

Deep Retrofit Pilot - Quality Assurance

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1 Introduction

The existing housing stock in Ireland continues to pose one of our greatest energy efficiency challenges. A considerable portion of the current building stock performs poorly when compared against a building built to the current standards. Deep retrofit is the significant upgrade of a building toward nearly zero energy requirements where it is practically feasible and achievable. Rather than upgrading isolated parts of the house, the whole home should be assessed as a system, looking at how energy is used and retained. All aspects of the building fabric, air tightness, ventilation and renewables should be assessed.

SEAI have launched the Deep Retrofit Pilot Programme, which will investigate the challenges and opportunities that deep retrofit present. The learning from these pilots will inform our approach and support towards the large-scale deep retrofit of buildings in Ireland

The quality of service delivered under the Deep Retrofit Pilot Programme is central to the reputation and effectiveness of delivery of all domestic energy efficient and renewable energy works carried out under the programme. This will have an impact on the energy savings in the home and the value for public money. The quality of service has two dimensions: competence and compliance.

Important Points Regarding Contractors Operating Under the Deep Retrofit Pilot Programme:

- While it is not a requirement of the programme, SEAI recommends that contractors operating on projects funded under the Deep Retrofit Pilot Programme be registered with SEAI.¹
- All contractors must ensure that they and their operators are fully familiar with all key elements and processes outlined in the Quality Assurance document (this document).
- All contractors must carry out works to best practice and in accordance with the *Contractors Code of Practice and Standards and Specifications Guidelines*.
- Contractors must deliver all of the Critical Success Factors (see Appendix A) for each measure being installed. Failure to deliver all of the relevant Critical Success Factors will compromise the quality of the project and risk the achievement of the requirements of the Deep Retrofit Pilot Programme, which may result in revocation of SEAI funding.
- SEAI will be evaluating the performance of all contractors operating on the Deep Retrofit Pilot Programme. All non-compliances will be recorded against their profile, as per the *Better Energy Homes Quality Assurance and Disciplinary Procedures for Contractors* document and may affect their future involvement in the Deep Retrofit Pilot Programme.

¹ Information on registering with SEAI can be found at http://www.seai.ie/Grants/Better_energy_homes/contractor/How_do_I_get_Registered/

2 Overview

The purpose of SEAI's Quality Assurance for deep retrofit is to support the project management delivery of high quality deep retrofit. To achieve this objective, the quality assurance requirements include upstream, in-line and downstream quality requirements with an emphasis on upstream measures where appropriate to ensure high quality delivery and reduce the risk of downstream reworks.

SEAI's Quality Assurance includes the following measures:

- Provision of advisory/mentoring inspections to guide contractors in meeting Code of Practice requirements
- Promoting best practice amongst contractors on the Deep Retrofit Pilot Programme.
- Enforcement of *Contractors Code of Practice and Standards and Specifications Guidelines* through audits and inspections;
- Enforcement of Terms and Conditions of the Deep Retrofit Pilot Programme through audits and inspections;

Contractor must read, understand and adhere to the obligations of the Deep Retrofit Pilot Programme, as contained within:

- The Deep Retrofit Pilot Programme *Contractors Code of Practice and Standards and Specifications Guidelines*;
- The Deep Retrofit Pilot Programme Quality Assurance and Disciplinary Procedure (this document);
- All relevant technical bulletins, newsletters and notifications as SEAI may issue from time to time;
- All relevant technical bulletins, newsletters and notifications as NSAI may issue from time to time for measures where SEAI require NSAI certification for the installed measures.

In addition, Standard Recommendation S.R.54:2014: "Code of practice for the energy efficient retrofit of dwellings" has been developed by State Agencies and National Standards Authority of Ireland in conjunction with the Building Research Establishment to provide guidance on the energy efficient retrofit of dwellings. Contractors will need to familiarise themselves with the standard and put its recommendations into practice as it is embedded in the Contractors Code of Practice and Standards and Specifications Guidelines.

A link to this document can be found here: <http://www.nsai.ie/S-R-54-2014-Code-of-Practice.aspx>. This QA document sets out the standard that must be adhered to in order to ensure the high quality delivery of projects funded under the Deep Retrofit Pilot Programme.

3 Audit Process

The purpose of the audit process is to demonstrate high quality delivery of deep retrofit. SEAI will incorporate a blend of both desk-based audits and site inspections confirm and monitor compliance with requirements.

