-lining boards to the wall using battens, the metal fixings through the battens should penetrate at least 35 mm into the masonry. Fixings through boards must penetrate at least 25 mm into the batten.

q. 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 S.R. 54.

r. 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.

s. 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 I.S. 10101 National Rules for Electrical Installations.

t. Avoid contact between PVC-insulated wiring and polystyrene insulation, e.g. run wires through flexible cable protection tubes.

u. 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.

v. 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 Insulation : Roof Insulation - Ceiling Level

Contractor Requirements and Competence

Roof insulation Contactors 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. Products must be installed by suitably qualified people in accordance with this guidance and Technical Guides supplied by the material manufacturer. Roof insulation contractors should have completed a NFQ Level 5 or equivalent in attic insulation installation.

Product Standards and Specification

For a cold pitched roof with insulation placed between and above joists, proper materials must be used, as referred to in TGD D Materials and Workmanship. When incorporating such a product, material or system into construction works it must be suitable for their intended use under Irish site conditions and be CE Marked. For products or components for which no appropriate standard exists then the insulation must be certified to Irish Agrément (or equivalent), refer to Clause 2.7.

Appropriate documentation is required to demonstrate compliance with Irish Building Regulations and details of materials used should be included on the SEAI Declaration of Works (DoW) form.

The most commonly available forms of insulation material are mineral wool (often called 'rockwool' or 'earth wool') and glass fibre wool. Plastic foam insulation materials are expanded polystyrene (EPS), extruded polystyrene (XPS), polyisocyanurate (PIR) foam and phenolic foam.

The objective of this measure is to install materials that will achieve a satisfactory level of performance in the home. The target maximum U-value[21] for attics insulated at ceiling level is 0.16 W/m^{2}K. For conventional fibrous materials (e.g. glass wool, mineral wool), a thickness of 300 mm is typically required to meet the U-value requirement whilst for PIR (polyisocyanurate) rigid foam insulation boards around 150 mm will achieve the recommended U-value of 0.16 W/m^{2}K.

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 *Code of Practice for Energy Efficient Retrofit of dwellings*.

b. Materials used in roof Insulation should be suitable for their intended use in Ireland and have either a CE Mark or an Irish Agrément Certificate (or equivalent) and be installed by suitably qualified people.

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 European Union (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 S.R. 54 to ensure adequate ventilation via appropriate ventilation openings (see Clause 4 Ventilation). Where

[21] U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details.

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. 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:
   - 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 attic access 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 were applicable.
   - Provide roof ventilation through side eaves or through ventilation tiles in the slope of the roof.

h. 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 25 mm 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 S.R. 54.
   - The next layer of insulation should be placed across the joists and tucked into the eaves ensuring access to eaves ventilation.

i. 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.

j. 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 75 mm should be left either side of the (heavy duty) cables for their entire length within the attic area, and placed in trunking.

k. The insulation material shall be retained at a minimum of 75 mm from all electrical apparatus penetrating the ceiling, for example, recessed lighting fittings. Where necessary a permanent physical restraint shall be used.

l. Recessed downlights 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 downlight covers installed must be tested to I.S. EN IEC 60598-1 Luminaires: General requirements and tests.

m. 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.

n. 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.

o. All attic and roof insulation should meet wall insulation to minimise /eliminate thermal bridges as per Appendix H of S.R. 54. See Programme-specific documentation for requirements.

p. All pipework and water storage vessels should be insulated. See Clause 6.4.2 Insulation of pipework and water storage tanks for further details.

q. In every roof space where cold water tanks or other fitted appliances occur, the Contractor must construct a permanent boarded walkway from the attic 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 50 x 50 mm softwood battens laid across rafters, notched over pipes and cable crossings, said battens to be securely screw fixed in place to rafters. Flooring grade chipboard, 19 mm thickness by 450 mm wide, 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 Access Hatch : Insulation and Draught-Proofing

The Contractor must insulate the attic access hatch to the same thermal value as the main attic. Insulation must be securely fixed to the attic access 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 access hatches:

- Draught strip shall be fitted to all sides of the attic access hatch.
- Non-hinged attic access 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 access 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 access 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 access hatches are found, they must be fitted with suitable securing catches, unless the method adopted would cause damage to the attic access hatch or frame.

6.4.2 Insulation of pipework and water storage tanks

Contractor Requirements and Competence

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 Irish Agrément Certificate it must be installed by suitably qualified people in accordance with the Irish Agrément certificate (or equivalent).

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 certified by the Irish Agrément Board (or equivalent) and installed by suitably qualified people in accordance with the Irish Agrément Certificate (or equivalent).

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 with an Irish Agrément Certificate (or equivalent) and installed by suitably qualified people.

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 G of the Building Regulations (see Table 7 below):

Table 7 : Minimum insulation thickness (mm) to protect against freezing for domestic cold-water systems (12-hour period)

Minimum insulation thickness (mm) to protect against freezing for domestic cold water systems (12 hour period)						
Outside diameter (mm)	Inside diameter bore (mm)	Extreme installation Inside the building but outside the envelope of the insulation				
		λ = 0.020	λ = 0.025	λ = 0.030	λ = 0.035	λ = 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
Initial water temperature: +2^{0}C Minimum ambient temperature: -6^{0}C Permitted ice formation: 50% Evaluation period: 12 hours.						
Note 1 Thicknesses given are calculated specifically against the criteria noted in the table. These thicknesses may not satisfy other design requirements.						
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.						

(source: TGD G Appendix Table 1)

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 300 mm 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 300 mm above the finished level of insulation the insulation should be installed below the vessel and the underside of the vessel should also be insulated.

Further detail is given in Figure 5 and TGD G of the Building Regulations.

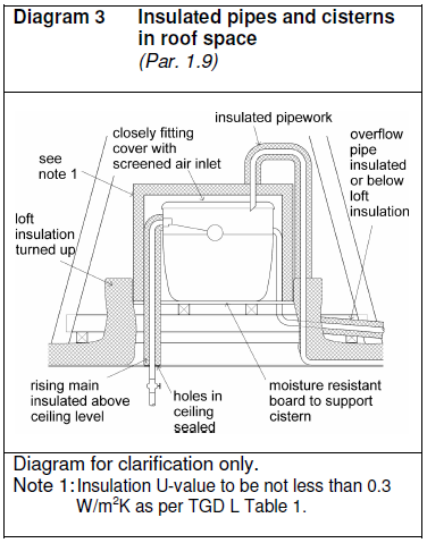


Figure 5 : Cold water cistern insulation requirements in the attic (source : TGD G Diagram 3)

i. All pipework bend and joints should be fully insulated.

j. Note, insulation of cold pitched roofs with either a vapour permeable (breathable) membrane (Type LR) or the traditional vapour impermeable (non-breathable) reinforced bitumen membrane (Type HR) will require a ventilation gap between the roof membrane/underlay and the cold side of the insulation (refer to Clause 6.5).

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 Insulation : Roof Insulation – pitched roof at Rafter Level (Cold Roof)

Contractor Requirements and Competence

Insulation between rafters is subject to Building Regulations in Ireland. 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 NFQ Level 5 or equivalent in roof 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 by suitably qualified people in accordance with this guidance and Technical Guides supplied by the material manufacturer.

Product Standards and Specification

For a cold pitched roof with insulation placed between and below rafters, proper materials must be used, as referred to in TGD D Materials and Workmanship. When incorporating such a product, material or system into construction works it must be suitable for their intended use under Irish site conditions and be CE Marked. For products or components for which no appropriate standard exists then the insulation must be certified to Irish Agrément (or equivalent), refer to Clause 2.7.

Appropriate documentation is required to demonstrate compliance with Irish Building Regulations and details of materials used should be included on the SEAI Declaration of Works (DoW) form.

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-value[22] for cold roofs insulated at rafter level is 0.20 W/m^{2}K.

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 cold roof

[22] U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details.

insulation at rafter level, insulation should be continuous and at no point prevent cross-ventilation of the roof voids.

Installation Standards and Specifications

a. All cold roof insulation installed at rafter level and associated works should be carried out in accordance with the manufacturer's specifications and NSAI's S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings* under Clause 6.2 and Clause 6.3 which provides the approach for rafter level insulation (cold roof) insulation.

b. If there is evidence of bats or bat roosts present in the roof space 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 (see Clause 3.1).

c. Contractors should identify any form of water penetration, infestation, rot or damp. Rafter level insulation should not be installed if the roof is leaking.

d. A cold pitched roof has insulation placed either between rafters (and battens) or between and under the rafters (rafters remain cold).

e. Materials used in roof Insulation should be suitable for their intended use in Ireland and have either a CE Mark or an Irish Agrément Certificate (or equivalent) and be installed by suitably qualified people.

f. Attention should be given to ventilation and condensation requirements of the attic in relation to the materials used (see Clause 4 Ventilation and S.R. 54). The installed insulation must not impede crossflow ventilation.

g. Ventilated cold pitched roofs require a 50 mm air gap above the between-rafter insulation (cold side) which is vented to the eaves and ridge for optimal ventilation. A breathable vent card can support the insulation and maintain a 50 mm air gap between the roofing underlay and the insulation.

   Ventilation is required at the eaves equivalent to a 25 mm continuous strip and at the ridge equivalent to a 5 mm continuous strip.

h. Traditional vapour impermeable (non-breathable) reinforced bitumen membranes (Type HR) used as underlay in older buildings require a 50 mm ventilation air gap to ensure adequate airflow.

   When a vapour permeable (breathable) underlay (Type LR) is used instead of the traditional roofing underlay the ventilation air gap in the batten cavity, normally 50 mm, *may* require a reduced depth for the airflow, depending on the Agrément certification. The breathable membrane should be Irish Agrément certified in accordance with Part D of the Building Regulations and installed in accordance with the guidance on the Agrément Certificate.

i. Cut the insulation boards marginally wider than the rafter space to ensure a friction fit upon installation. Filling remaining gaps or voids between the insulation boards and rafters with low-expansion foam can provide a tight seal however it is important not to overfill the gaps as this can lead to compression of the insulation and reduce its effectiveness. Similarly, any service penetrations, such as a soil stack, should be sealed adequately.

j. Insulating a cold pitched roof by using a thinner layer of insulation beneath the rafters is essential to combatting the thermal bridging (cold bridging) effect. Insulation should be continuous at junctions between the roof and other elements, particularly the ridge, eaves and gable. Where the coverage is not continuous it allows the rafter itself to conduct heat out to the external or 'cold' environment, thus providing a 'thermal bridge' through which heat can escape.

k. A second continuous layer of insulation should be fixed to the underside of the rafter transverse to the first layer of insulation with joints tightly butted. 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 roof insulation should meet wall insulation to minimise /eliminate thermal bridges as per Appendix H of S.R. 54. Refer to SEAI's Programme-specific documentation for requirements.

l. A separate vapour control layer (VCL) should be fitted between the insulation (warm side of the insulation) and plasterboard in accordance with DHLGH's Appendix B of Technical Guidance Document (TGD) L.

m. 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.
NOTE Insulation tape, with a width of no less than 75 mm, is used as a supplemental measure to hold the insulation boards in place and not as a primary means of attachment.

n. The insulation material shall be retained at a minimum of 75 mm from all electrical apparatus penetrating the insulation, for example, recessed lighting fittings. Where necessary a permanent physical restraint shall be used.

o. Downlighters should be provided with enough space to dissipate heat to prevent the lights themselves from overheating. For pitched (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.

The purpose made recessed down-light covers installed must be tested to I.S. EN IEC 60598-1 Luminaires: General requirements and tests.

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 Clause 6.4 Insulation : Roof Insulation - Ceiling Level.

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.

Additional Guidance on Roof Insulation

S.R. 54 provides for insulation methods with regard to pitched roof (cold/warm) and flat roof (cold/warm deck). Please refer to S.R. 54 should the roof and attic space be of an alternative structure.

6.6 Insulation : Floor Insulation

Contractor Requirements and Competence

Contractors installing floor insulation must be competent to complete the installation and must complete the work in accordance with S.R. 54 *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

Floor insulation must also be installed in accordance with any technical guides supplied by the material manufacturer. Products must be installed by suitably qualified people in accordance with the Irish Agrément Certificate (or equivalent).

SEAI expects documentary and photographic evidence of the installation of insulation to be available for inspection and for the purpose of BER assessments (see Clause 2.5).

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
- General environment during, and because of, the installation.

Product Standards and Specification

Materials used in the insulation of a suspended timber floor are typically mineral wool (often called 'rockwool' or 'earth wool'), glass fibre wool, expanded polystyrene (EPS), high-density foam, etc. Any insulation type, regardless of the insulation's technical composition, should have an Irish Agrément Certificate (or equivalent) and be installed by suitably qualified people. Materials used in the insulation of a concrete ground floor slab must be rigid insulation materials certified by the Irish Agrément Board (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-value[23] for the insulation of floors is:

- 0.36 W/m^{2}K, ground floor with no underfloor heating, or
- 0.15 W/m^{2}K, 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 must be installed in accordance with the Irish

[23] U-values are calculated according to the standards detailed in the DEAP methodology, I.S. EN ISO 6946, TGD L and BR 443 - *Conventions for U-value calculations.* See Clause 2.6 of this document for further details

Agrément Certificate (or equivalent) and installed by suitably qualified people. 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 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 *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 (see Table 3).

b. Suspended timber floor Insulation should be installed by suitably qualified people in accordance with the Irish Agrément Certificate (or equivalent).

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 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 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 Clause 4 Ventilation).

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 Clause 4).

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 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 Irish 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 Standards:
   - Protection of below ground structures against water ingress. Code of practice (BS 8102)
   - Design and installation of damp-proof courses in masonry construction (BS 8215)

e. The insulation works should not reduce the floor-to-ceiling height of the room to below 2.4 m or the clear door heights to below 2.0 m.

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 2 mm per meter run or a minimum of 10 mm, 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 Clause 3.1 for guidance on Radon. Post retrofit radon testing is recommended where extensive energy retrofit measures have been completed.

6.7 Mechanical Extract Ventilation (MEV) and Mechanical Ventilation with Heat Recovery (MVHR)

This measure is for continuous mechanical extract ventilation systems which include mechanical extract ventilation (MEV) and balanced system such as Mechanical Ventilation with Heat Recovery (MVHR). It primarily focusses on centralised systems, although there is some reference to decentralised systems. Information on mechanical extract systems as a ventilation strategy are detailed in Clause 4.3.2.

Contractors Requirements & Competence

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

Product Standard & Specification

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

- Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F published by the Department of Housing, Local Government and Heritage (DHLGH)
- Commission Regulation (EU) No 1254/2014 with regard to the energy labelling of residential ventilation units
- Commission Regulation (EU) No 1253/2014 with regard to Ecodesign requirements for ventilation units
- I.S. 10101 National Rules for Electrical Installations
- I.S. EN 13141-1:2019 Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices
- I.S. EN 13141-4:2021 Ventilation for buildings - Performance testing of components/products for residential ventilation. Aerodynamic, electrical power and acoustic performance of unidirectional ventilation units
- I.S. EN 13141-5:2020 Ventilation for buildings - Performance testing of components/products for residential ventilation. Cowls, assisted cowls and roof outlet terminal devices
- 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 13141-7:2021 Ventilation for buildings - Performance testing of components/products for residential ventilation. Performance testing of ducted mechanical supply and exhaust ventilation units (including heat recovery)
- I.S. EN 13141-8:2022 Ventilation for buildings - Performance testing of components/products for residential ventilation. Performance testing of non-ducted mechanical supply and exhaust ventilation units (including heat recovery)
- 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 ISO 9972:2015 Thermal Performance of Buildings - Determination of Air Permeability of Domestic Buildings – (Single or Single & Multi) Fan Pressurization Method
- I.S. EN 14134 Ventilation for buildings - Performance measurement and checks for residential ventilation systems
- Domestic Ventilation Systems, a guide to measuring airflow rates - BSRIA
- BS 8233:2014 Sound insulation and noise reduction for buildings Code of Practice.

