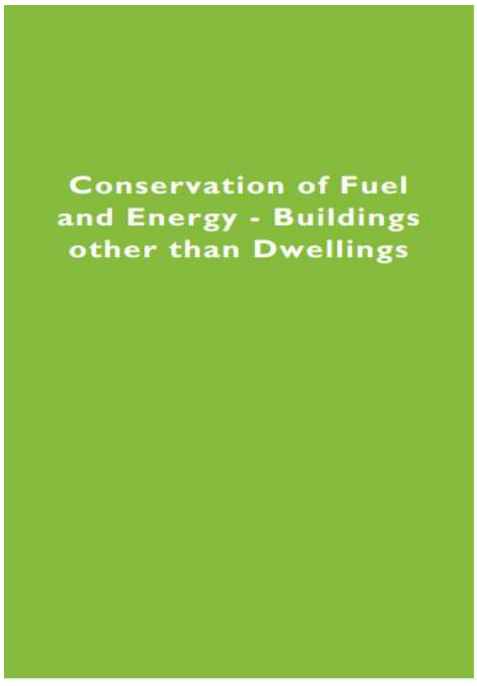
Douglas Carroll
Consulting Engineers

Seafront Building and Civic Space at Seaview Terrace, Bettystown, Co Meath **Building Regulations Part L & BER Assessment Report**

comhairle chontae na mí
meath county council



L

Building Regulations 2017

Technical Guidance Document

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

Adam Stringer
W1909
08/06/2020

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1 GENERAL

In June 2020, Douglas Carroll Consulting Engineers carried out a Preliminary Building Energy Rating (BER) & NZEB/PART L assessment for the proposed development at Seaview Terrace, Bettystown, Co. Meath. The scope of this NZEB/PART L calculation includes the entire proposed building excluding the public toilet area.

Our Client, Meath County Council, has expressed a desire to achieve NZEB compliance on the property.

The Part L assessment & BER report to show Nzeb compliance was based on the following:

- The proposed building fabric thermal performance has been based on the current best practice, TGD Part L compliance and is also aligned with the NZEB (Nearly Zero Energy Buildings) recommended fabric performance.
- The glazing performance has been based on the current best practice to comply with all aspects of TGD (Technical Guidance Document) Part L (2017) of the building regulations and is also aligned with the NZEB (Nearly Zero Energy Buildings) recommended glazing performance guidelines.
- The M&E services in particular the HVAC (Heating, Ventilation and Air Conditioning) and lighting performance parameters are based on “Best Practice” and the plant efficiency values are “Best in Class”. This achieves significant improvements within the overall Building Energy Rating.
- The geometry of the building was constructed as per the latest Architectural drawings

The BER model currently includes Photovoltaic (PV) renewable technologies with the addition of Air to Water Heat Pumps which is defined as a renewable technology in TGD Part L.

Based on the fabric and M&E design parameters contained within this report the calculated BER is A2.

Current Building Energy Rating = **A2**
Calculated Annual Primary Energy Consumption = **41.2 kWh/m2/yr**
Calculated Annual CO2 Emissions = **13.3 kgCO2/m2/yr**
Energy Performance Coefficient (EPC) (NZEB Limit =1.00) = **0.94**
Carbon Performance Coefficient (CPC) (NZEB Limit =1.15) = **0.99**
Renewable Energy Ratio (RER) (0.20 where EPC >0.90, 0.10 where EPC <0.90) = **0.25**
Overall Compliance with NZEB Standard = **Yes**

Section 3 sets out the design parameters that shall be followed to achieve an A2 BER for the extension.

The current mechanical and electrical specifications as well as current architect's drawings were used to produce the current desktop based provisional report. Documentary evidence is required and a full on-site survey of the completed building to produce the final BER report.

2 INTRODUCTION

DCCEng were commissioned by our client Meath County Council in May 2020 to investigate the Architectural, Mechanical & Electrical requirements to achieve the NZEB standard for their proposed library and civic space development at Seaview Terrace, Bettystown, Co. Meath. The extension will consist of 4 levels (ground to third floor) with a total building internal floor area of 910 m²

The proposed development consists of a lifeguard area, entrance & office/meeting areas at ground floor level. Ground floor level also includes a public toilet block which has not been included as part of the BER assessment

First Floor level consists of study, staff & office areas.

Second Floor level consists of study, exhibition, staff & office areas.

Third Floor level consists of study, plant & office areas.

Associated toilet blocks, lifts and circulation areas on the ground, first and second & third floors are all included in the calculation.