Desk-based audits

Project owners are required to demonstrate compliance with requirements throughout the lifecycle of a deep retrofit. SEAI may audit

Project Owners are required to demonstrate that all requirement is achieved throughout the lifecycle of the project, which include Key Critical Success Factors, i.e. the key specified elements of design and works, have been implemented and are of required standard. It is important that Project Owners communicate these requirements to all contractors on their project(s). The Critical Success Factors are given in Appendix A.

Project Owners are required to retain evidence of all items specified in Appendix A for a period of 6 years after works have been completed and issues resolved². This is to facilitate any potential SEAI audit.

Site inspections

Site inspections are carried to confirm works carried out on site meet requirements. Such inspections may be selected at any stage of the deep retrofit of the process and aims to assist the Project Owner in meeting high quality deep retrofit.

The aim of the audit and inspection process is to identify issues and administrative and technical non-compliances so that:

- SEAI have confidence that the design of the project will meet the requirements of the Deep Retrofit Pilot Programme;
- Technical issues can be addressed via reworks in order to make the measure(s) compliant;
- SEAI have confidence in the installed measures performing as specified;
- To provide feedback to contractors on the quality of measures required in order to continuously improve the delivery of projects funded through the programme;
- To avoid future errors through disciplinary sanctions as appropriate

Audit & inspection selection

Selection for an audit and/or inspection is based on both a random and targeted approach. Targeted audits/inspections will be selected on a risk-based approach.

² This is in line with contractors insurances to take account of the insurer's responsibilities under the Statute of Limitations

Demonstration of compliance with upstream quality requirements may reduce the level of downstream auditing and site inspection.

The selection of projects from the Deep Retrofit Pilot Programme for an audit should not be interpreted as being indicative of any presumption by SEAI that there will be errors or non-compliances in the project. Audits will also be used to learn from where Project Owners have applied best practice in their projects, which would inform SEAI how to improve delivery of projects.

4 Demonstration of Compliance

Administrative Compliance

Project Owners are required to fulfil their obligations in respect of testing, certification, installation, operation, etc. The documentation providing confirmation of required works is an important element of the Deep Retrofit Pilot Programme as it provides assurance that the systems and systems installers have been installed and commissioned, as appropriate, and that the dwelling will achieve the expected level of energy performance. This includes, but is not limited to, the following:

- Confirmation of registration with the National Standards Authority of Ireland (NSAI) as a registered installer of external wall insulation and full fill cavity wall insulation, as appropriate;
- Confirmation of NSAI registration for air pressure testing;
- Airtightness test report;
- System guarantee;
- RECI and/or ETCI completion certificate;
- Commissioning checklist, report, certificate, etc. as appropriate;
- NC5/NC6 Form (solar photovoltaic)
- Declaration of conformity
- Handover documentation and operating manual for end user;

Technical Compliances

In order to demonstrate technical compliance, Project Owners will be expected to confirm the following:

- Compliance of the design of the project measures, and;
- Compliance of the works involved in installing the measures.

Compliance of the design is important because it lays out very clearly what is required to be delivered onsite and reduces the need for decisions to be made onsite. It is important that designs be based on site surveys.

The compliance of the works is critical to ensuring that a high quality design is installed to the same high quality and gives confidence in the performance of the measures as per the design.

Critical Success Factors

Critical Success Factors are the key elements of the design and installation of a measure funded by the Deep Retrofit Pilot Programme that ensure the measures deliver the required level of energy performance. Measures being designed and installed as required by S.R. 54 and the Contractors Code of Practice and Standards and Specifications Guidelines should be achieving the Critical Success Factors as a matter of course.

The Critical Success Factors are set out in Appendix 1 of this document. SEAI retains the right to amend these appendices as required to maintain the integrity of the Programme.

Monthly Reporting

Each month the Project Owner will be required to submit a monthly report to document project progress, with the first report due a month from the date of the Letter of Offer. The report will require the Project Owner to declare that they have completed Critical Success Factors and that they retain evidence of this, thereby assuring high quality delivery of works. It will also require the Project Owner to indicate project progress. A summary template will be provided to the Project Owner in order to reduce the time to complete the report. Project owners are required to provide a monthly report, which is required to be submitted by the first working day of each subsequent month, e.g. 2nd October for work completed in August.

To support the Monthly Project Reporting, documentary evidence is required to demonstrate project progress. Appendix C (Project Monthly Reporting structure) provides two options for reporting structure. SEAI may carry out desk-based audits of monthly reports as part of Programme risk profiling.