6.7.1 Mechanical Extract Ventilation (MEV)

- A Mechanical Extract Ventilation (MEV) system should be considered where it is intended to achieve relatively low air leakage rates, typically 5 $m^3/(h.m^2)$ or less.
- The continuous mechanical extract ventilation (MEV) system must be designed to provide ventilation for the entire dwelling.
- Mechanical Extract Ventilation provides continuous ventilation (24/7).
- Mechanical Extract Ventilation includes Demand Controlled Ventilation (DCV), refer to Clause 4.3.3. DCV systems adjust the rate of ventilation according to the demands of each room.
- Only MEV systems that are compliant with the Commission Regulation (EU) No 1254/2014 with regard to energy labelling requirements for residential ventilation units with a specific power input (SPI) of no greater than ≤ 1.08 $W/(m^3/h)$ and have a specific fan power (SFP) of less than ≤ 0.30 W/(l/s) should be installed, or included in Product Characteristic Database (PCDB)[24] or SAP Appendix Q Database.
- Where continuous extract ventilation is proposed, the minimum ventilation rate provided should be in accordance with S.R. 54 (refer to Clause 4.3.2.).
- 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 testing of the ventilation unit. Note the specification of ductwork in SAP Appendix Q is currently categorised as: 'Flexible duct', 'Rigid duct' or 'No duct'. Where a semi-rigid duct is proposed, it must conform with SAP Appendix Q 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".
- Where applicable, air inlets should include humidity sensors, so the system automatically adjusts air flow volume to ensure a comfortable indoor environment.
- **NOTE:** Where an open-flued heat-producing appliance is located in a dwelling that also contains mechanical extract ventilation (MEV), it should be installed and commissioned in accordance with Building Regulations (Part J) and S.R. 54.

- **Background ventilation**: Care should be taken to ensure adequate cross ventilation is provided throughout the dwelling.
  To allow for enough replacement air, each habitable room should be fitted with background ventilation with an equivalent area of 2,500 mm^2 i.e., trickle ventilators to windows and/or through wall ventilation, as per TGD F Clause 1.2.2.8.
  NOTE: Free Area is typically 25% greater than its equivalent area. Equivalent area is measured in accordance with the method specified in I.S. EN 13141-1.
  Background ventilation should not be installed in a wet room where a MEV provides ventilation. A continuously running MEV system partially depressurises the dwelling.

[24] Product Characteristics Database (PCDB) https://www.ncm-pcdb.org.uk/sap/searchpod.jsp?id=17

- **Purge ventilation** for habitable rooms and wet rooms should be provided in accordance with S.R. 54. 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.

6.7.2 Mechanical Ventilation with Heat Recovery (MVHR)

- A MVHR system should be considered where it is intended to achieve relatively low air leakage rates, typically 5 $m^3/(h.m^2)$ or less.
- Where MVHR is proposed, the minimum ventilation rate provided should be in accordance with TGD F Ventilation.
- The minimum capacity of a MVHR should be based on the calculated general ventilation rate, adjusted to allow for air infiltration due to permeability of the building fabric, as per TGD F Ventilation.
- Only MVHR systems compliant with the Commission Regulation (EU) No 1254/2014 with regard to energy labelling requirements for residential ventilation units with a specific power input (SPI) of no greater than ≤ 2.88 $W/(m^3/h)$ and have a specific fan power (SFP) no greater than ≤ 0.8 W/(l/s) with a minimum Heat Recovery Efficiency of 85% should be installed, or included in the Product Characteristic Database (PCDB) or SAP Appendix Q Database.
- The MVHR system should be capable of an extract rate from each wet room at least equal to that specified in TGD F Ventilation.
- 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 testing of the ventilation unit. Note the specification of ductwork in SAP Appendix Q is categorised as: 'Flexible duct', 'Rigid duct' or 'No duct'. Where a semi rigid duct is proposed, it must conform with SAP Appendix Q 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*".
- It is not recommended to connect extract cooker hoods to Mechanical Ventilation with Heat Recovery systems. Where extract cooker hoods are connected, the Building Regulations (Part B Fire Safety and Part F Ventilation) and the guidance under fire precautions in BRE Digest 398 "*Continuous mechanical ventilation in dwellings*", should be followed.
- Mechanical Ventilation with Heat Recovery (MVHR) systems are not designed to provide combustion air.

  NOTE: Open flued combustion appliances are not recommended in dwellings fitted with Mechanical Ventilation with Heat Recovery (MVHR) where the system might interfere with the operation of the appliance and combustion, in accordance with Building Regulations (Part J). All extract points should be treated as if they were extract fans. Further guidance is available in BRE Digest 398 "Continuous Mechanical Ventilation in Dwellings".
- It is recommended that a spillage test be carried out before and after installation of the mechanical ventilation system, with the appropriate spillage test procedure, in accordance with Building Regulations (Part J).

6.7.3 Installation Standard & Specification: MEV and MVHR

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:

- Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F published by DHLGH
- Manufacturer's guidelines
- S.R. 54 Code of Practice for the energy efficient retrofit of existing dwellings
- I.S. 10101 National Rules for Electrical Installations. Please refer to Clause 3.2 Electrical Installations: Best Practice.

  Note: If ductwork has an electrically powered damper, it should be bonded with any simultaneously accessible conductive parts.

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 mm^2 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).
- The fan unit should not exceed 35 dB at full power.
- 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.
- 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 in accordance with the requirements of Part B (Fire Safety) of the Building Regulations.
- 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. attic spaces), with material that has the equivalent of at least 25 mm 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 in order 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 attic 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, such that 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. This will require that connections are permanent 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 300 mm 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 area[25] 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 mechanical 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 mechanical ventilation systems (MEV, MVHR, DCV) 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.

[25] As per Building Regulations (Part F), 'free area' is the geometric open area of a ventilator. Free Area is typically 25 % greater than its equivalent area. Equivalent area is measured in accordance with the method specified in I.S. EN 13141-1.

- 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 %.
- Installation of manual controls for the system must meet the requirements of Part M of the Building Regulations.
- Installation of room sensors should follow the manufacturer's guidance on positioning and in accordance with I.S. 10101 National Rules for Electrical Installations.
- 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 mechanical ventilation system must be commissioned to verify that the installed system achieves the designed level of ventilation.
- Where new mechanical extract ventilation system is installed as part of a Major Renovation, as defined in Building Regulations Part L, then the system should be designed, installed, commissioned and validated as per NSAI Ventilation Validation Scheme[26].
- Commissioning must be completed in accordance with the *Installation and Commissioning of Ventilation Systems for Dwellings – Achieving Compliance with Part F* 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 ± 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 mechanical extract ventilation system should:

[26] NSAI Ventilation Validation Scheme https://www.nsai.ie/certification/agrement-certification/ventilation-validation-registration-scheme/

        - 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 way that is clear and easy to understand and relate directly to the installed system. The following information should be provided where relevant:
    - Manufacturers 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*, should be appended to the operation and maintenance manual.

Additional Guidance

- Energy efficient ventilation in dwellings – a guide for specifiers (GPG 268) published by Energy Saving Trust
- Domestic Ventilation Systems - a guide to measuring airflow rates (BG 46/2022) published by BSRIA
- I.S. EN 14134 Ventilation for buildings - Performance measurement and checks for residential ventilation systems
- NSAI Ventilation Validation Registration Scheme (see Clause 4.2)

6.8 Heat Pump Systems

For the purposes of SEAI home energy upgrade grants, a Heat Pump System is defined as a space heating and Domestic Hot Water (DHW)[27] system including:

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

Contractor Requirements and Competence

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

- National Craft Certificate or Advanced Craft Certificate in Plumbing, or equivalent and includes a module on minor electrical works – NFQ Level 6[28]
- Domestic Heat Pump Systems (6N5646) – NFQ Level 6 Component Award
  under Maintenance Skills Technology (6M5154) - NFQ Level 6 Primary Award
- Certificate of Competence from the specific manufacturer of the heat pumps installed, based on an adequate training programme
- Registration on the SEAI Renewable Energy Installers Register for heat pumps
  https://www.seai.ie/register-with-seai/contractor/

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 Completion Certificate for all electrical works completed 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 Regulation (EU) No 2024/573.

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.

[27] Heat pump systems, excluding those providing warm air to the home (air to air heat pumps)

[28] Equivalence refers primarily to course content and is related to the competence required to correctly install heat pumps in accordance with these technical specifications. Please check with the training provider as to requirements. SEAI reserves the right to decide whether a qualification is equivalent to the reference QQI Award curriculum. Supplementary certifications may be required to support equivalence.

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 SEAI Programme's Terms and Conditions, as applicable.

6.8.1 Heat Pump System and Heat Loss Indicator (HLI)

The building fabric consists of the walls, roof, floors, windows and doors. The building fabric is a major area of heat loss which can be reduced by adding internal or external wall insulation, attic and floor insulation, replacement of windows and doors and installing an efficient renewable space heating system such as a heat pump.

Heat Loss Indicator (HLI) is a summary of the overall energy performance of a home. Heat Loss Indicator (HLI) is specified as the ratio of heat loss coefficient (W/K) to total floor area (m^2) in the current version of DEAP under the 'Heat Losses' section. The HLI is calculated by the DEAP software as part of the Building Energy Rating (BER) process (see Clause 2.5).

DEAP methodology calculates the HLI as the Total Heat Loss per m^2 ($W/K \cdot m^2$) of floor area:

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

Heat Loss Indicator (HLI) threshold for a heat pump system grant eligibility:

$$HLI \leq 2.3\ W/(K \cdot m^2)$$

SEAI registered contractors must consider home energy upgrade measures to enhance the energy performance of a home to allow a heat pump system to perform efficiently and effectively.

Information on heat pump systems and home energy upgrade grant process is available on SEAI's website:-

- Heat pump system grant process
  www.seai.ie/grants/home-energy-grants/individual-grants/heat-pump-systems
- Homeowner's Guide To Heat Pump Systems
  www.seai.ie/Homeowner's Guide to Heat Pump Systems

6.8.2 Heat Pump Product and installation requirements

For the installation of the heat pump it is important to evaluate the appropriate size of the heat pump and its type. It is a requirement that the heat pump system design specifications include:

- Heat Loss Indicator (HLI) based on the total fabric (envelope) and ventilation loss for the home divided by the total floor area (see Clause 6.8.1).
- SEAI registered contractors must document the home energy upgrade measures recommended when providing a full technical design and product specification for the installation of a heat pump system.
- The Contract of Works is agreed between the Homeowner and the Contractor following discussion on the types of heat pump systems available and determining the option most suitable for the home.

A heat pump that uses energy from electricity and a renewable energy source (RES) such as air, ground or water, and does not involve a primary (fossil fuel based) heating source, is eligible for SEAI's heat pump system grant. Different types of RES heat pumps systems include:-

- Air Source Heat Pump (ASHP)
  - Air-to-Air
  - Air-to-Water
  - Exhaust Air-to-Water
- Ground Source Heat Pump (GSHP)
  - Ground-to-Water (horizontal)
  - Ground-to-Water (vertical)
- Water Source Heat Pump (WSHP)
  - Water-to-water

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 Energy Labelling Commission Regulation (EU) No 811/2013 and Ecodesign Commission Regulation (EU) No 813/2013 for Air/Ground/Water/Exhaust air to water heat pumps. Ecodesign Commission Regulation (EU) No 206/2012 and Energy Labelling Commission Regulation (EU) No 626/2011 for air-to-air heat pumps.
- Provide the data required for the Domestic BER assessment (Ecodesign datasheets). These must be based on I.S. EN 14825 and I.S. EN 16147 testing standards
- CE Marked and associated EU Declaration of Conformity
- Satisfy the minimum Seasonal Performance Factor (Main Space Heating Efficiency) calculated according to the DEAP methodology as specified in Table 8. To ensure that this requirement is met, the heat pump system should be assessed in DEAP during the design phase and prior to installation.

*Table 8 : Minimum heat pump efficiency requirements**

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

***Important**

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 legislation.

Important Note on Hydrofluorocarbons (HFCs)
SEAI recommends that, to the extent possible, HFCs are avoided in heat pumps. The F-Gas Regulation (EU) No 2024/573 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.

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 Clause 6.8.3.

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 Clause 6.8.4 Documentation requirements). The sizing must be based on an external design temperature of -3 ^{o}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 Table 9 as a minimum:

Table 9 : Heat pump system controls and protection

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		√	√

h. The Domestic Hot Water (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 ^{o}C and the supplementary hot water heater shall provide stored hot water at 60 ^{o}C. See further guidance in standards, guidance and specifications documents;
- Any other requirements under the regulations and standards listed in Clause 6.8.3 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 I.S. EN 17628. 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 NSAI S.R. 50-4 *Heat pump systems in dwellings* and BS 7593 *Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems*.

n. Earthing and Bonding must be in accordance with I.S. 10101 National Rules for Electrical Installations. Please refer to Clause 3.2 Electrical Installations: Best Practice 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 Clause 6.8.4 Documentation requirements.

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. All ventilation requirements must be met (see Clause 4).

s. Where applicable, the homeowner must be made aware of obligations under the F-Gas regulations, and equipment must be labelled according to these regulations.

6.8.3 Heat Pump 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:

- I.S. 10101 National Rules for Electrical Installations
- Environmental Protection Agency (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*"
- "*Heating and Domestic Hot Water Systems for Dwellings – Achieving compliance with Part L & Energy Performance of Buildings Regulations*" Clause 8 from DHLGH
- I.S. EN 15450 Heating Systems in Buildings - Design of Heat Pump Heating Systems
- I.S. EN 12831-1 Energy Performance of Buildings - Method for Calculation of the Design Heat Load - Space Heating Load
- I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems
- Heat Pump Association of Ireland (HPAI) Heat Pump installation guidelines
- S.R. 50-1 Building services - Code of Practice - Water based heating systems in dwellings
- Refrigerating systems and heat pumps I.S. EN 378-1 Safety and environmental requirements and I.S. EN 378-3 Installation site and personal protection
- Manufacturer's installation instructions for the specific Heat Pump model(s) and other parts of the system installed
- TM 51 Ground Source Heat Pumps, CIBSE
- Domestic Heating Design Guide, CIBSE
- "*Heat emitter guide for domestic heat pumps - Microgeneration Certification Scheme MCS 021*"
- "*Requirements for MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration heat pump systems*" Microgeneration Certification Scheme (MCS) MIS 3005 and "*Heat Emitter supplement to the Domestic Heating Design Guide*" by the Institute of Domestic Heating and Environmental Engineers (IDHEE)
- I.S. EN ISO 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 (GEHO0311BTPA-E-E) by the UK Environment Agency
- GSI Geothermal Collector suitability Maps
- GSI Ground Source Heat and Shallow Geothermal Energy Homeowner Manual
- SEAI DEAP Heat Pump Methodology

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 I.S. EN 1566-1 "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 I.S. EN 1566-1
- Unvented hot water storage system products should:
  - comply with I.S. 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

6.8.4 Heat Pump Documentation requirements

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

Heat Pump System documentation to be provided to the homeowner, and to be available for inspection[29]:

- 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.

6.8.5 Important notes on Heat Pump Systems

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.

6.9 Boiler : High Efficiency Boilers

Contractor Requirements and Competence

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 (REC) and a Completion Certificate must be issued.

[29] Make and model on all the Heat Pump System documentation must match that of the unit installed.

6.9.1 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.

6.9.2 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).

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

- 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.
- The CRU Criteria document 'The Regulation of Gas Installers with respect to safety'.

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

Oil and Gas Boiler 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 Product Characteristic Database (PCDB). 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 Clause 1.4 of the DHLGH's "*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.

When replacing a gas boiler any adjacent exposed conductive parts should also be bonded in 10 mm^2 as any exposed conductive parts that are simultaneously accessible to the new installation are affected by the new installation.

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.

Oil and Gas Boiler Installation Standard and Specification

Qualifying boilers must be fitted in accordance with:

- All ventilation requirements must be met (see Clause 4). Gas, oil and solid fuel appliances must be correctly ventilated as per TGD F Ventilation and TGD J Heat Producing Appliances.
- Manufacturer's guidelines
- I.S. 10101 National Rules for Electrical Installations (refer to Clause 3.2 Electrical Installations: Best Practice for details)
- BS EN 12831-1 Energy performance of buildings. Method for calculation of the design heat load

6.9.3 Condensing Boilers

When installing condensing boilers, the DHLGH 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 DHLGH 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.

6.9.4 Installation of safety valve discharge works : Important Guidance Note

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 15 mm (½") copper. The pipework shall terminate in a visible position outside the building and have a 100 mm 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 15 mm (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 (30 mm) 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

6.10 Boiler Service

Contractor Requirements and Competence

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 Guild**s.**

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 RGI. To align with this requirement gas installers undertaking High Efficiency Gas Boiler and Heating Controls upgrade works must be on the Registered Gas Installer (RGI) list. Details on how to register with RGI is available at www.rgi.ie.

Standard and Specification

a. A boiler service should be to manufacturer's instructions or as per SEAI boiler servicing checklists
   The gas boiler checklist is available at:
   www.seai.ie/resources/publications/Communities-Programme_Gas-Checklist.pdf

   The oil boiler checklist is available at:
   www.seai.ie/resources/publications/Communities-Programme_Oil-Checklist.pdf

b. 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 logbook 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.

   The boiler logbook 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.