Energy efficiency shall be a critical part of the design, therefore in conjunction to the energy efficient façade, intelligent HVAC and lighting systems shall also be specified for this project. The proposed development shall achieve an A2 Rating

3D Image of Proposed Development

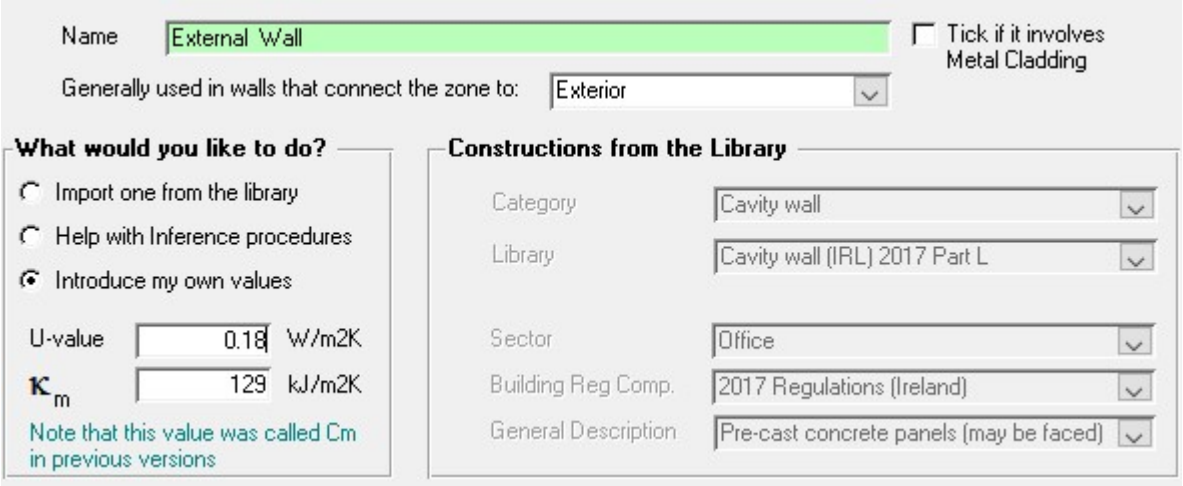
Seafront Building & Civic Space at Seaview Terrace, Bettystown, Co. Meath

3 ASSESSMENT DETAILS

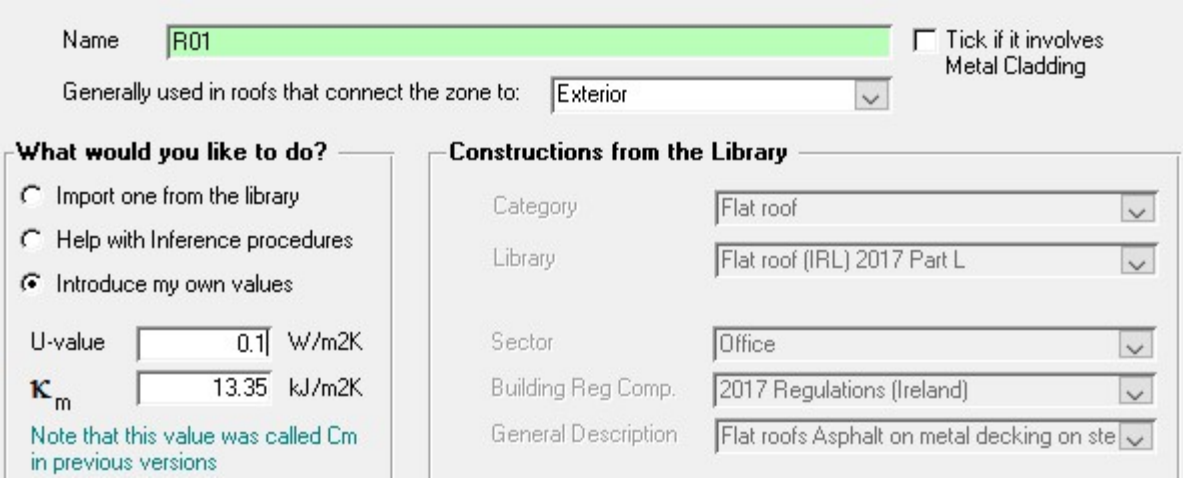
3.1 NEW BUILDING FABRIC PERFORMANCE – OPAQUE BUILDING ELEMENTS

The Elements Fabric Performance listed below were used to make this preliminary BER assessment with the U-Values & km values listed below.
The km value is the effective thermal capacity of an element (wall, floor, ceiling, etc.), given in kJ/m2.K.