5 Classification System for Non-Compliances

Demonstration of compliance will be required for the design of the project and the works involved in installing the measures.

Compliance will be determined by the Project Owner’s evidence of implementation of the Critical Success Factors.

An audit finding of non-compliance may arise from a technical error or non-compliance with the *Contractors Code of Practice and Standards and Specifications Guidelines* or in not having completed one of the specified design or works elements.

Each non-compliance is assigned a severity rating and penalty points are assigned to each severity rating for the purpose of evaluation of the performance of the stakeholder responsible for compliance of the particular element.

The severity ratings of non-compliances are defined as follows:

Severity Rating	Severity 1	Severity 2	Severity 3
Classification	Possible health and safety risk; Highly non-compliant and compromising the effectiveness of the installed measure	Non-compliant and compromising the effectiveness of the installed measure	Not best practice; Not giving confidence in the installation of the measure, e.g. administrative non-compliance
Reworks Requirement	Reworks required to make compliant	Reworks required to make compliant	Reworks may be required; Provision of required documentation

The Project Owner is responsible for the end-to-end project management delivery of all elements of the deep retrofit in ensuring that all stakeholders involved in design and works are delivering to the required standard. Non-compliances may potentially result in revocation of funding.

6 Response Time to Reworks Requirement Notifications

The allowable period for reworks to take place is determined by the severity level discovered at the time of audit. All reworks instructions must be responded to within the timeframe indicated (varies depending on severity).

- **Severity 1:** Project Owner is notified within 1 week of audit and he / she must undertake reworks and submit confirmation of same to SEAI within 28 days of dated notification.
- In certain instances, a **Severity 1** merits immediate action to ensure the issue is made safe and in such circumstances, SEAI notifies the Project Owner that immediate remedial action is required. This rework must be completed as a matter of urgency and confirmation of completion of same submitted to SEAI within 48 hours of notification of rework requirement.
- **Severity 2 and 3:** Project Owner is notified within 1 week of audit and he/she must undertake reworks and submit confirmation of same to SEAI within 28 days of dated notification.
- Where a **Severity 3** requires the provision of supporting documentation SEAI notifies the Project Owner and requests that the documentation be provided. The documentation must be provided within 7 days of notification.

The Project Owner receives a Reworks Notification from SEAI with a deadline of four weeks to complete reworks and return the attached Reworks Form to the stated SEAI address.

Where the notification from SEAI requires the provision of supporting documentation, the deadline for receipt of documentation is 14 days.

A reworks notification may be appealed within seven days, in writing only.

Failure to comply with a direction to undertake reworks may result in revocation of SEAI funding.

APPENDIX A

Critical Success Factors

To support high quality delivery, critical success factors provide key project management milestone verification. In delivering project reports to SEAI, Project Owners will be required to confirm that each of the critical success factors, outlined under each measure, have been addressed adequately. The critical success factors are the key elements of design and installation set out in S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings* and *Contractors Code of Practice and Standards and Specifications Guidelines*.

All measures must be installed as per S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings* and *Contractors Code of Practice and Standards and Specifications Guidelines*.

Project Owners must retain supporting information for each of the critical success factors for each measure installed on a project for the purposes of auditing by SEAI.

A.1 – System Design

Critical Success Factor	Supporting Info. Type
Site surveys have been conducted for each unit so that the designed whole house solution addresses all internal and external issues critical to the success of the installed solution	Site survey reports
The design has accounted for the provision of sufficient ventilation of the dwelling and complies with Part F of the Building Regulations	Calculations
The design has addresses all potential thermal bridges, especially at corners, junctions, edges and interfaces	Design
The design provides detailing that addresses airtightness	Design
The risk of summer overheating has been mitigated	Calculations
Use of vapour impermeable materials will not result in interstitial condensation	Document

A.2 – Roof Insulation

Critical Success Factor	Supporting Info. Type
Insulation covers entire area to provide whole building solution	Photo
Insulation depth provides U-value as per specification	Photo
All pipework insulated as per Contractors Code of Practice and Standards and Specifications Guidelines	Photo
Draught proof attic hatch fitted and insulated appropriately	Photo
Water storage tank insulated as per <i>Contractors Code of Practice and Standards and Specifications Guidelines</i>	Photo
Sufficient ventilation has been provided for roof space	Photo & Calculations

Correct provisions have been made for heavy-duty electrical cabling so as not to compromise the insulation layer	Photo
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A.3 – External Wall Insulation