6.11 Biomass Boilers (with/without thermal storage)

Contractor Requirements and Competence

Biomass boilers work on the same principle as a conventional oil boiler and must be installed by suitably qualified individuals in accordance with the manufacturer's guidelines and the DHLGH "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 (REC) 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 Clause 6.13 Heating Controls – Fully Integrated) 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 Clause 6.13.1 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 80 mm, 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 Specification

Qualifying biomass boilers must be CE Marked to demonstrate compliance with the Low Voltage Directive (LVD 2014/35/EU) and Machinery Directive (MD 2006/42/EC).

The biomass boiler must also be listed under 'Solid Fuel Boilers' 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 I.S. EN 1566-1 "*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

The guidance in Clause 5.3 of the DHLGH 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 always comply with I.S. EN 14336 "*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. All ventilation requirements must be met (see Clause 4). Solid fuel appliances such as biomass boilers must be correctly ventilated as per TGD F Ventilation and TGD J Heat Producing Appliances.

e. The calculation of the heating requirement for sizing of the biomass boiler should be in compliance with I.S. EN 12831 'Heating systems in buildings. Method for calculation of the design heat load' or equivalent.

f. 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.

g. 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.

h. 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 550 mm^2 per kW of boiler output but no less than 6500 mm^2 will be provided, or as required by TGD J of the Building Regulations.

i. The Contractor shall ensure that the required electricity supply is available for the plant in the boiler room.

j. 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.

k. 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.

l. The existing central heating system should be thoroughly cleaned and flushed out before installing a new boiler.

m. 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.

n. An exhaust flue should be twin-walled insulated stainless steel. The inner wall should be grade 316 and the outer wall should be grade 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.

o. 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.

p. Biomass boilers must be commissioned to verify that the system is installed in accordance with I.S. EN 12828 "*Heating systems in buildings. Design for water-based heating systems*", I.S. EN 14336 "*Heating systems in buildings. Installation and commissioning of water-based heating systems*" and manufacturer's guidelines.

q. 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.

r. 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.

s. 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:-

- 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 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

6.12 Heating Controls – Fully Integrated

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

Contractor Requirements and Competence

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 European or Irish standard for that measure. As a minimum, the following Standards should be satisfied:

- I.S. EN 60730-1 Automatic electrical controls for household and similar use. General requirements
- I.S. EN IEC 60730-2-7 Automatic electrical controls for household and similar use Part 2-7: Particular Requirements for Timers and Time Switches
- I.S. 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

- "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*", DHLGH
- S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings, NSAI*
- "*Domestic Heating Design Guide", CIBSE*
- 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 I.S. 10101 National Rules for Electrical Installations and I.S. EN 12828 "*Heating systems in buildings - Design for water-based heating systems"* or equivalent, where applicable. Please refer to Clause 3.2 Electrical Installations: Best Practice 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:

6.12.1 Space Heating and Domestic Hot Water : Dual Zone Control
6.12.2 Space Heating and Domestic Hot Water : adding an additional Zone Control
6.12.3 Programmable Timer (Time and Temperature Control) with Remote Access
6.12.4 Immersion Heater with Thermostatic Controls and Timers
6.12.5 Hot Water Cylinder Thermostat
6.12.6 Hot Water Cylinder Insulation
6.12.7 Boiler Heating Controls
6.12.8 Thermostatic Radiator Valves (TRVs)

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
- Earthing and equipotential Bonding

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

6.12.1 Space Heating and Domestic Hot Water : Dual Zone Control

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 European or Irish standard for that measure. For example, I.S. EN IEC 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 20 kW. 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 Clause 6.12 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.

6.12.2 Space Heating and Domestic Hot Water : adding an additional Zone Control

In addition to establishing dual zones (see Clause 6.12.1), the Customer must also commission the installation of an additional space heating zone **OR** the installation of Thermostatic Radiator Valves (TRVs), see Clause 6.12.8 for details. 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 Clause 6.12.1).

6.12.3 Programmable Timer (time and temperature control) with remote access

A 24-hour 7-Day Programmable Timer, 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.

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).

6.12.4 Immersion Heater with thermostatic controls and timers

Product Standard and Specification

Timers and temperature control for electric immersion heaters must conform to the appropriate European or Irish standard i.e.

- I.S. EN 60730-1 Automatic electrical controls for household and similar use. General requirements
- I.S. 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.

6.12.5 Hot Water Cylinder Thermostat

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 ^{o}C. It is not uncommon in many households for domestic hot water to be heated to temperatures higher than 60 ^{o}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 ^{o}C. This is to protect against the risk of Legionella.

6.12.6 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 BS 5645 specification.
  - The insulating material, covering material and fastenings shall not have suffered any permanent deterioration.
  - The insulating material shall be at least 80 mm nominal thickness.

6.12.7 Boiler Heating Controls

Boiler Interlock is a method of connecting the heating system controls with a boiler. 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 is 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.

6.12.8 Thermostatic Radiator Valves (TRVs)

In addition to establishing 2 zones (see Clause 6.12.1), 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 European or Irish standard for Thermostatic Radiator Valves such as I.S. 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 *Code of Practice for the Energy Efficient Retrofit of Dwellings* and BS 7478 "*Guide to selection and use of thermostatic radiator valves"*. BS 7478 guides on selection, application and use of thermostatic radiator valves (TRVs) manufactured in accordance with I.S. EN 215 for use in domestic and commercial wet central heating systems up to a water temperature of 120 ^{o}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.

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.

6.13 Heating Controls with Remote Access – Fully Integrated

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 Competence

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 (REC) 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 European or Irish standard for that measure. As a minimum, the following Standards should be satisfied:

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

- "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*", DHLGH
- S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings, NSAI*
- "*Domestic Heating Design Guide", CIBSE*
- 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 I.S. 10101 National Rules for Electrical Installations and I.S. EN 12828 *Heating systems in buildings - Design for water-based heating systems* or equivalent, where applicable. Please refer to Clause 3.2 Electrical Installations: Best Practice 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:

6.13.1 Space Heating and Domestic Hot Water : Dual Zone Control
6.13.2 Space Heating and Domestic Hot Water : adding an Additional Zone Control
6.13.3 Programmable Timer (Time and Temperature Control) with Remote Access
6.13.4 Immersion Heater with Thermostatic Controls and Timers
6.13.5 Hot Water Cylinder Thermostat
6.13.6 Hot Water Cylinder Insulation
6.13.7 Boiler Heating Controls
6.13.8 Thermostatic Radiator Valves (TRVs)

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-clauses describe the requirements for the items above.

6.13.1 Space Heating and Domestic Hot Water : Dual Zone Control

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 European or Irish standard for that measure. For example, I.S. EN IEC 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 20 kW. 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 powerhead 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 Clause 6.13 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.

6.13.2 Space Heating and Domestic Hot Water : adding an additional Zone Control

In addition to establishing 2 zones (see Clause 6.13.1), the customer must also commission the installation of an additional space heating zone OR the installation of Thermostatic Radiator Valves (TRVs), see Clause 6.12.8 for details. TRVs must not be installed in rooms with room thermostats.

Product Standard and Specification

The Product Standards and Specifications outlined in Clause 6.13.1 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 *Code of Practice for the Energy Efficient Retrofit of Dwellings*, and Industry Best Practice. The Installation Standards and Specifications outlined in Clause 6.13.1 also apply to the installation of an additional heating zone.

6.13.3 Programmable Timer (time and temperature control) with remote access

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.

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).

6.13.4 Immersion Heater with thermostatic controls and timers

Product Standard and Specification

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

- I.S. EN 60730-1 Automatic electrical controls for household and similar use. General requirements
- I.S. 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.

6.13.5 Hot Water Cylinder Thermostat

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 ^{o}C. It is not uncommon in many households for domestic hot water to be heated to temperatures higher than 60 ^{o}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 ^{o}C. This is to protect against the risk of Legionella.

6.13.6 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 BS 5615 specification.
  - The insulating material, covering material and fastenings shall not have suffered any permanent deterioration.
  - The insulating material shall be at least 80 mm nominal thickness.

6.13.7 Boiler Heating Controls

Boiler Interlock is a method of connecting the heating system controls with a boiler. 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 is 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.

6.13.8 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 European or Irish standard for Thermostatic Radiator Valves such as I.S. 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 *Code* of Practice for the Energy Efficient Retrofit of Dwellings and BS 7478 "Guide to selection and use of thermostatic radiator valves". BS 7478 gives guidance on the selection, application and use of thermostatic radiator valves (TRVs) manufactured in accordance with I.S. EN 215 for use in domestic and commercial wet central heating systems up to a water temperature of 120 oC. 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 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 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.

6.14 Heating Controls – Entry Level

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 Competence

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 (REC) and a Completion Certificate must be issued.

Product Standard and Specification

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

- I.S. EN 60730-1 Automatic electrical controls for household and similar use. General requirements
- I.S. EN IEC 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

- "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*", DHLGH
- S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings, NSAI*
- "*Domestic Heating Design Guide", CIBSE*
- 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 I.S. 10101 National Rules for Electrical Installations and I.S. EN 12828 *Heating systems in buildings - Design for water-based heating systems* or equivalent, where applicable. Please refer to Clause 3.2 Electrical Installations: Best Practice 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:
6.14.1 Space Heating : Single Zone Control with Room Thermostat
6.14.2 Boiler Heating Controls with 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.

6.14.1 Space Heating : Single Zone Control

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, see Clause 6.12.2 for details).

Product Standard and Specification
Product Standard and Specification are as detailed in Clause 6.12 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.

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.

6.14.2 Boiler Heating Controls

Boiler Interlock is a method of connecting the heating system controls with a boiler. 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.

6.15 Heating Controls with Remote Access – Entry Level

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 Competence

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 with remote access products must conform to the appropriate European or Irish standard for that measure. As a minimum, the following Standards should be satisfied:

- I.S. EN 60730-1:2011 *Automatic electrical controls for household and similar use. General requirements*
- I.S. EN IEC 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 and Industry Best Practice. All works should be installed in accordance with

- "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*", DHLGH
- S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings, NSAI*
- "*Domestic Heating Design Guide", CIBSE*
- 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 I.S. 10101 National Rules for Electrical Installations and I.S. EN 12828 *Heating systems in buildings - Design for water-based heating systems* or equivalent, where applicable. Please refer to Clause 3.2 Electrical Installations: Best Practice 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:
6.15.1 Space Heating : Single Zone Control with Remote Access with Room Thermostat
6.15.2 Boiler Heating Controls with 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.

6.15.1 Space Heating : Single Zone Control with remote access

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, see Clause 6.13.2 for details).

Product Standard and Specification
Product Standard and Specification are as detailed in Clause 6.12 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.

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.

6.15.2 Boiler Heating Controls

Boiler Interlock is a method of connecting the heating system controls with a boiler. 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.

6.16 Stoves : Solid Multi-Fuel Heating System

Contractor Competence

Contractors installing high-performance stoves must be competent to complete the installation and must complete the work in accordance with BS 8303 "*Installation of domestic heating and cooking appliances burning wood and solid mineral fuels. Specification"* and in accordance with CE47 "*Energy Efficiency Best Practice in Housing – Domestic heating by solid fuel: Boiler systems*" 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 Specification

The multi-fuel stove being installed must meet the requirements of I.S. EN 16510-1 *Residential solid fuel burning appliances - General 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 DHLGH "*Heating and Domestic Hot Water Systems for Dwellings – Achieving compliance with Part L & Energy Performance of Buildings Regulations*", particularly Table 16. The Contractor must discuss the specification and output of the stove with the customer before selecting the final system.

The Ecodesign Regulation (EU) 2015/1185 sets standards for the efficiency and emissions of solid fuel space heating appliances. Appliances must meet the minimum efficiency levels set out within the regulation and must not exceed the emission levels standards.

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 "*Installation of domestic heating and cooking appliances burning wood and solid mineral fuels. Specification*".
- 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.
- All ventilation requirements must be met (see Clause 4). Gas, oil and solid fuel appliances must be correctly ventilated as per TGD F Ventilation and TGD J Heat Producing Appliances.
- 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 I.S. 10101 National Rules for Electrical Installations. All Electrical components shall be installed in

accordance with I.S. 10101 National Rules for Electrical Installations. Please refer to Clause 3.2 Electrical Installations: Best Practice for details.

- Any soot door required for cleaning the chimney shall be correctly located and fitted. (See BS 8303). 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 Figures 1, 2, 3, 13 and 15).
- 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 Regulations I.S. 813 *Domestic Gas Installations*.
- 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 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.

6.17 Gas Fired Room Heater

Contractor Requirements and Competence

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 the Contractor must be a Registered Gas Installer (RGI).

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

Product Standard and Specification

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

1. It must meet the conditions specified in Clause 2 of the DHLGH document "*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L*".
2. 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)
3. 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.
4. The correct level of permanent ventilation must be installed as per TGD J of the Building Regulations and/or I.S. 813.
5. A carbon monoxide (CO) alarm complying with I.S. EN 50291-1 should be provided.

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 'Specification for safety and rational use of energy of domestic gas appliances". Radiant/convectors' and I.S. EN 613 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 Clause 4 Ventilation).

Installation Standard and Specification

A qualifying gas-fired independent space heater must be installed by a Registered Gas Installer (RGI) and in accordance with the latest version of TGD J *Heat Producing Appliances* 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 Clause 2 of DHLGH document "*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L*".

If the installation involves work to the electrical wiring:

- All wiring must be in accordance with I.S. 10101 National Rules for Electrical Installations;
- Where required electrical works must be a carried out by a Registered Electrical Contractor (REC)
- Please refer to Clause 3.2 Electrical Installations: Best Practice for details.

6.18 Storage Heaters - High Heat Retention

Contractor Requirements and Competence

High heat retention electric storage heaters should be installed by a Registered Electrical Contractor (REC) in accordance with manufacturer's guidelines as a minimum.

To align with this requirement all Registered Electrical Contractors (REC) undertaking Electric Storage Heater upgrade works must be registered with Safe Electric. Details on how to register are available at Safe Electric www.safeelectric.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 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 EN 60531 or the testing must be endorsed by a body accredited to test in accordance with 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 a Registered Electrical Contractor (REC) and in accordance with I.S. 10101 National Rules for Electrical Installations. Please refer to Clause 3.2 Electrical Installations: Best Practice for details.

The high heat retention electric storage heater must also be installed in accordance with manufacturer's guidelines, NSAI's S.R. 54 "*Code of Practice for the Energy Efficient Retrofit of Dwellings*", Clause 2 of DHLGH "*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part* L". All ventilation requirements must be met (see Clause 4) as per TGD F Ventilation and TGD J Heat Producing Appliances.

6.19 Power Flush of Heating System

Contractor Requirements and Competence

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 (RGI). To align with this requirement all gas installers proposing to undertake High Efficiency Gas Boiler and Heating Controls upgrade works must be on the Registered Gas Installer (RGI) list. Details on how to register with RGI is available at www.rgi.ie.

Product Standard and Specification

Mechanically assisted powered cleanse and flush (power flushing) 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.

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

Installation Standard and Specification

Mechanically assisted powered cleanse and flush (power flushing) 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 power flushing procedure should include:

- Operation of the unit for at least 10 minutes (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 power flushing reservoir tank until the water runs clear;
- Addition of the chosen cleansing chemical to the reservoir of the power flushing 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 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 C*ode of practice for treatment of water in domestic hot water central heating systems* Clause 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.

6.20 Power Flush and Magnetic Filter of Heating System

Contractor Requirements and Competence

Contractors undertaking a mechanically assisted powered cleanse and flush (power flushing) 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 NFQ 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 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 (power flushing) 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 (RGI). To align with this requirement all gas installers proposing to undertake High Efficiency Gas Boiler and Heating Controls upgrade works must be on the Registered Gas Installer (RGI) list. Details on how to register with RGI is available at www.rgi.ie.

Product Standard and Specification

Mechanically assisted powered cleanse and flush (power flushing) of system must be performed as per Clause 6.19 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

- www.seai.ie/resources/publications/Communities-Programme_Oil-Checklist.pdf
- 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 NSAI S.R. 50-1 "*Building services - Code of Practice - Water based heating systems in dwellings"* where applicable.

Installation Standard and Specification

Mechanically assisted powered cleanse and flush (power flushing) of a heating system must be performed as per Clause 6.19 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 NSAI S.R. 50-1 "*Building services - Code of Practice - Water based heating systems in dwellings"* 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.

6.21 Domestic Hot Water Storage : High Heat Retention Cylinders

Contractor Competence

Hot water storage that are 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 (REC) 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 document: (i.e. that the heat loss from the cylinder will not exceed 1.6 X (0.2 + 0.051$^{V2/3}$) kWh per 24 hours, where V is the nominal cylinder capacity in litres), or a standing loss from a storage cylinder of less than 0.5 W/l per hour.