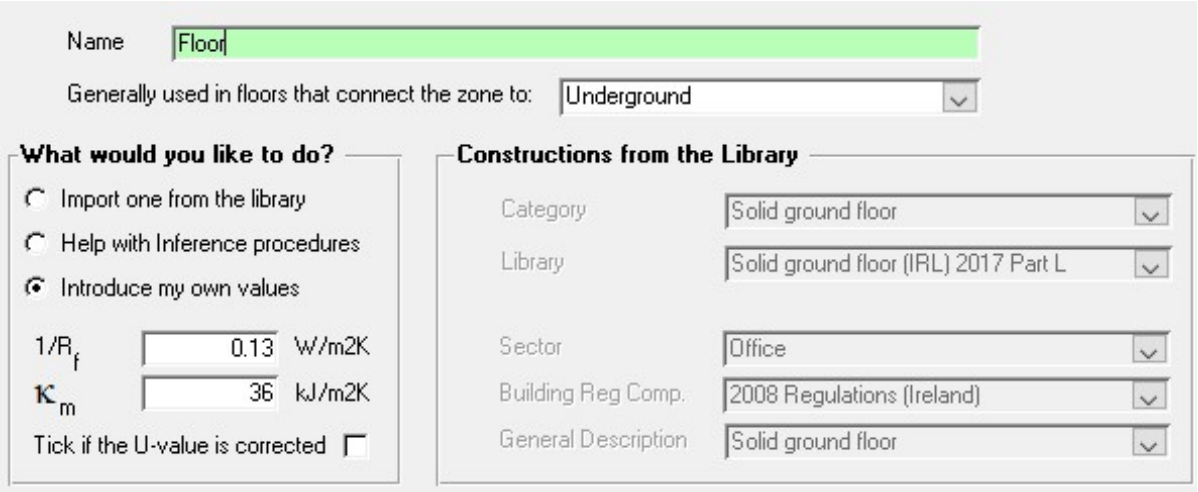
External Wall:



Roof:



Floor:



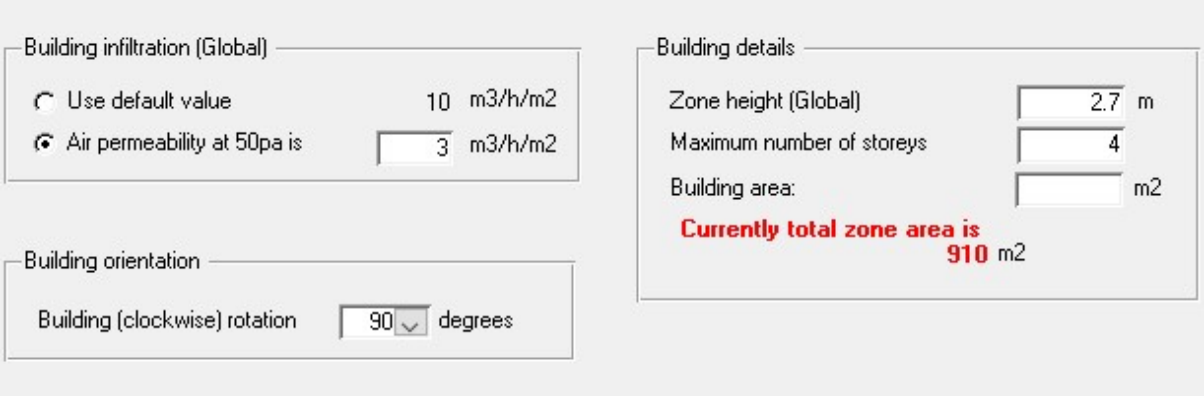
For the purposes of carrying out this BER calculation the default thermal bridging factors have been used. The U-values specified in the table above are in line with the Building Specification for NZEB. These improved building fabric performance parameters are used to aid compliance with the TGD Part L 2017 Standard for non-Domestic Buildings.

3.2 GLAZED ELEMENTS

The glazing performance specified in the table above is line with the Specification for NZEB as well as current industry best practice. The glazing thermal and solar

performance for the building is to comply with the TGD Part L 2017 Standard for Non-Domestic Buildings.