Critical Success Factor	Supporting Info. Type
Insulation system is certified by the National Standards Authority of Ireland (NSAI).	Document
The installer is a Registered External Wall Insulation Contractor (registered with NSAI) for the installation of the system installed.	Document
The entire external wall area is covered providing a whole house solution.	Photo
All external wall insulation panels should be tightly butted together. Any gaps at joints should be filled with insulant.	Photo (before render applied)
Where the insulation is to be applied to a cavity wall, the cavity wall has been fully filled, in accordance with the Contractors Code of Practice and Standards and Specifications Guidelines.	Photo (Borescope)
Detailing around windows and external doors is as per Appendix H of S.R. 54:2014 Code of practice for the energy efficient retrofit of dwellings and NSAI system certificate.	Photo
Thermal bridging detailing is as per both Appendix H.1 of S.R. 54:2014 <i>Code of practice for the energy efficient retrofit of dwellings</i> and the NSAI system certificate to ensure that insulation is provided at the wall-floor and wall-roof junctions such that the building envelope is fully insulated and that there are no gaps in insulation at these key junctions.	Photo
All joints and seals are as per NSAI certificate.	Photo
Installation of vertical fire break between properties in semi-detached and terraced houses.	Photo
Sufficient ventilation has been provided.	Photo
Mechanical ventilation has been installed to standard, as per Contractors Code of Practice and Standards and Specifications Guidelines.	Document
Sufficient ventilation has been provided for roof space.	Photo
ESB Networks have moved service cables anchored or clipped to the external wall surface and replaced once the external wall insulation has been installed, as per the <i>Contractors Code of Practice and Standards and Specifications Guidelines</i> .	Photo
Where the service cable was clipped to the wall, appropriate ducting has been provided for the cabling along the new external wall surface.	Photo
The ESB Networks External Meter Cabinet has been moved as per the Contractors Code of Practice and Standards and Specifications Guidelines.	Photo

Gas meter box and gas supply has been provided for as per the Technical Bulletin issued by Bord Gáis Networks in the Contractors Code of Practice and Standards and Specifications Guidelines.	Photo
All penetrations of the External Wall Insulation are sealed correctly.	Photo

A.4 – Internal Wall Insulation

Critical Success Factor	Supporting Info. Type
The insulation panels are CE marked AND there is a Declaration of Conformity.	Photo / Document
The insulation covers all accessible areas providing a whole house solution.	Photo
All panels are closely abutting and joints are sealed as per of S.R. 54:2014 <i>Code of practice for the energy efficient retrofit of dwellings</i> and Contractors Code of Practice and Standards and Specifications Guidelines.	Photo (before plastering)
The insulation system includes a vapour control barrier.	Photo / Document
The installation of the system does not negatively affect the provision of sufficient purposeful ventilation.	Photo
Thermal bridging detailing in line with Appendix H.2 of S.R. 54:2014 <i>Code of practice for the energy efficient retrofit of dwellings</i>	Photo
Potential thermal bridges at window and door reveals have been addressed as per clause 7.3.3.2.11 of S.R. 54:2014 <i>Code of practice for the energy efficient retrofit of dwellings</i>	Photo

A.5 – Heat Pump

Critical Success Factor	Supporting Info. Type
System is CE marked AND there is a Declaration of Conformity.	Document
A commissioning certificate has been provided for the heat pump.	Document/Photo
System is listed on HARP database, or similar, as per the <i>Contractors Code of Practice and Standards and Specifications Guidelines</i> .	Document
The system has a Seasonal Performance Factor (SPF) that meets the minimum requirements of the <i>Contractors Code of Practice and Standards and Specifications Guidelines</i> .	Document
RECI/ETCI certificate has been provided	Document
Operations and Maintenance manual provided to homeowner	Document

Homeowner shown how to use system	Homeowner declaration
Programmer and thermostatic controls are fitted correctly.	Photo
Appropriately sized radiators are in place for low flow water temperatures from the heat pump.	Calculations / specs
Where Thermostatic Radiator Valves are used, they must comply with the <i>Contractors Code of Practice and Standards and Specifications Guidelines</i> .	Document
All accessible pipework is insulated	Photo

A.6 – Certified Wood Only Stove

Critical Success Factor	Supporting Info. Type
System is sized appropriately	Calculation
System is CE marked AND there is a Declaration of Conformity.	Document
A minimum certified efficiency of 70%	Document
System is listed on HARP database, or similar, as per the <i>Contractors Code of Practice and Standards and Specifications Guidelines</i> .	Document
Operations and Maintenance manual provided to homeowner	Document
Homeowner shown how to use stove	Homeowner declaration
Appropriate-sized dry fuel storage has been provided	Photo