- Tested to the relevant standard:
  - Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of I.S. EN 1566 "*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*" (Part 1 and 2) or BS 3198 "*Specification for copper hot water storage combination units for domestic purposes*"
  - Unvented systems should comply with I.S. EN 12897 "*Water supply. Specification for indirectly heated unvented (closed) storage water heaters"* and have a CE Mark or be certified by Irish Agrément Board; or equivalent
    or
  - BS 1566-1 "*Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods"* and/or

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.

Additional standards and guidance documents are also useful:

- I.S. EN 14336 "*Heating systems in buildings. Installation and commissioning of water-based heating systems" and the requirements of the system supplier*s'
- I.S. EN 12828 *Heating systems in buildings - Design for water-based heating systems*
- 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

6.22 Draught-Proofing

Contractor Requirements and Competence

Draught-proofing Contractors must be competent to complete the installation and must complete the work as set out in the guidance document BS 7386 "*Specification for draughtstrips 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 Irish 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 carried out using materials with a CE Mark or approved by the Irish Agrément Board (or equivalent) and installed by suitably qualified people in accordance with these standards.
  - 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.
  - The bottom horizontal edge of the door shall be fitted with a draught brush cut to between –1 mm and – 4 mm 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.
  - 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.

- **Attic Access Hatch**
  See Clause 6.4.1 for requirements and installation instructions for attic access hatch draught-proofing.

Installation Standards and Specifications

a. Draught-proofing should be carried out using materials with a CE Mark or approved by the Irish Agrément Board (or equivalent) and installed by suitably qualified people.

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 Table 10. 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.

Table 10 : Draught Strip compression

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

   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 25 mm from each end of the carrier.
   iii. Corners should be butt, mitred or notch cut as appropriate with a maximum gap of 1 mm 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 +0 mm and – 2 mm 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 "*Specification for draughtstrips 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 1.5 mm 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 draught-proofing could not be fitted.
v. Carrier based draught strip shall not be used in sections shorter than 75 mm.

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 20 mm stainless steel screws using all fixing holes.
v. An additional screw must be fitted with 35 mm 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.

6.23 Chimney Draught Limiter

Contractor Requirements and Competence

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 open fires burning solid mineral fuels 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 Clause 4 Ventilation).

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 open fires burning solid mineral fuels 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.

6.24 Door Replacement

Contractor Competence

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

Product Standards and Specification

- All external doorsets being installed must meet the requirements of the Construction Products Regulation (EU) No 2024/3110.

- All doorsets being installed must carry CE Marking and must conform to the requirements of I.S. EN 14351-1 "*Windows and doors - Product standard, performance characteristics - Windows and external pedestrian doorsets"*.

- All single leaf doorsets being installed must have been tested to and meet requirements in PAS 24 "*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 L *Conservation of Fuel and Energy - Dwellings*. Thus, replacement doors must achieve a U-value of 1.4 W/m^2K.

The stated U-value of the doorsets must be certified by an appropriate independent body and have been derived according to I.S. EN ISO 12567 *Thermal performance of windows and doors - Determination of thermal transmittance by the hot-box method* or I.S. EN ISO 10077 *Thermal*

performance of windows, doors and shutters - Calculation of thermal transmittance (Parts 1 and 2 respectively).

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 I.S. EN 17037 Daylight in Buildings.

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 doorset.

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.

6.25 Window Replacement

Contractor Competence

Contractors installing windows must be competent to complete the installation and must complete the work in accordance with BS 8213-4 "*Code of practice for the survey and installation of windows and external doorsets"* 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 (EU) No 2024/3110.

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

- I.S. EN 14351-1 "*Windows and doors - Product standard, performance characteristics - Windows and external pedestrian doorsets"*
- I.S. EN 1279-1 "*Glass in Building - Insulating glass units - Generalities, system description, rules for substitution, tolerances and visual quality"*
- I.S. EN 1279-2 "*Glass in building - Insulating glass units Part 2: 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 should achieve a U-value of 1.4 W/m^{2}K.

The stated U-value of the units must be certified by an appropriate independent body, e.g. NSAI's WEP (Window Energy Performance) Scheme, British Fenestration Rating Council, and have been derived according to I.S. EN ISO 12567 *Thermal performance of windows and doors - Determination of thermal transmittance by the hot-box method* or I.S. EN ISO 10077 *Thermal performance of windows, doors and shutters - Calculation of thermal transmittance* (Parts 1 and 2 respectively).

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 I.S. EN 17037.

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.

6.26 Window Secondary Glazing

Contractor Competence

Contractors installing window glazing envelopes must be competent to complete the installation and must complete the work in accordance with BS 8213-4 "*Code of practice for the survey and installation of windows and external doorsets"* 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 BS 8000-0 "*Workmanship on construction sites. Introduction and general principles"*.

In all cases the manufacturer's instructions should be followed. Insulating glass units, setting and location blocks (see Figure 5 of BS 8213-4), distance pieces, frame to glass and bead to glass gaskets, bead to frame air seals, 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 (EU) No 2024/3110.

The glazing must conform to:-
- I.S. EN 1279-1 "*Glass in Building - Insulating glass units - Generalities, system description, rules for substitution, tolerances and visual quality"*
- I.S. EN 1279-2 "*Glass in building - Insulating glass units Part 2: 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 should achieve a U-value for the glazing of envelopes of 2.1 W/m^2K.

All U-values of the glazing envelopes shall be calculated according to either I.S. EN 410 "*Glass in Building - Determination of Luminous and Solar Characteristics of Glazing*" and I.S. EN 673 "*Glass in Building - Determination of Thermal Transmittance (U Value) - Calculation Method"* and I.S. EN 12898 "*Glass in building - Determination of the emissivity"*.

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 I.S. EN 17037.

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.

6.27 Window Glazing Low E-Film

Contractor Competence

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 (EU) No 2024/3110.

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 should achieve a U-value for the glazing of envelopes of 2.4 W/m^{2}K for double glazing envelope and 3.5 W/m^{2}K for single glazing envelope.

All U-values of the glazing envelopes shall be calculated according to either I.S. EN 410 "*Glass in Building - Determination of Luminous and Solar Characteristics of Glazing*" and I.S. EN 673 "*Glass in Building - Determination of Thermal Transmittance (U Value) - Calculation Method*" and I.S. EN 12898 "*Glass in building - Determination of the emissivity*".

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 I.S. EN 17037 'Daylight in Buildings'.

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 I.S. EN 410 "*Glass in Building - Determination of Luminous and Solar Characteristics of Glazing*" and I.S. EN 673 "*Glass in Building - Determination of Thermal Transmittance (U Value) - Calculation Method*".

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.

6.28 Lighting - LED

Contractor Requirements and Competence

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 Ecodesign Regulation (EU) 2019/2020 requirements for light sources and separate control gears. I.S. EN IEC 60598-1 Luminaires: General requirements and tests specifies general safety requirements for luminaires.

LED luminaires:

- I.S. EN 13032-1 and I.S. EN 13032-2 "*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 I.S. 10101 National Rules for Electrical Installations
- Contractors must be Registered Electrical Contractors (REC)

Please refer to Clause 3.2 Electrical Installations: Best Practice for details.

6.29 Home Energy Assessment (HEA) Report

Contractors are required to submit a Home Energy Assessment (HEA) Report in accordance with a specific Programme.

A Home Energy Assessment includes:-

- Building Energy Rating (BER) assessment with published BER including the Advisory Report.
- Technical Design report on the energy efficiency of a home.
  - Details include ventilation/airtightness strategy, fabric design, plumbing and heating design considerations.
  - Estimate of annual energy usage in kWh using the BER assessment methodology regarding occupancy, duration of space heating and hot water demand.
- Details on the home energy upgrade measures needed to get a home to a B2 rating or better.
- Heat Pump Technical Assessment detailing the home energy upgrades required to make a home suitable for a heat pump.
- A report explaining how the recommended home energy upgrades will improve the comfort of a home and help to reduce energy bills.
- An estimate of the costs of the recommended home energy upgrades including deduction of the SEAI grant allowance.

6.30 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.

6.30.1 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.

6.30.2 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.

6.31 Solar Electricity

Solar panels that produce electricity are known as solar photovoltaic (PV) modules. The SEAI Solar Photovoltaic (PV) Scheme operates under the Microgeneration Support Scheme www.seai.ie/grants/home-energy-grants/individual-grants/solar-electricity-grant.

Solar Photovoltaic (PV) modules shall meet the PV module requirements in the SEAI's *Domestic Solar Photovoltaic - Code of Practice for Installers* (refer to www.seai.ie/publications/SPV-Code-of-Practice.pdf).

The *Domestic Solar Photovoltaic - Code of Practice for Installers* includes sections on:

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

SEAI's Solar Electricity Calculator is available on www.seai.ie/about/tools/solar electricity calculator. SEAI's support and guidance documents are available on www.seai.ie/contractors-and-suppliers/register-with-seai/solar-pv-installer/solar-pv-scheme/support-for-domestic-solar.

6.32 Solar Water Heating

Contractor Requirements and Competence

Solar water heating systems (also known as "solar thermal") must be installed by suitably qualified individuals in accordance with manufacturer's guidelines as a minimum. The Contractor undertaking the works must hold a NFQ Level 6 Certificate in Domestic Solar Hot Water Systems or an equivalent qualification.

Information on solar thermal for hot water is available on the SEAI website:-

- Solar water heating grant www.seai.ie/grants/home-energy-grants/individual-grants/solar-water-heating-grant
- A Homeowner's Guide to Solar Thermal for Hot Water www.seai.ie/Homeowners Guide To Solar Thermal

Product Standard and Specification

Qualifying solar water heating systems must be listed on the SEAI Solar Thermal Registered Product List, refer to Appendix 2 for details.

The solar thermal installation must contribute a portion of renewable energy for domestic hot water heating. The minimum required output of the solar hot water system depends on the total floor area (TFA) of the dwelling as detailed in the Table 11, below:

Table 11 : Minimum solar renewable energy contribution in Ireland per year

Total Floor Area (TFA) of dwelling (DEAP methodology)	Required Energy Yield for Solar Panels Installed
0 - 170 m^2	10 kWh/m^2/year
171 - 200 m^2	1,700 solar hot water input Qs (kWh/year) *
201 - 250 m^2	1,850 solar hot water input Qs (kWh/year) *
250$^+$ m^2	2,000 solar hot water input Qs (kWh/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.

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

SEAI's 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. SEAI tools and calculators are available on the SEAI website, www.seai.ie/tools.

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 Solar Hot Water Compliance 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 (see Clause 2.5).

Some solar thermal systems can be designed to heat both hot water and space heating[30]. Where the solar heating system is being installed to contribute to the space heating requirements, the DEAP Solar Space Heating calculator must be used.

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 to achieve compliance with Building Regulations Part L (Clause 1.4.4.2).

[30] Refer to "Use of Solar Systems for Space Heating" here: www.seai.ie/sites/default/files/publications/Homeowners Guide to Solar Thermal

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 S.R. 50-2 "*Building services – Code of practice – Part 2: Thermal solar systems*", and the applicable National Rules for Electrical Installations, as applicable. Please refer to Clause 3.2 Electrical Installations: Best Practice for details.

b. All solar water heating works must be in full compliance with this document, DTSS.

c. A Commissioning Report for Solar Thermal Systems, 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. www.seai.ie/sites/default/files/publications/Solar_Commissioning_Report_2017

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 on 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 I.S. EN 1111 and I.S. 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 *Solar Water Heating and Hot Water Temperature Safety Notice* document can be downloaded at the following link: https://www.seai.ie/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 distributed at 50 °C or higher. Ensure that hot water draw offs have temperature mixing/blending valve(s) to prevent scalding.

   The recommended maximum mixed hot water temperatures for safe use for the most common installations are listed in Table 12.

Table 12 : Maximum mixed hot water temperatures for safe use

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

h. The sizing of the expansion vessel must consider 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 guidance outlined in the HVSH Solar Heating Design and Installation Guide – CIBSE Guide.
- Solar Water Heating designers refer to S.R. 50-2 – Building services – Code of practice – Part 2: Thermal solar systems.
- Commission for Regulation of Utilities (CRU) has set standards and guidelines that must be followed by all those who wish to install solar panels on their property, Safe Electric (see Clause 3)
- Solar Installers Note: Guidance on Achieving Compliance with the Better Energy Homes Programme www.seai.ie/publications/Solar_Installers_Notes_2017

Warranty

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

6.33 Electric Vehicle Chargers

Electric Vehicle Home Charger Grant details are on the SEAI website www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-home-charger-grant/.

Contractor Competence

Registered Electrical Contractors (REC) must be registered on Safe Electric list on https://safeelectric.ie/find-an-electrician/.

Product Standards and Specification

The Electric Vehicle Home Charger system must meet the following criteria:

- I.S. EN IEC 61851 - *Electric vehicle conductive charging system*
- I.S. EN 62196-1 - *Plugs, Socket-Outlets, Vehicle Connectors and Vehicle Inlets - Conductive Charging of Electric Vehicles*
- 768/2008/EC - affixing and use of the CE conformity marking Decision
- 2014/30/EU - *Electromagnetic Compatibility (EMC) conformity assessment and certification* Directive
- 2012/19/EU - *Waste Electrical and Electronic Equipment (WEEE)* 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 Department of Housing, Local Government and Heritage (DHLGH) 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 I.S. 10101 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 (see Clause 3.2). 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.

Further Guidance

- Clause 3.2 Electrical Installations: Best Practice
- Health and Safety Authority (HSA) guidance notes on Periodic Inspection and Testing of Electrical Installations:- www.hsa.ie/eng/publications_and_forms/publications/information_sheets/guidance-note_on_periodic_inspection_and_testing_of_electrical_installations.html

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:

- Building Regulations apply extensively to measures as detailed in Clause 6 Home Energy Upgrades : Best Practice for specific energy efficiency measures and are not referenced in depth in this Appendix. Contractors must comply with relevant parts of Building Regulations for all measures.
- All measures must be installed as per the Manufacturer's Installation guidelines
- S.R. 54 *Code of Practice for the Energy Efficient Retrofit of Dwellings* is available, free of charge, from both the SEAI and NSAI website:
  SEAI https://www.seai.ie/documents/S.R.54-2014.pdf and NSAI S.R. 54:2014/A2:2022 Code of Practice for the energy efficient retrofit (standards.ie)
- This Appendix does not detail standards and references for Solar Photovoltaic (PV) Systems.
  These are covered in the SEAI document "*Domestic Solar Photovoltaic – Code of Practice for Installers*" https://www.seai.ie/publications/SPV-Code-of-Practice.pdf

Reference (Publisher)	Insulation						
	Cavity Wall CWI	External Wall EWI	Internal Wall IWI	Roof Ceiling-Level	Pipework and CWST	Roof Rafter	Floor
S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings	·	·	·	·		·	·
CE Mark or Irish Agrément Certificate or equivalent, refer to each measure for applicable requirements	·	·	·	·		·	·
BR 443 (BRE) Conventions for U-value calculations	·	·	·	·		·	·
BR 262 Thermal insulation avoiding risks	·	·	·	·		·	
I.S. EN ISO 15927-3 specifies 2 procedures for providing an estimate of the quantity of water likely to impact on a wall of any given orientation.	·	·	·				
BS 8215 Design and installation of damp-proof courses in masonry construction (BSI)	·	·					·
I.S. EN IEC 60598-1 Luminaires: General requirements and tests.				·		·	
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					·		
Domestic floors: construction, insulation and damp-proofing (GBG 28 Part 1) published by BRE							·
Insulating ground floors (GBG 45), published by BRE							·
Protection of below ground structures against water from the ground, and ingress. Code of practice (BS 8102)							·
PD CEN/TR 12872:2014 – Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs							·

Reference (Publisher)	MEV Mechanical Extract Ventilation and MVHR Mechanical Ventilation with Heat Recovery
BRE Digest 398 “Continuous mechanical ventilation in dwellings”	.
BS 8233:2014 Sound insulation and noise reduction for buildings Code of Practice.	.
Building Regulations (Part B and Part F)	.
Domestic Ventilation Systems - a guide to measuring airflow rates (BG 46/2022) published by BSRIA	.
Commission Regulation (EU) No 1254/2014 with regard to the energy labelling of residential ventilation units	.
Commission Regulation (EU) No 1253/2014 with regard to Ecodesign requirements for ventilation units	.
I.S. EN 13141-1 Ventilation for buildings. Performance testing of components/products for residential ventilation. Externally and internally mounted air transfer devices.	.
I.S. EN 13141-11 Ventilation for Buildings – Performance Testing of Components/products for Residential Ventilation Part 11: Supply Ventilation Units	.
I.S. EN 13141-4 Ventilation for buildings - Performance testing of components/products for residential ventilation. Aerodynamic, electrical power and acoustic performance of unidirectional ventilation units	.
I.S. EN 13141-5 Ventilation for buildings. Performance testing of components/products for residential ventilation. Cowls and roof outlet terminal devices.	.
I.S. EN 13141-6 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 13141-7 Ventilation for buildings - Performance testing of components/products for residential ventilation. Performance testing of ducted mechanical supply and exhaust ventilation units (including heat recovery)	.
I.S. EN 13141-8 Ventilation for buildings - Performance testing of components/products for residential ventilation. Performance testing of non-ducted mechanical supply and exhaust ventilation units (including heat recovery)	.
I.S. EN 14134 Ventilation for buildings - Performance measurement and checks for residential ventilation systems	.
I.S. EN ISO 9972:2015 – Thermal Performance of Buildings – Determination of Air Permeability of Domestic Buildings – (Single or Single & Multi) Fan Pressurization Method	.
Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F published by DHLGH	.
NSAI Ventilation Validation Registration Scheme	.
S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings	.

Reference (Publisher)	Heat Pumps	Biomass Boilers (with or without thermal storage)
BS 7593 Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems.	•	
BS 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806	•	
Design of low-temperature domestic heating systems: A guide for system designers and installers (FB 59) Publisher. BRE	•	
Environmental good practice guide for ground source heating and cooling (GEHO0311BTPA-E-E) by the UK Environment Agency	•	
Environmental Protection Agency (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"	•	
GSI Geothermal Collector suitability Maps	•	
GSI Ground Source Heat and Shallow Geothermal Energy Homeowner Manual	•	
Heat emitter guide for domestic heat pumps - Microgeneration Certification Scheme MCS 021	•	
Heat Emitter supplement to the Domestic Heating Design Guide" by the Institute of Domestic Heating and Environmental Engineers (IDHEE)	•	
Heat Pump Association of Ireland (HPAI) Heat Pump installation guidelines	•	
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHLGH)	•	
I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems	•	
I.S. EN 14825 Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling, commercial and process cooling - Testing and rating at part load conditions and calculation of seasonal performance	•	
I.S. EN 15450 Heating Systems in Buildings – Design of Heat Pump Heating Systems	•	
I.S. EN 16147 Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units	•	
I.S. EN ISO 17628 – Geotechnical Investigation and Testing – Geothermal Testing- Determination of thermal conductivity of soil and rock using borehole heat exchangers	•	
Manufacturer's installation instructions for the specific Heat Pump model(s) and other parts of the system installed	•	
Refrigerating systems and heat pumps I.S. EN 378-1 Safety and environmental requirements and I.S. EN 378-3 Installation site and personal protection	•	
Requirements for MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration heat pump systems" Microgeneration Certification Scheme (MCS) MIS 3005	•	

Reference (Publisher)	Heat Pumps	Biomass Boilers (with or without thermal storage)
S.R. 50-1 Building services - Code of Practice - Water based heating systems in dwellings	•	
S.R. 50-4 Heat pump systems in dwellings	•	
SEAI DEAP Heat Pump Methodology	•	
TM 51 Ground Source Heat Pumps, CIBSE	•	
BS 3198 'Specification for copper hot water storage combination units for domestic purposes'	•	•
Domestic Heating Design Guide, CIBSE	•	•
I.S. EN 12831-1 Energy Performance of Buildings - Method for Calculation of the Design Heat Load - Space Heating Load	•	•
I.S. EN 12897 "Water supply. Specification for indirectly heated unvented (closed) storage water heaters"	•	•
I.S. 10101 National Rules for Electrical Installations	•	•
I.S. EN 1566-1 "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.S. EN 12828 Heating systems in buildings - Design for water-based heating systems		•
I.S. EN 14336 "Heating systems in buildings. Installation and commissioning of water-based heating systems" and the requirements of the system suppliers' specifications.		•
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		•
Qualifying biomass boilers must be CE Marked to demonstrate compliance with the Low Voltage Directive (LVD 2014/35/EU) and Machinery Directive (MD 2006/42/EC).		•
TR38 Guide to Good Practice – Installation of Biofuel Heating (Heating and Ventilation Contractors' Association)		•

Reference (Publisher)	Heating Control with/ without remote access	Heating Control : Boiler	Solar water heating
S.R. 54 Code of Practice for the Energy Efficient Retrofit of Dwellings	·	·	·
I.S. 10101 National Rules for Electrical Installations	·	·	·
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHLGH)	·	·	·
CE29 Domestic Heating by Oil: Boiler Systems – Guidance for Contractors and Specifiers	·	·	
CE30 Domestic Heating by Gas: Boiler Systems – Guidance for Contractors and Specifiers	·	·	
CIBSE – Domestic Heating Design Guide	·	·	
CRU: Definition of the Scope of Controlled Works	·	·	
I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems	·	·	
BS 7478 “Guide to selection and use of thermostatic radiator valves”	·		
EN 60730-1 Automatic Electrical Controls for Household and similar use	·		
GPG 302 Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers, Energy Savings Trust and BRE	·		
I.S. EN 215 “Thermostatic Radiator Valves - Requirements and Test Methods”	·		
CRU/20/088: CRU Criteria document ‘The Regulation of Gas Installers with respect to safety’		·	
GPG 301 Controls for Domestic Heating and Hot Water – Choice of Fuel and System Type		·	
Guide to the Condensing Boiler Installation Assessment Procedure for Existing Dwellings (DHLGH)		·	
I.S. 813 Domestic Gas Installations (NSAI)		·	
CIBSE Solar heating design and installation guide			·
S.R. 50-2 “*Building services – Code of practice – Part 2: Thermal solar systems*”			·

Reference (Publisher)	Draught-Proofing	Door Replacement	Window Replacement	Window Secondary Glazing	Window Glazing Low E-Film
BS 7386 “Specification for draughtstrips for the draught control of existing doors and windows in housing”	·				
I.S. EN 17037 Daylight in Buildings		·	·	·	·
CPR - Construction Products Regulation (Regulation (EU) No 2024/3110)		·	·	·	·
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 8213-4 “Code of practice for the survey and installation of windows and external doorsets”		·	·	·	
I.S. EN 14351-1 “Windows and doors - Product standard, performance characteristics - Windows and external pedestrian doorsets” and CE Marking		·	·		
I.S. EN ISO 12567-1 Thermal performance of windows and doors - Determination of thermal transmittance by the hot-box method (Parts 1 and 2)		·	·		
I.S. EN ISO 10077 Thermal performance of windows, doors and shutters - Calculation of thermal transmittance (Parts 1 and 2)		·	·		
PAS 24 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.S. EN 1279-1 “*Glass in Building - Insulating glass units - Generalities, system description, rules for substitution, tolerances and visual quality*”			·	·	
I.S. EN 1279-2 “*Glass in building - Insulating glass units Part 2: Long term test method and requirements for moisture penetration*”			·	·	
I.S. EN 410 “Glass in Building - Determination of Luminous and Solar Characteristics of Glazing”				·	·
I.S. EN 673 Glass in building. Determination of thermal transmittance (U value). Calculation method				·	·
I.S. EN 12898 Glass in building. Determination of the emissivity				·	

Reference (Publisher)	Stoves : Solid Multi-Fuel Heating System	Heating System Power Flush	Heating System Magnetic filtration	Chimney Draught Limiter	Boiler Service	Lighting LED
BS 8303 “Installation of domestic heating and cooking appliances burning wood and solid mineral fuels. Specification”	·					
CE47 “Energy Efficiency Best Practice in Housing – Domestic heating by solid fuel: Boiler systems”	·					
Ecodesign Regulation (EU) 2015/1185 sets standards for the efficiency and emissions of solid fuel space heating appliances.	·					
Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L (DHLGH)	·					
I.S. 813 Domestic Gas Installations (NSAI)	·					
I.S. 10101 National Rules for Electrical Installations	·					·
BS 7593 Code of practice for treatment of water in domestic hot water central heating systems		·				
S.R. 50-1 “Building services - Code of Practice - Water based heating systems in dwellings”			·			
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					·	
Ecodesign Regulation (EU) 2019/2020 requirements for light sources and separate control gears.						·
I.S. EN 13032-1 and I.S. EN 13032-2 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						·

Reference (Publisher)	Gas Fired Room Heater	Storage Heaters - High Heat Retention	Domestic Hot Water Storage : High Heat Retention Cylinders
BS 7977-1 'Specification for safety and rational use of energy of domestic gas appliances". Radiant/convectors'	·		
CRU Criteria document 'The Regulation of Gas Installers with respect to safety'	·		
Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L (DHLGH)	·		
I.S. 10101 National Rules for Electrical Installations	·		
I.S. EN 613 Independent closed-fronted gas-fired type B11, type C11, type C31 and type C91 heaters	·		
I.S. 813 Domestic Gas Installation	·		
Technical Guidance Document (TGD) J - Heat Producing Appliances	·		
DOM 8, Guide to the Design of Electric Space Heating Systems, TEHVA or the manufacturer's sizing methodology		·	
EN 60531 (Household Electric Thermal Storage Room Heaters – Methods for Measuring Performance)		·	
BS 1566-1 Copper indirect cylinders for domestic purposes. Open vented copper cylinders. Requirements and test methods			·
BS 3198 'Specification for copper hot water storage combination units for domestic purposes"			·
Domestic Heating Design Guide_CIBSE			·
I.S. EN 12828 'Heating systems in buildings. - Design for water-based heating systems'			·
I.S. EN 12897 Water supply. Specification for indirectly heated unvented (closed) storage water heaters			·
I.S. EN 14336 "Heating systems in buildings. Installation and commissioning of water-based heating systems" and the requirements of the system suppliers'			·
I.S. EN 1566 "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" (Part 1 and 2)			·
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)			·

Reference (Publisher)	Electric vehicle Chargers
I.S. EN IEC 61851 - Electric vehicle conductive charging system	.
I.S. EN 62196-1 – Plugs, socket-outlets, vehicle couplers and vehicle inlets – Conductive charging of electric vehicles	.
768/2008/EC – The affixing and use of the CE conformity marking	.
2014/30/EU - Electromagnetic Compatibility (EMC) conformity assessment and certification Directive	.
2012/19/EU - Waste Electrical and Electronic Equipment (WEEE) Directive	.

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:

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

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Cavity wall insulation (CWI)	Irish Agrément approved or equivalent	Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of 0.35 W/m^{2}K for cavity walls • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	• The insulation system must be installed as per the conditions specified in the Irish Agrément Certificate (or equivalent) and system supplier specifications. • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings* • I.S. EN ISO 15927-3 specifies 2 procedures for providing an estimate of the quantity of water likely to impact on a wall of any given orientation.
External Wall Insulation (EWI)	• Trained by manufacturer in the installation of the system. - Installer Certification, certifying the area m^2 insulated, type of insulation and depth of insulation • Irish Agrément certified installer on ETICS (or equivalent). - To facilitate full ETICS certification a Contractor can complete a maximum of one job if they have validly applied to Irish Agrément to become a registered installer of this system.	Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of 0.27 W/m^{2}K for external walls • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	• The insulation system must be installed as per the manufacturer's technical guidance and specifications and the Irish Agrément Certificate or equivalent. • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings* • I.S. EN ISO 15927-3 specifies 2 procedures for providing an estimate of the quantity of water likely to impact on a wall of any given orientation.
Internal Wall Insulation (IWI)	• Must be competent to install insulation in accordance with S.R. 54 (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 • Installer Certification, certifying the area m^2 insulated, type of insulation and depth of insulation	CE Mark or Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of 0.27 W/m^{2}K for internal walls. Where a U-value of 0.27 W/m^{2}K 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/m^{2}K. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	• The insulation system must be installed as per the manufacturer's technical guidance and specifications and the Irish Agrément Certificate or equivalent. • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings* • I.S. EN ISO 15927-3 specifies 2 procedures for providing an estimate of the quantity of water likely to impact on a wall of any given orientation.

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Roof Insulation: Ceiling-Level Attic Insulation	Must be competent to install insulation in accordance with S.R. 54 Code of Practice for the energy efficient retrofit of dwellings).	CE Mark or Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of 0.16 W/m^{2}K • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	• The insulation system must be installed as per the manufacturer's technical guidance and specifications and the Irish Agrément Certificate or equivalent. • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*
Roof Insulation: Rafter-Level (Cold Roof)	• Must be competent to install insulation in accordance with S.R. 54 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	CE Mark or Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of 0.20 W/m^{2}K for rafter level insulation. • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	• The insulation system must be installed as per the manufacturer's technical guidance and specifications and the Irish Agrément Certificate or equivalent. • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*
Floor Insulation	Must be competent to install insulation in accordance with • Domestic floors: construction, insulation and damp-proofing (GBG 28 Part 1) published by BRE • Insulating ground floors (GBG 45), published by BRE	Irish Agrément Certificate for the installed product or equivalent. • Must help achieve a U-value of - 0.36 W/m^{2}K ground floor with no underfloor heating, or - 0.15 W/m^{2}K (underfloor heating) for floors • U-values are calculated according to the standards detailed in the DEAP methodology, TGD L, I.S. EN ISO 6946 and BR 443 – Conventions for U-value calculations	The insulation must be installed as per • *Domestic floors: construction, insulation and damp-proofing* (GBG 28 Part 1) published by BRE • *Insulating ground floors* (GBG 45), published by BRE • Protection of below ground structures against water from the ground, and ingress. Code of practice (BS 8102) • *Design and installation of damp-proof courses in masonry construction* (BS 8215) • PD CEN/TR 12872:2014 – *Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs* • S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*
Insulation of pipework and water storage tanks	Must be competent to install Insulation of pipework and water storage tanks in accordance TGD G of the Building Regulations	• 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.	• *Where a product is covered by an Irish Agrément Certificate it must be installed in accordance with this certificate and by suitably qualified people.* • *The insulation must be installed as per manufacturer's guidelines*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
MEV + MVHR Mechanical Ventilation and Heat Recovery Systems	• Must be carried out by suitably qualified individuals in accordance with manufacturer guidelines and industry best practice at a minimum. • Where new mechanical extract ventilation system is installed as part of a Major Renovation, as defined in Building Regulations Part L, then the system should be designed, installed, commissioned and validated as per NSAI Ventilation Validation Scheme	• Detailed list of relevant standards and performance criteria in Clause 6.7.	• System must be designed by competent designer in accordance with manufacturer's guidance and industry best practice • S.R. 54 – *Code of practice for the energy efficient retrofit of dwellings* • *I.S. 10101 National Rules for Electrical Installations* • 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 Clause 6.7.3 • System handover and commissioning as per Clause 6.7.3
Outline of Ventilation Section	• Key section referenced for several measures. See Clause 4 Ventilation.	Key section referenced for several measures. See Clause 4 Ventilation.	• 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 *Code of Practice (particularly Clause 4.5, 10.2.2.1 and Tables 30, 31, 32, 35)* • BS 5250 - *Code of practice for control of condensation in buildings* • I.S. EN ISO 13788 - *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 *Hygrothermal Performance of Building Components and Building Elements - Assessment of Moisture Transfer by Numerical Simulation*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Heat Pump Systems	• National Craft Certificate or Advanced Craft Certificate in Plumbing, or equivalent and includes a module on minor electrical works – NFQ Level 6 • Domestic Heat Pump Systems (6N5646) – NFQ Level 6 Component Award under Maintenance Skills Technology (6M5154) - NFQ Level 6 Primary Award • Certificate of Competence from the specific manufacturer of the heat pumps installed, based on an adequate training programme • Registration on the SEAI Renewable Energy Installers Register for heat pumps • 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 Regulation (EU) No 2024/573 • 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 Completion Certificate for all electrical works completed must be left with the homeowner and available for inspection.	See Clause 6.8.2 Product and installation requirements detailing: • Heat pump types and minimum efficiency requirements • Ecodesign compliant - Ecodesign Commission Regulation (EU) No 813/2013 for Air/Ground/Water/Exhaust air to water heat pumps. - Ecodesign Commission Regulation (EU) No 206/2012 for air-to-air heat pumps. • CE Mark requirement + EU Declaration of Conformity - Energy Labelling Commission Regulation (EU) No 811/2013 for Air/Ground/Water/Exhaust air to water heat pumps - Energy Labelling Commission Regulation (EU) No 626/2011 for air-to-air heat pumps. • Adequate data for DEAP Heat Pump calculations	See Clause 6.8.2 Product and installation requirements. Some of the key points are as follows: • 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. • Manufacturer installation requirements must be followed • Installer must ensure that documentation requirements are met
Heat Pump Systems (CEG)	• 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.	• 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. • I.S. EN 15450 Heating Systems in Buildings – Design of Heat Pump Heating Systems. • Clause 8.1 of the DHLGH Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L	• Manufacturer's guidelines, • Microgeneration Installation Standard: MIS 3005 *Requirements for Contractors Undertaking the Supply, Design, Installation, Set to Work, Commissioning and Handover of Microgeneration Heat Pump Systems*, • Industry best practice, • Building Regulations Technical Guidance Document J – Home Heating Appliances, • *I.S. 10101 National Rules for Electrical Installations* • I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems • *The Heat Emitter Guide for Domestic Heat Pumps* (MCS 021) • I.S. EN 15450 *Heating Systems in Buildings – Design of Heat Pump Heating Systems* • *Domestic Building Services Compliance Guide* (Section 9) • *TR30 Guide to Good Practice – Heat Pumps (Building and Engineering Services Association)*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
			• *CIBSE Guide A – Environmental Design* • FB 59 – *Design of Low-Temperature Domestic Heating Systems – a Guide for System Designers and Installers* (BRE Trust)
Biomass boilers (with/without thermal storage)	• 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.	• 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 I.S. EN 1566-1 "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 1566-1 • Unvented hot water storage system products should: - comply with I.S. 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 • Clause 5.3 of the DHLGH "Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L" must be adhered to.	• I.S. EN 1566-1 "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" • I.S. EN. 12897 '*Water supply. Specification for indirectly heated unvented (closed) storage water heaters'* • I.S. EN 14336 "Heating systems in buildings. Installation and commissioning of water-based heating systems" • 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) • I.S. EN 12831-1 Energy Performance of Buildings - Method for Calculation of the Design Heat Load - Space Heating Load • CIBSE – *Domestic Heating Design Guide* • *I.S. 10101 National Rules for Electrical Installations*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Boiler : High Efficiency Boiler	• 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. • Gas Boiler - Contractors must hold a Gas Contractors Domestic Certificate (GI D, GI 2 or GI 3) • For Natural Gas and LPG works the Contractor must be RGI registered • Oil Boiler - Contractor is registered with a professional organisation, e.g. OFTEC.	• Boiler must be installed complete with heating controls • Seasonal efficiency >= 90 % https://www.seai.ie/plan-your-energy-journey/for-your-business/energy-efficient-products/harp-database/ • Carbon equivalent efficiency of new boiler must be better than existing boiler	• Manufacturer's guidelines • CE29 Domestic Heating by Oil: Boiler Systems – Guidance for Contractors and Specifiers • CE30 Domestic Heating by Gas: Boiler Systems – Guidance for Contractors and Specifiers • TGD J – Home Heating Appliances • DHLGH and SEAI *Guide to the condensing boiler installation assessment procedure for Existing Dwellings* • *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L* • CIBSE – *Domestic Heating Design Guide* • *I.S. 10101 National Rules for Electrical Installations* • I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems • Good Practice Guide (GPG) 301 Controls for Domestic Heating and Hot Water – Choice of Fuel and System Type • I.S. 813 *Domestic Gas Installations* • CRU/20/088: CRU Criteria document '*The Regulation of Gas Installers with respect to safety*' • CRU Decision Paper – *Definition of the Scope of Controlled Works*
Boiler Service	• 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. • Registered gas installer (RGI) to carry out domestic Natural Gas or LPG works • For gas/LPG systems, must hold a Gas Contractors Domestic Certificate • For oil systems, should be registered with professional organisation such as OFTEC	• Manufacturer's guidelines • SEAI boiler service checklists • I.S. 813 Domestic Gas Installations (where applicable)	Boiler must be serviced as per • Manufacturer's guidelines • SEAI boiler service checklists • I.S. 813 *Domestic Gas Installations* (where applicable)