A.7 – Solar Thermal

Critical Success Factor	Supporting Info. Type
System is sized in accordance with Contractors Code of Practice and Standards and Specifications Guidelines	Calculation
System is CE marked AND there is a Declaration of Conformity.	Document / Photo
Commissioning certificate has been provided	Document / Photo
RECI/ETCI certificate has been provided	Document / Photo
Operations and Maintenance manual provided to homeowner	Document
Homeowner shown how to use system	Homeowner declaration

Aperture area of panels/tubes is correctly sized	Calculation
Cylinder is correctly sized	Calculation
Cylinder is correctly and adequately insulated.	Photo
Collectors are correctly oriented and not at risk of shading	Photo
Electrical controls, temperature sensors and circulation pump are set and operating correctly	Document
Where integrated with space heating, the sensor for space heating control is correctly placed.	Photo
All accessible pipework is insulated	Photo
Pipework penetrating the building fabric has been sealed	Photo

A.8 – Solar PV

Critical Success Factor	Supporting Info. Type
Evidence that system meets Accelerated Capital Allowances (ACA) eligibility criteria for solar PV modules and inverters.	Document
System is CE marked AND there is a Declaration of Conformity.	Document/Photo
Commissioning report has been provided	Document/Photo
RECI/ETCI certificate has been provided	Document/Photo
Evidence of NC5/NC6 (if <11kW) or ESB Licence (if <11kW) has been provided	Document/Photo
Inverters comply with EN50438 or equivalent.	Document
The inverter efficiency is 95% or greater	Document
Operations and Maintenance manual provided to homeowner	Document
Homeowner shown how to use system	Homeowner declaration
Any penetrations of the building fabric are adequately sealed	Photo

A.9 – Mechanical Ventilation

Critical Success Factor	Supporting Info. Type
Condensate drain properly installed	
Commissioning checklist completed	
Operation and maintenance manual not provided	
Ducting properly insulated	

No excessive bends in ductwork	
Metallic ducts have been earth bonded to ETCl standards	
Ducting boxed off	
Ducting fireproofed	
Ducting sealed	
Ducting is accessible for maintenance	
Fan is accessible for maintenance	
Heat recovery unit is accessible for maintenance	
Heat recovery unit is adequately insulated	
Heat recovery unit	
Vents are not blocked	
Inlets and outlets are sufficiently far apart	
Distribution grilles are locked	
Vents are sleeved	
Mechanical extract not in the same room as an open flued appliance	
Permanent vent installed to standard	

APPENDIX B

Requirements for Non-Supported Measures

While certain energy efficiency measures may be installed on a project that are not supported under the Deep Retrofit Pilot Programme, it is important that they are specified and installed to a high standard. The critical success factors are the key elements of design and installation set out in S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings* and *Contractors Code of Practice and Standards and Specifications Guidelines*.

All measures must be installed as per S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings* and *Contractors Code of Practice and Standards and Specifications Guidelines*.

B.1 – Condensing Oil Boilers and Controls

Critical Success Factor	Supporting Info. Type
Boiler is on the HARP database, or equivalent, and shall meet a minimum seasonal efficiency of 90%	Document
The boiler has been sized appropriately	Calculation
System is CE marked AND there is a Declaration of Conformity.	Document/Photo
Commissioning certificate has been provided	Document
RECI/ETCI certificate has been provided	Document
Thermostatic controls are in place and working	Photo
Programmer controls in place and working	Photo
Operations and Maintenance manual provided to homeowner	Document
Homeowner shown how to use system	Homeowner declaration

B.2 – Condensing Gas Boilers and Controls

Critical Success Factor	Supporting Info. Type
Boiler is on the HARP database, or equivalent, and shall meet a minimum seasonal efficiency of 90%	Document
The boiler has been sized appropriately	Calculation
System is CE marked AND there is a Declaration of Conformity.	Document/Photo
Commissioning certificate has been provided	Document
RECI/ETCI certificate has been provided	Document
Gas compliance certificate has been provided	Document
Evidence that installer is registered with RGI has been provided	Document/Photo
Operations and Maintenance manual provided to homeowner	Document

Homeowner shown how to use system

Homeowner
declaration

APPENDIX C

Project Monthly Reporting Structure