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Power Flush of Heating System	• Registered gas installer (RGI) to carry out domestic Natural Gas or LPG works • 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. • 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	BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems*	Mechanically assisted powered cleanse and flush (powerflushing) of a heating system must be performed as per • Manufacturer's guidelines • BS 7593 *Code of practice for treatment of water in domestic hot water central heating systems*
Power Flush and Magnetic Filter of Heating System	• 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. • Level 6 National Craft Certificate in Plumbing or an equivalent Plumbing qualification such as City and Guilds • Registered gas installer (RGI) to carry out domestic Natural Gas or LPG works • For gas/LPG systems, must hold a Gas Contractors Domestic Certificate • For oil systems, should be registered with professional organisation such as OFTEC	S.R. 50-1 "Building services - Code of Practice - Water based heating systems in dwellings"	Magnetic filtration system to existing heating system must be installed as per • Manufacturer's guidelines • S.R. 50-1 "Building services - Code of Practice - Water based heating systems in dwellings"

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Stoves: Solid Multi-Fuel Heating System	• Must be competent to install Multi Fuel Stoves in accordance document *BS 8303 "Installation of domestic heating and cooking appliances burning wood and solid mineral fuels. Specification"* and in accordance with *CE47 "Energy Efficiency Best Practice in Housing – Domestic heating by solid fuel: Boiler systems" published by the Energy Saving Trust* • Where the manufacturer operates an Approved Installer list, the Contractor must demonstrate their inclusion on the list	• BS EN 13240 (Room heaters fired by solid fuel. Requirements and test methods) www.seai.ie/plan-your-energy-journey/for-your-business/energy-efficient-products/harp-database/ • Ecodesign Regulation (EU) 2015/1185 sets standards for the efficiency and emissions of solid fuel space heating appliances. • When installing a multi-fuel stove, a carbon monoxide (CO) alarm complying with I.S. EN 50291-1 should be provided.	Multi Fuel Stoves must be installed as per • Manufacturer's guidelines • I.S. EN 16510-1 Residential solid fuel burning appliances - General requirements and test methods. • *BS 8303 "Installation of domestic heating and cooking appliances burning wood and solid mineral fuels. Specification"* • *CE47 "Energy Efficiency Best Practice in Housing – Domestic heating by solid fuel: Boiler systems" published by the Energy Saving Trust* • I.S. 10101 National Rules for Electrical Installations • I.S. 813 *Domestic Gas Installations* • DHLGH "Heating and Domestic Hot Water Systems for Dwellings – Achieving compliance with Part L", particularly Table 16.
Gas fired room heaters	• Registered gas installer (RGI) with RGI • 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)	• Minimum gross efficiency of 65 % from accredited test body, HARP database or manufacturer's declaration. • I.S. 813 Domestic Gas Installation. • Clause 2.5 of the DHLGH 'Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L' • BS 7977-1 'Specification for safety and rational use of energy of domestic gas appliances. Radiant/convectors' and • BS EN 613:2001 – Independent gas-fired convection heaters	• I.S. 813. *Domestic Gas Installation* • DHLGH '*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L'* • BS 7977-1 '*Specification for safety and rational use of energy of domestic gas appliances. Radiant/convectors'* • *I.S. 10101 National Rules for Electrical Installations* • carbon monoxide (CO) alarm complying with I.S. EN 50291-1 should be provided.
Storage Heaters - High Heat Retention	• 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 a Registered Electrical Contractor (REC)	• 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 EN 60531 (Household Electric Thermal Storage Room Heaters – Methods for Measuring Performance) • Heat retention must have been tested by an organisation accredited to test in accordance with EN 60531 or the testing must be endorsed by a body accredited to test in accordance with EN 60531 • It must include input and output controls • It also must include a timer and a room thermostat, controllable by the user.	High heat retention electric storage heater Installation must be installed as per • Manufacturer's guidelines • DOM 8, *Guide to the Design of Electric Space Heating Systems,* TEHVA or the manufacturer's sizing methodology. • *I.S. 10101 National Rules for Electrical Installations* • S.R. 54 – *Code of practice for the energy efficient retrofit of dwellings* • DHLGH '*Heating and Domestic Hot Water Systems for dwelling – Achieving Compliance with Part L'*.

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Heating Controls Fully Integrated: Dual zone with 24 hour 7-day Programmer (incl. remote access controls) – incorporating a room thermostat, DHW cylinder thermostat, motorised control valve and boiler interlock.	• 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.	I.S. EN IEC 60730-2-7 *"Automatic Electrical Controls for Household and similar Use Part 2-7: Particular Requirements for Timers and Time Switches"*	• Manufacturer's guidelines • Good Practice Guide GPG 302 Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers, Energy Savings Trust and BRE • CIBSE - *Domestic Heating Design Guide* • *I.S. 10101 National Rules for Electrical Installations* • I.S. EN 12828 Heating systems in buildings - Design for water-based heating systems • *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L* • CE29 Domestic Heating by Oil: Boiler Systems – Guidance for Contractors and Specifiers • CE30 Domestic Heating by Gas: Boiler Systems – Guidance for Contractors and Specifiers • CRU Decision Paper – Definition of the Scope of Controlled Works • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*
Heating Controls: Additional Control Measures	• 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.	• EN 60730-1 Automatic Electrical Controls for Household and similar Use • Other Relevant IS, BS or EN Standards (if available)	• Manufacturer's guidelines • GPG 302 Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers, Energy Savings Trust and BRE • CIBSE – *Domestic Heating Design Guide* • *I.S. 10101 National Rules for Electrical Installations* • *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L* • DHLGH *Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L* • CRU Decision Paper – Definition of the Scope of Controlled Works • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Thermostatic Radiator Valves (TRVs)	• 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	I.S. EN 215 "*Thermostatic Radiator Valves - Requirements and Test Methods*"	• Manufacturer's guidelines • BS 7478 "*Guide to selection and use of thermostatic radiator valves"* • CIBSE - *Domestic Heating Design Guide* • GPG 302 Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers, Energy Savings Trust and BRE • DHLGH *Heating and Domestic Hot Water Systems for Dwellings - Achieving Compliance with Part L* • NSAI's S.R. 54 *Code of Practice for the energy efficient retrofit of dwellings*
Domestic Hot Water (DHW) Storage: High Heat Retention Cylinders	• 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.	• Vented copper hot water storage vessels should comply with the heat loss and heat exchanger requirements of I.S. EN 1566-1 "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 1566-1 • Unvented hot water storage system products should: – comply with I.S. 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 • Clause 5.3 of the DHLGH document – "*Heating and Domestic Hot Water Systems for Dwellings – Achieving Compliance with Part L*" must be adhered to.	• I.S. EN 1566-1 "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" • I.S. EN. 12897 '*Water supply. Specification for indirectly heated unvented (closed) storage water heaters'* • I.S. EN 14336 "Heating systems in buildings. Installation and commissioning of water-based heating systems" and the requirements of the system suppliers' specifications. • 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) • I.S. EN 12831-1 Energy Performance of Buildings - Method for Calculation of the Design Heat Load - Space Heating Load CIBSE – *Domestic Heating Design Guide*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Immersion Heater with thermostatic controls and timers	• 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 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.	EN 60730-1 *Automatic Electrical Controls for Household and similar Use*	• Manufacturer's guidelines • GPG 302 Controls for Domestic Central Heating and Hot Water – Guidance for Specifiers and Installers, Energy Savings Trust and BRE • *I.S. 10101 National Rules for Electrical Installations* • CRU Decision Paper – Definition of the Scope of Controlled Works • *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L* • NSAI's S.R. 54 *Code of Practice*
Space Heating and Domestic Hot Water: adding an additional Zone Control	Refer to Clause 6.13.2 or Heating Controls Fully Integrated: Dual zone with 24 hour 7-day Programmer (incl. remote access controls) – incorporating a room thermostat, DHW cylinder thermostat, motorised control valve and boiler interlock.	Refer to Clause 6.13.2	Refer to Clause 6.13.2
Electric Energy and Shower Energy Monitors	Energy monitors shall be installed to manufacturer's recommendations.	Electricity Energy Monitor: • 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 Shower Energy Monitor • 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.	• MPRN must be submitted with application for Energy Credits for electricity energy monitors • Install to manufacturer's recommendations. • I.S. 10101 National Rules for Electrical Installations

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Solar water heating systems (aka "solar thermal")	• NFQ Level 6 Certificate in Domestic Solar Hot Water Systems or an equivalent qualification. - National Craft Certificate in a relevant trade (Electrical, Plumbing or Fitting) or a NFQ Level 6 qualification in a related area such as Building Services, G.I.D. etc. Support for contractors www.seai.ie/contractors-and-suppliers/supports-for-contractors	• The product must be registered on the SEAI Solar Thermal Registered Product List www.seai.ie/resources/publications/Solar-Thermal-Registered-Product-List.pdf - The products on this Registered Product list for Solar Collectors have been tested in accordance with ○ I.S. EN 12975 Solar collectors - General requirements ❖ Performance Test Report ❖ Durability Test **OR** ○ I.S. EN ISO 9806 Solar Energy - Solar Thermal Collectors - Test Methods • assumed to be proper materials for the purpose of Part L of the Building Regulations • Each Homeowner must be supplied with a warranty (product and labour) of at least 5 years.	• NSAI document S.R. 50-2 "*Building services – Code of practice – Part 2: Thermal solar systems*" • *I.S. 10101 National Rules for Electrical Installations* • *Heating and Domestic Hot Water Systems for dwellings – Achieving compliance with Part L* • *Solar Heating Design and Installation Guide* – CIBSE Guide ❖ Solar fraction method of calculating the energy yield per solar system is as per Appendix H: Solar Water Heating in the DEAP Manual ❖ Solar Hot Water Compliance Calculator for achieving compliance with the solar thermal measure requirements. ❖ SEAI tools and calculators are available on the SEAI website, www.seai.ie/about/tools
Solar Electricity Photovoltaic (PV) Systems	Solar Photovoltaic (PV) modules shall meet the SEAI's Domestic Solar Photovoltaic - Code of Practice for Installers www.seai.ie/publications/SPV-Code-of-Practice.pdf.	Solar Photovoltaic (PV) modules shall meet the SEAI's Domestic Solar Photovoltaic - Code of Practice for Installers • www.seai.ie/publications/SPV-Code-of-Practice.pdf.	Solar Photovoltaic (PV) modules shall meet the SEAI's Domestic Solar Photovoltaic - Code of Practice for Installers www.seai.ie/publications/SPV-Code-of-Practice.pdf.
Lighting - LED	Contractors installing LED lighting must be competent to complete the installation.	• Ecodesign Regulation (EU) 2019/2020 LED luminaires: • I.S. EN 13032-1 and I.S. EN 13032-2 "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".	• LEDs must be installed as per manufacturer's guidelines • I.S. EN IEC 60598-1 specifies general safety requirements for luminaires
Chimney Draught Limiter	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.	• BS 1251 'Specification for open-fireplace components' and • BS 3376 'Specification for solid mineral fuel open fires with convection, with or without boilers'	• Chimney Draught Limiter must be installed as per manufacturer's guidelines • Temporary draught limiters are not included in this measure.

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Draught-Proofing	Must be competent to install draught-proofing in accordance with BS 7386 "*Specification for draughtstrips for the draught control of existing doors and windows in housing*".	• The draught-proofing system must be manufactured to relevant IS, BS or EN standard • Installed as per manufacturer's instructions • Measures include: - Letterbox seals - Door-bottom brushes - Window draught stripping - Door draught stripping - Attic access hatch draught proofing	The insulation must be installed as per manufacturer's guidelines. Clause 6.22 details a several steps for each of the types of draught proofing to be installed.
Window Replacement	Must be competent to install windows in accordance with *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"* and the manufacturer's guidelines as a minimum requirement.	• U-value requirement of 1.4 W/m^{2}K or better. • I.S. EN 14351-1 "Windows and doors - Product standard, performance characteristics - Windows and external pedestrian doorsets". • Glazing must conform to I.S. EN 1279-1 "Glass in Building - Insulating glass units - Generalities, system description, rules for substitution, tolerances and visual quality" • I.S. EN 1279-2 "Glass in building - Insulating glass units Part 2: Long term test method and requirements for moisture penetration" • NSAI Window Energy Performance (WEP) certification, British Fenestration Rating Council • U-values derived according to IS EN ISO 12567 Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors or 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 • I.S. EN 17037 Daylight in Buildings	The window must be installed as per • Manufacturer's guidelines • *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"*
Window Glazing Low E-Film	• 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.	• U-value requirement of 2.4 W/m^{2}K or better for double glazing 3.5 W/m^{2}K or better for single glazing. • I.S. EN 410 Glass in building. Determination of luminous and solar characteristics of glazing	The Window Glazing Envelope must be installed as per • Manufacturer's guidelines • I.S. EN 17037 Daylight in Buildings

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Window Secondary Glazing	Must be competent to install Window Secondary Glazing in accordance with *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"* and the manufacturer's guidelines as a minimum requirement and BS 8000-0 *Workmanship on construction sites. Introduction and general principles*	• U-value requirement of 2.1 W/m^{2}K or better. • Window Secondary Glazing must conform to I.S. EN 1279-1 "Glass in Building - Insulating glass units - Generalities, system description, rules for substitution, tolerances and visual quality" • I.S. EN 1279-2 "Glass in building - Insulating glass units Part 2: Long term test method and requirements for moisture penetration" • 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 • I.S. EN 410 Glass in building. Determination of luminous and solar characteristics of glazing • I.S. EN 673 Glass in building. Determination of thermal transmittance (U value). Calculation method • I.S. EN 17037 Daylight in Buildings • I.S. EN 12898 Glass in building. Determination of the emissivity	The Window Secondary Glazing must be installed as per • Manufacturer's guidelines • *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"*
Door Replacement	Must be competent to install doors in accordance with *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"* and the manufacturer's guidelines as a minimum requirement.	• U-value requirement of 1.4 W/m^{2}K or better. • I.S. EN 14351-1 "Windows and doors - Product standard, performance characteristics - Windows and external pedestrian doorsets". • PAS 24 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 U-values derived according to IS EN ISO 12567 Thermal performance of windows and doors – Determination of thermal transmittance by hot box method – Part 1: Complete windows and doors or 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 • I.S. EN 17037 Daylight in Buildings	The external door must be installed as per • Manufacturer's guidelines *BS 8213-4 "Code of practice for the survey and installation of windows and external doorsets"*

Measure	Installer Competence	Product Standards and Specification	Installation Standards and Specification
Home Energy Assessment (HEA) Reports	Contractors are required to submit a Home Energy Assessment (HEA) Report in accordance with a specific Programme.	Home Energy Assessment (HEA) includes:- • Building Energy Rating (BER) assessment with published BER including the Advisory Report. • Technical Design report on the energy efficiency of a home. - Details include ventilation/airtightness strategy, fabric design, plumbing and heating design considerations. • Details on the home energy upgrade measures needed to get a home to a B2 rating and better. • Heat Pump Technical Assessment detailing the home energy upgrades required to make a home suitable for a heat pump. • A report explaining how the recommended home energy upgrades will improve the comfort of a home and help to reduce energy bills. • An estimate of the costs of the recommended home energy upgrades.	
Electric Vehicle Chargers	Registered Electrical Contractors (REC) must be registered on Safe Electric list on https://safeelectric.ie/find-an-electrician/.	The Electric Vehicle Home Charger system must meet the following criteria: • I.S. EN IEC 61851 – *Electric vehicle conductive charging system* • I.S. EN 62196-1 – *Plugs, socket-outlets, vehicle couplers and vehicle inlets – Conductive charging of electric vehicles* • 768/2008/EC – *The affixing and use of the CE conformity marking* • 2014/30/EU - Electromagnetic Compatibility (EMC) conformity assessment and certification Directive • 2012/19/EU - Waste Electrical and Electronic Equipment (WEEE) Directive	• All systems must be installed to manufacturer's guidelines. • Only one charger may be installed per property. • All electrical work must comply with I.S. 10101 National Rules for Electrical Installations. A Safe Electric Ireland Certificate Number 3 is required to evidence this compliance. • 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.

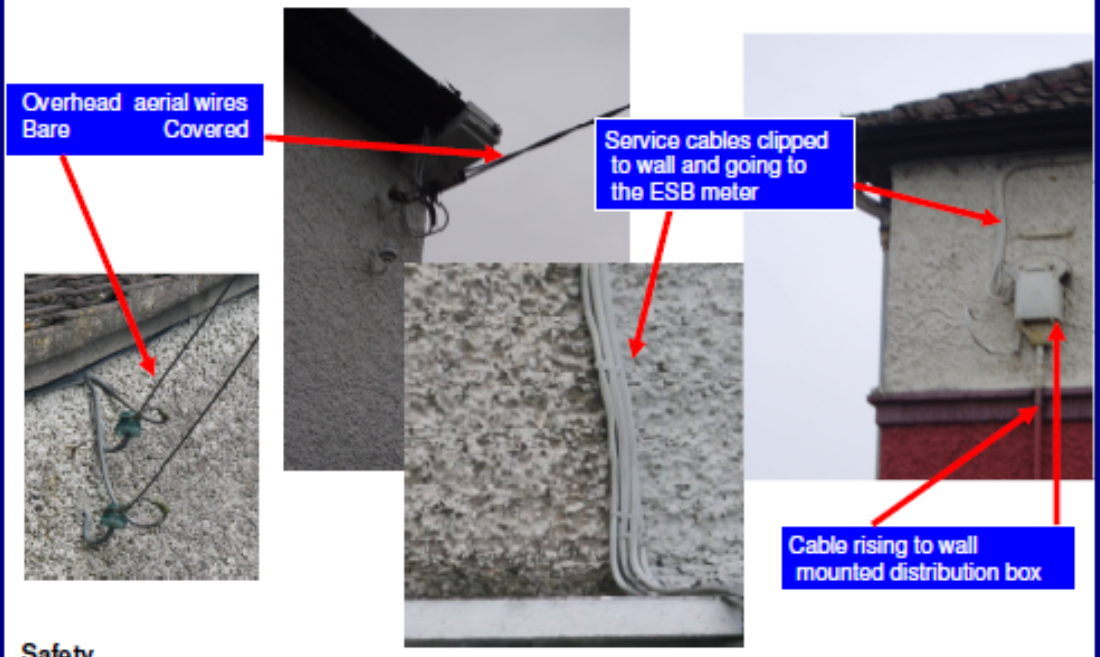
Appendix 3: ESB Networks Guidance Documents

ESB Networks
Serving all electricity customers

EXTERNAL WALL INSULATION
Guidelines for Homeowners and Contractors on ESB Networks requirements and charges

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.

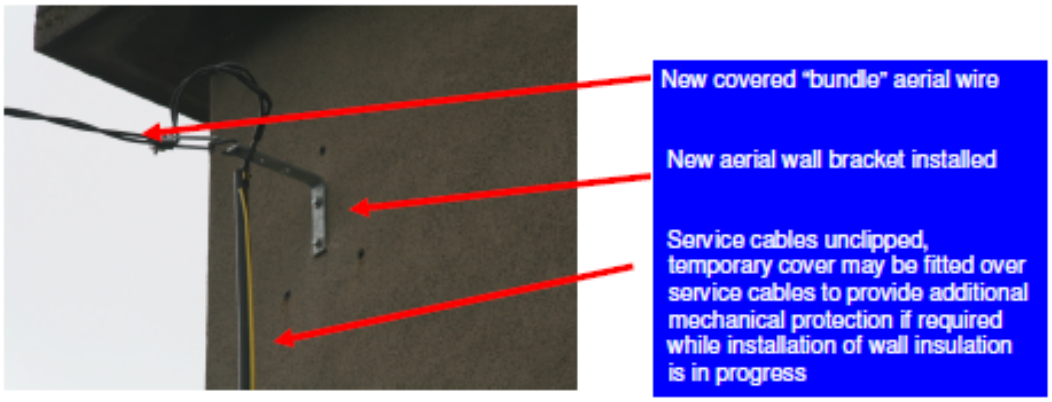
Contacting ESB Networks

ESB Networks can be contacted by calling **1850-372-757**. The **M**eter **P**oint **R**eference **N**umber (**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:

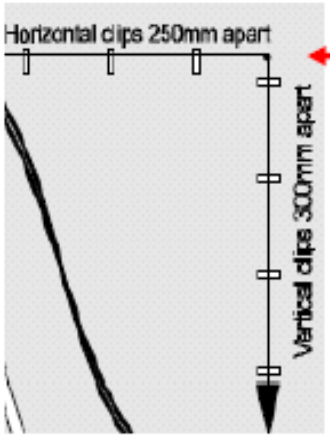
- **Unclipping of existing service cables** (and replacement of cables where required)
- **Removal of anchor insulators and the fitting of a new extended aerial bracket**
- **Installation of new covered "bundle" aerial wire if the existing aerial wire is bare or PVC covered (See photograph below)**
-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



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.**

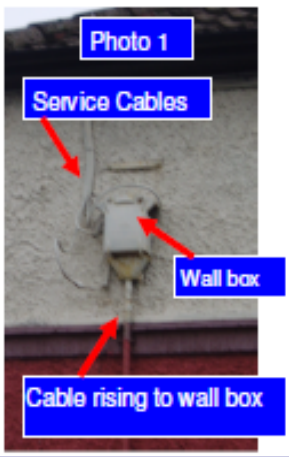


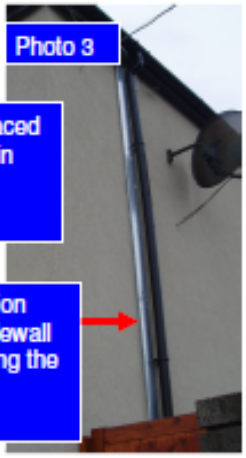
Spacing of non load bearing fixing elements for reinstating service cables to finished render.

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 x100mm 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.

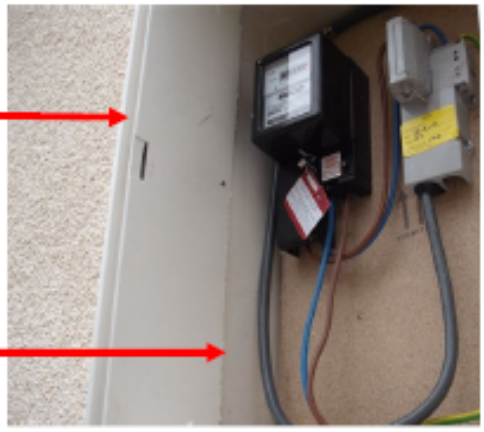
Do not attempt to move the existing cabinet. Doing so will disturb the existing connections and increase the risk of damage to the cables creating a potential fire hazard.

Meter Cabinet Door

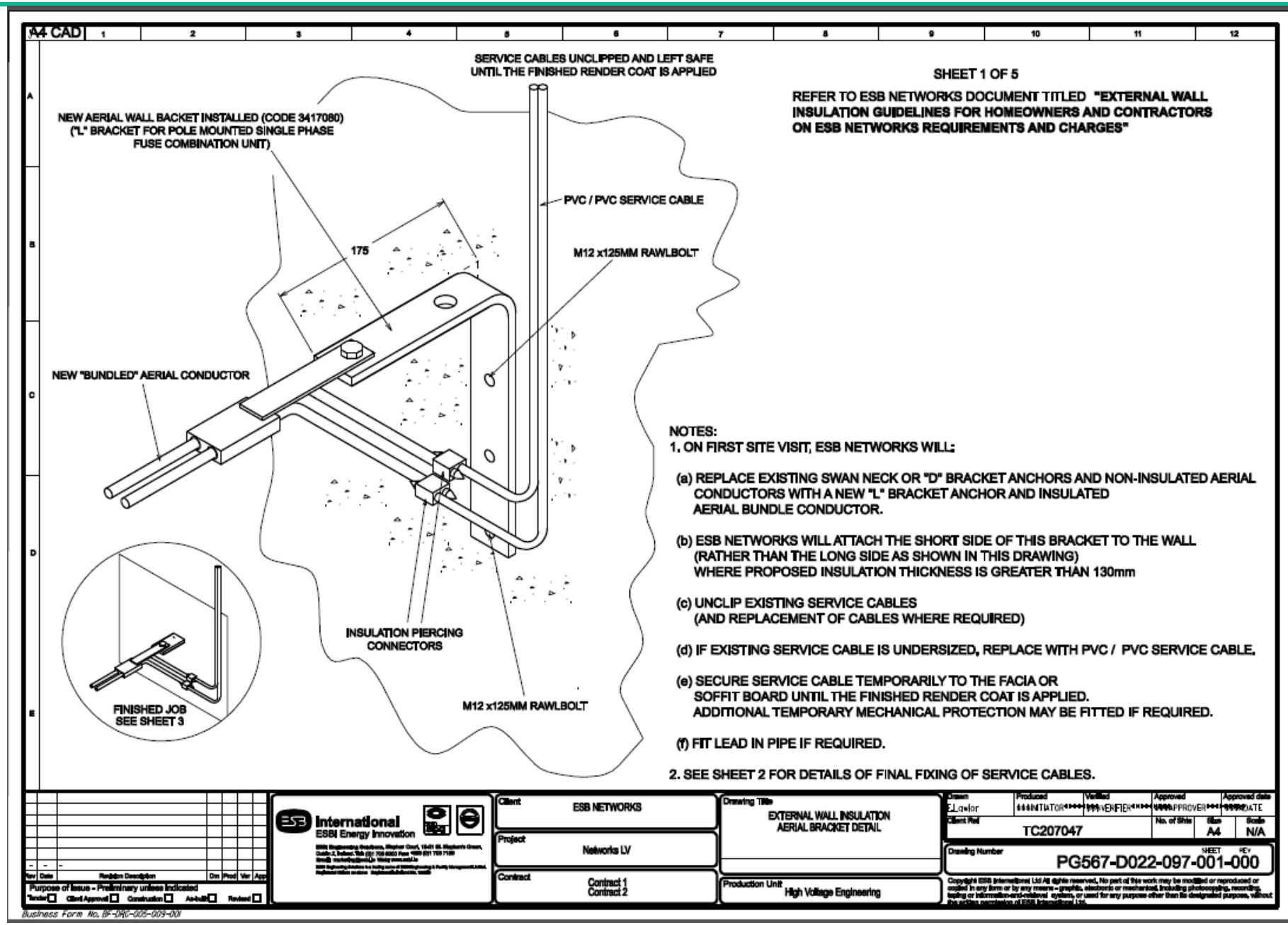
The contractor must modify the existing meter cabinet in order to fill the recess created by the fitting of external wall insulation. This is done by removing the door from the existing cabinet and cutting away the back from a new cabinet. The new cabinet is then placed in the recess with the sidewalls 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.

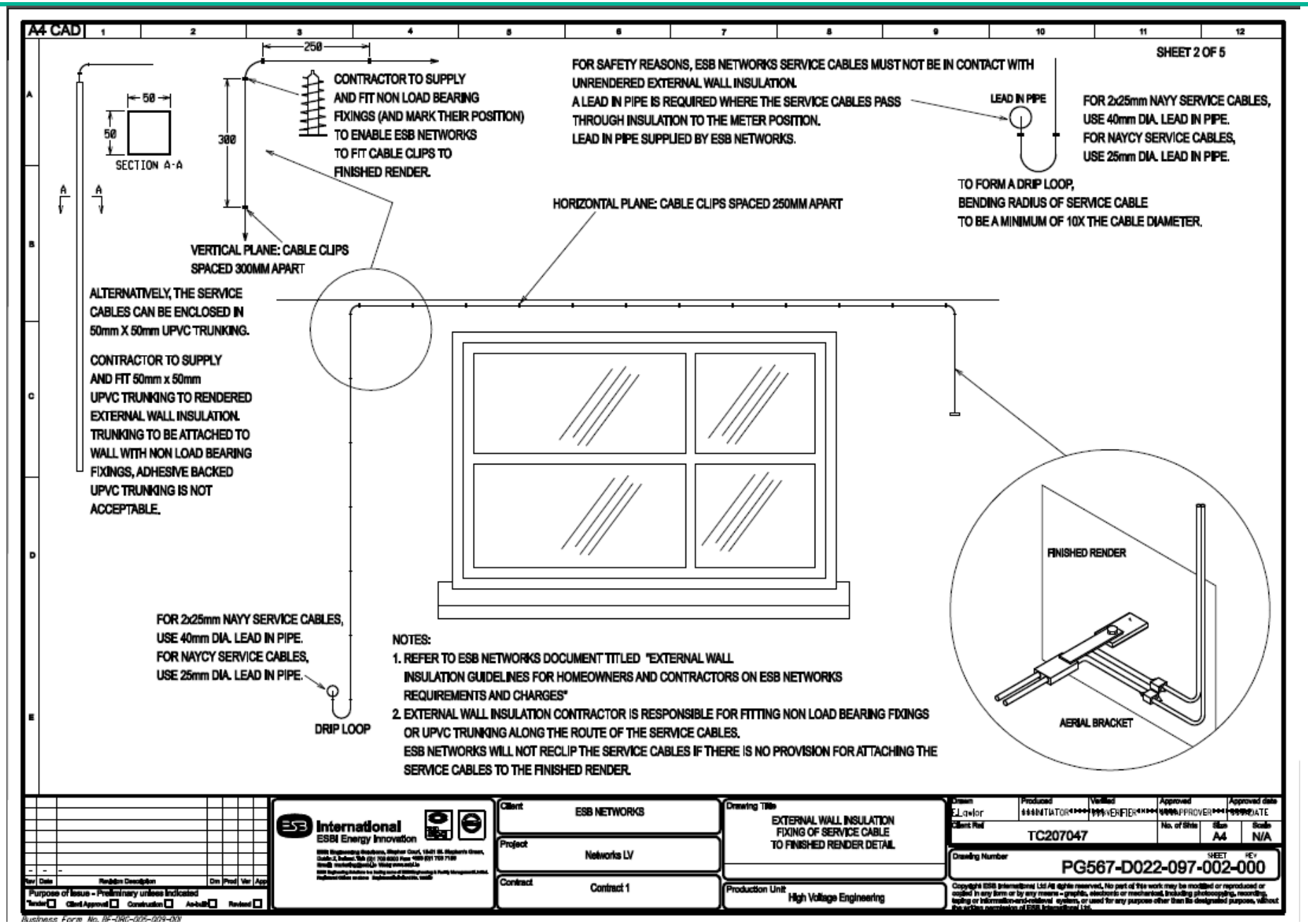
New meter cabinet with back removed is placed into existing cabinet.

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
SERVICE CABLES UNCLIPPED AND LEFT SAFE UNTIL THE FINISHED RENDER COAT IS APPLIED
SHEET 1 OF 5
REFER TO ESB NETWORKS DOCUMENT TITLED "EXTERNAL WALL INSULATION GUIDELINES FOR HOMEOWNERS AND CONTRACTORS ON ESB NETWORKS REQUIREMENTS AND CHARGES"
NEW AERIAL WALL BACKET INSTALLED (CODE 3417080) ("L" BRACKET FOR POLE MOUNTED SINGLE PHASE FUSE COMBINATION UNIT)
PVC / PVC SERVICE CABLE
175
M12 x125MM RAWLBOLT
NEW "BUNDLED" AERIAL CONDUCTOR
INSULATION PIERCING CONNECTORS
M12 x125MM RAWLBOLT
FINISHED JOB SEE SHEET 3
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.
Purpose of Issue - Preliminary unless indicated
ESB International
ESBI Energy Innovation
Client ESB NETWORKS
Project Networks LV
Contract Contract 1 Contract 2
Drawing Title EXTERNAL WALL INSULATION AERIAL BRACKET DETAIL
Production Unit High Voltage Engineering
Drawn S.Lawlor
Client Ref TC207047
Size A4
Scale N/A
Drawing Number PG567-D022-097-001-000


A4 CAD
SHEET 2 OF 5
250
50
50
SECTION A-A
300
CONTRACTOR TO SUPPLY AND FIT NON LOAD BEARING FIXINGS (AND MARK THEIR POSITION) TO ENABLE ESB NETWORKS TO FIT CABLE CLIPS TO FINISHED RENDER.
FOR SAFETY REASONS, ESB NETWORKS SERVICE CABLES MUST NOT BE IN CONTACT WITH UNRENDERED EXTERNAL WALL INSULATION.
A LEAD IN PIPE IS REQUIRED WHERE THE SERVICE CABLES PASS THROUGH INSULATION TO THE METER POSITION.
LEAD IN PIPE SUPPLIED BY ESB NETWORKS.
LEAD IN PIPE
FOR 2x25mm NAYY SERVICE CABLES, USE 40mm DIA. LEAD IN PIPE.
FOR NAYCY SERVICE CABLES, USE 25mm DIA. LEAD IN PIPE.
TO FORM A DRIP LOOP, BENDING RADIUS OF SERVICE CABLE TO BE A MINIMUM OF 10X THE CABLE DIAMETER.
HORIZONTAL PLANE: CABLE CLIPS SPACED 250MM APART
VERTICAL PLANE: CABLE CLIPS SPACED 300MM APART
ALTERNATIVELY, THE SERVICE CABLES CAN BE ENCLOSED IN 50mm X 50mm UPVC TRUNKING.
CONTRACTOR TO SUPPLY AND FIT 50mm x 50mm UPVC TRUNKING TO RENDERED EXTERNAL WALL INSULATION. TRUNKING TO BE ATTACHED TO WALL WITH NON LOAD BEARING FIXINGS, ADHESIVE BACKED UPVC TRUNKING IS NOT ACCEPTABLE.
FINISHED RENDER
AERIAL BRACKET
FOR 2x25mm NAYY SERVICE CABLES, USE 40mm DIA. LEAD IN PIPE.
FOR NAYCY SERVICE CABLES, USE 25mm DIA. LEAD IN PIPE.
DRIP LOOP
NOTES:
1. REFER TO ESB NETWORKS DOCUMENT TITLED "EXTERNAL WALL INSULATION GUIDELINES FOR HOMEOWNERS AND CONTRACTORS ON ESB NETWORKS REQUIREMENTS AND CHARGES"
2. EXTERNAL WALL INSULATION CONTRACTOR IS RESPONSIBLE FOR FITTING NON LOAD BEARING FIXINGS OR UPVC TRUNKING ALONG THE ROUTE OF THE SERVICE CABLES.
ESB NETWORKS WILL NOT RECLIP THE SERVICE CABLES IF THERE IS NO PROVISION FOR ATTACHING THE SERVICE CABLES TO THE FINISHED RENDER.
Purpose of Issue - Preliminary unless Indicated
ESB International
ESBI Energy Innovation
Client ESB NETWORKS
Project Networks LV
Contract Contract 1
Drawing Title EXTERNAL WALL INSULATION FIXING OF SERVICE CABLE TO FINISHED RENDER DETAIL
Production Unit High Voltage Engineering
Drawn EJaylor
Produced ####INITIATOR
Verified ###VERIFIER
Approved ####APPROVER
Approved date ####DATE
Client Ref TC207047
No. of Shts
Size A4
Scale N/A
Drawing Number PG567-D022-097-002-000
SHEET
REV
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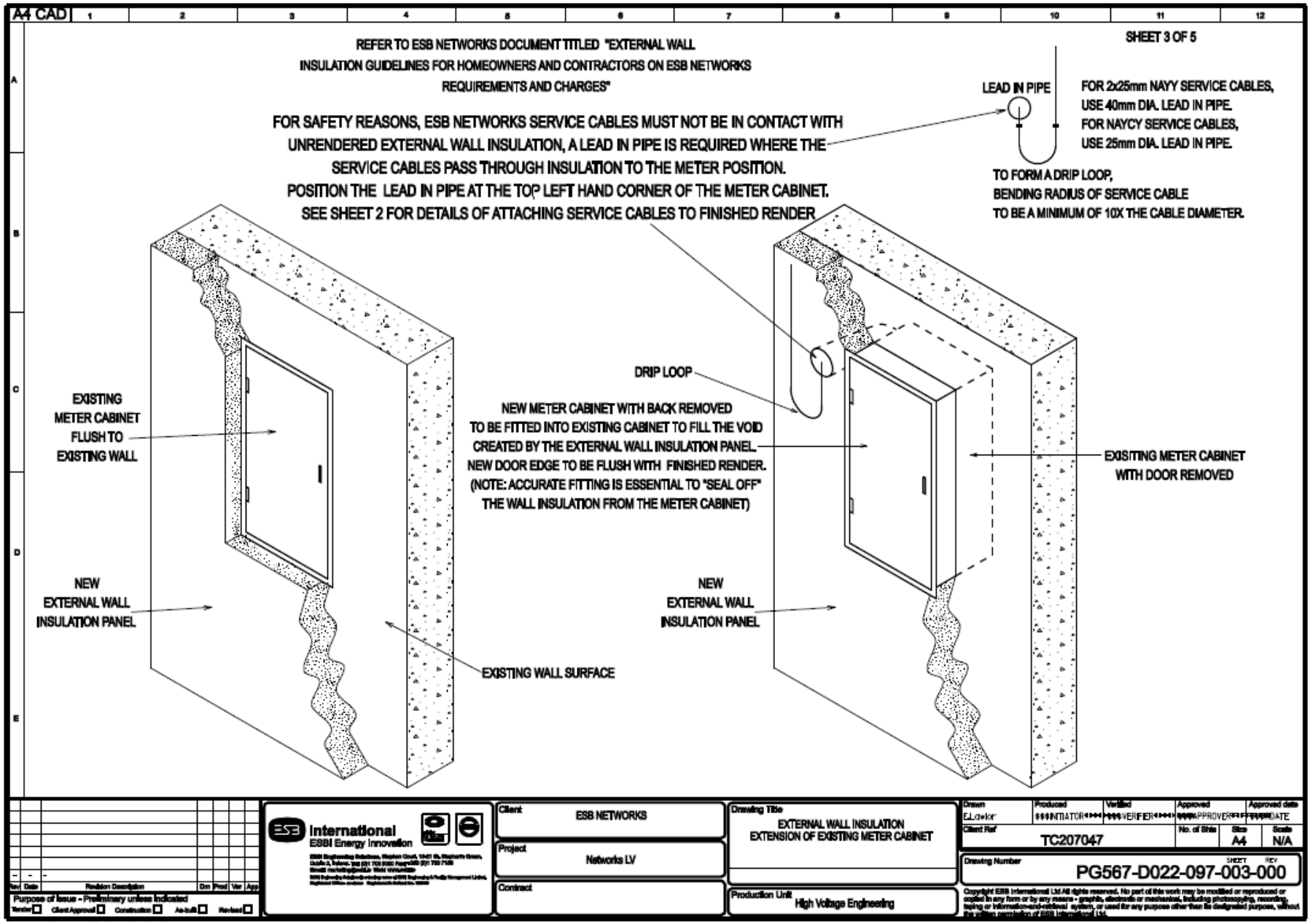
A4 CAD
SHEET 3 OF 5
REFER TO ESB NETWORKS DOCUMENT TITLED "EXTERNAL WALL INSULATION GUIDELINES FOR HOMEOWNERS AND CONTRACTORS ON ESB NETWORKS REQUIREMENTS AND CHARGES"
FOR SAFETY REASONS, ESB NETWORKS SERVICE CABLES MUST NOT BE IN CONTACT WITH UNRENDERED EXTERNAL WALL INSULATION, A LEAD IN PIPE IS REQUIRED WHERE THE SERVICE CABLES PASS THROUGH INSULATION TO THE METER POSITION.
POSITION THE LEAD IN PIPE AT THE TOP LEFT HAND CORNER OF THE METER CABINET.
SEE SHEET 2 FOR DETAILS OF ATTACHING SERVICE CABLES TO FINISHED RENDER
LEAD IN PIPE
FOR 2x25mm NAYY SERVICE CABLES, USE 40mm DIA. LEAD IN PIPE.
FOR NAYCY SERVICE CABLES, USE 25mm DIA. LEAD IN PIPE.
TO FORM A DRIP LOOP, BENDING RADIUS OF SERVICE CABLE TO BE A MINIMUM OF 10X THE CABLE DIAMETER.
EXISTING METER CABINET FLUSH TO EXISTING WALL
NEW EXTERNAL WALL INSULATION PANEL
EXISTING WALL SURFACE
DRIP LOOP
NEW METER CABINET WITH BACK REMOVED TO BE FITTED INTO EXISTING CABINET TO FILL THE VOID CREATED BY THE EXTERNAL WALL INSULATION PANEL.
NEW DOOR EDGE TO BE FLUSH WITH FINISHED RENDER.
(NOTE: ACCURATE FITTING IS ESSENTIAL TO "SEAL OFF" THE WALL INSULATION FROM THE METER CABINET)
NEW EXTERNAL WALL INSULATION PANEL
EXISTING METER CABINET WITH DOOR REMOVED
Purpose of Issue - Preliminary unless Indicated
Tender Client Approval Construction As-built Revised
ESBI International
ESBI Energy Innovation
Client ESB NETWORKS
Project Networks LV
Contract
Drawing Title EXTERNAL WALL INSULATION EXTENSION OF EXISTING METER CABINET
Production Unit High Voltage Engineering
Drawn EJ.Lawlor
Produced INITIATOR
Verified VERIFIER
Approved APPROVER
Approved date DATE
Client Ref TC207047
No. of Shts
Size A4
Scale N/A
Drawing Number PG567-D022-097-003-000
SHEET
REV
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A4 CAD

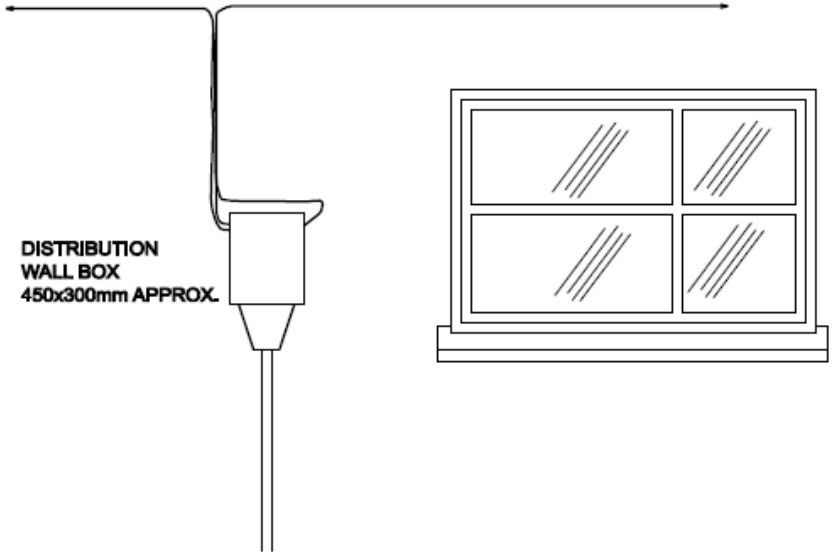
SHEET 4 OF 5

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

EXISTING CONNECTION TO ESB NETWORK

ESB NETWORKS DISTRIBUTION WALL BOX,
MAINS & SERVICE CABLES SURFACE MOUNTED
ON EXISTING WALL.

SERVICE CABLES TO MULTIPLE HOUSES
CONNECTED TO DISTRUBUTION WALL BOX.

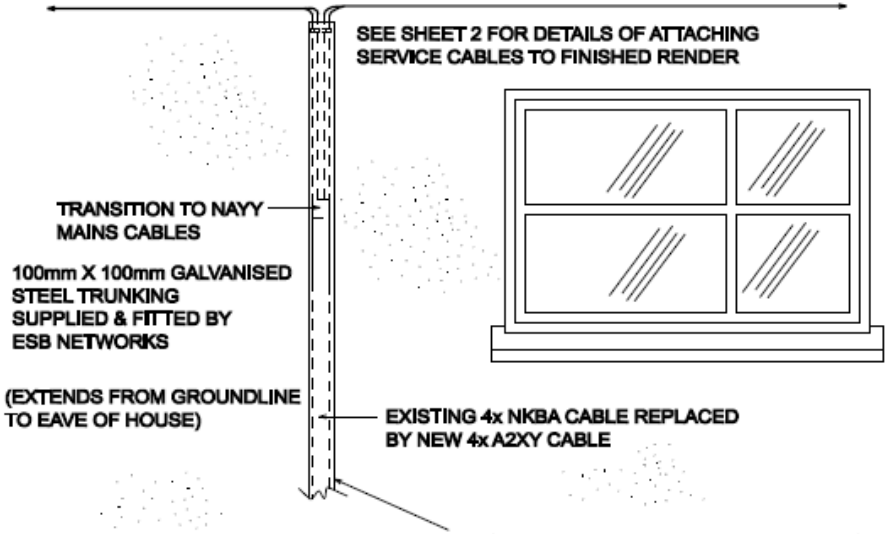


EXISTING WALL BOX, MAINS CABLE FROM UNDERGROUND
NETWORK & SERVICE CABLES TO A NUMBER OF HOUSES

NEW CONNECTION TO ESB NETWORK

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.

SERVICE CABLES FOR MULTIPLE HOUSES
CONNECTED TO MAINS CABLES IN TRUNKING.



WALL BOX REPLACED BY GALVANISED TRUNKING & MAINS CABLE FROM UNDERGROUND
NETWORK & SERVICE CABLES TO A NUMBER OF HOUSES

Rev	Date	Revision Description	Drn	Prod	Ver	App	
-	-	-					

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

ESB International
ESBI Energy Innovation

Client: ESB NETWORKS
Project: Networks LV
Contract:

Drawing Title: EXTERNAL WALL INSULATION
REPLACEMENT OF DISTRIBUTION BOX,
& FITTING 100mm X 100mm GALVANISED TRUNKING

Production Unit: High Voltage Engineering

Drawn	Produced	Verified	Approved	Approved date
CLaylor	INITIATOR	VERIFIER	APPROVER	DATE

Client Ref	No. of Shts	Size	Scale
TC207047		A4	N/A

Drawing Number: PG567-D022-097-004-000 (SHEET / REV)

Business Form No. BF-DRC-005-009-000

Appendix 4: DTSS redline version (RLV)

A redline version (RLV) is available to compare all the changes between the Domestic Technical Standards and Specifications version 2.0 (DTSS v.2.0) and its previous edition (DTSS v.1.6).

Please request the DTSS RLV v.2.0 from SEAI.