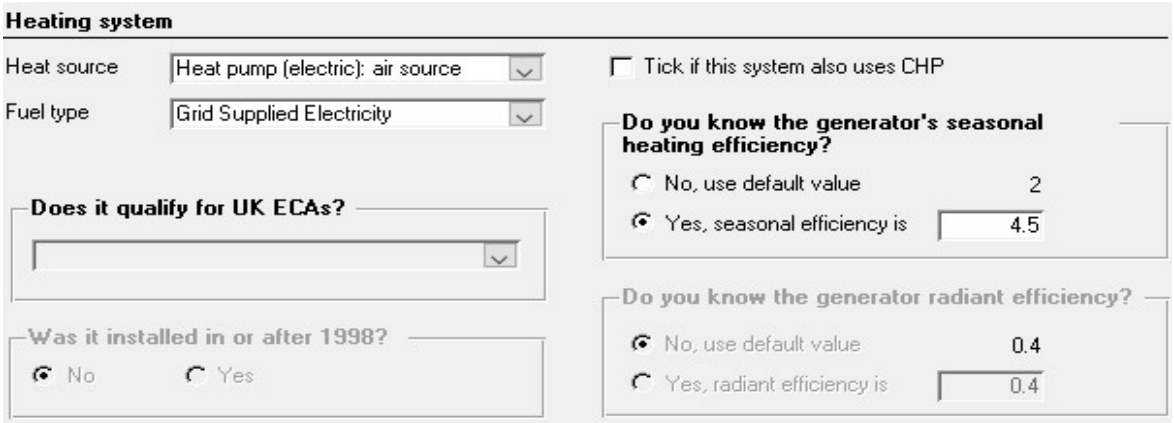
3.3 BUILDING AIR PERMEABILITY

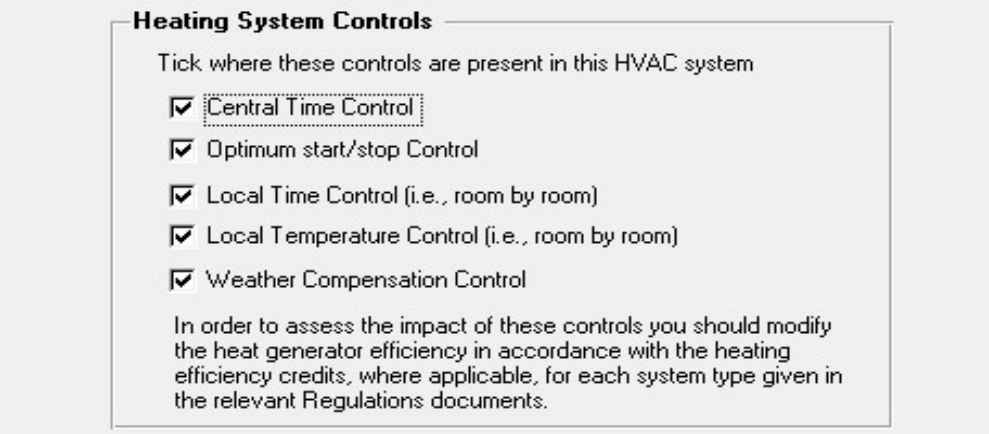


Building was assumed to have achieved an air tightness target of 3m3/h/m2. It is deemed good practice to achieve this for Nzeb compliant new builds.

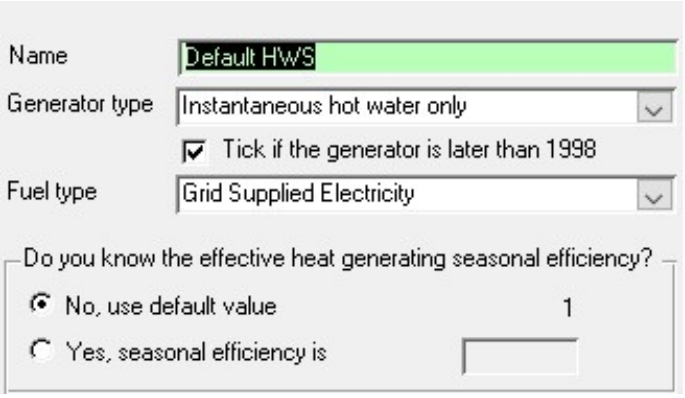
3.4 MECHANICAL PLANT PERFORMANCE

3.4.1 An Air/ Water Split-Style Heat Pump as the primary central heating source was used to complete the assessment. This was designed on the basis the central heating was a wet system using radiators with a high level of efficient zonal control on the system. SBEM Heat Pump inputs listed below:



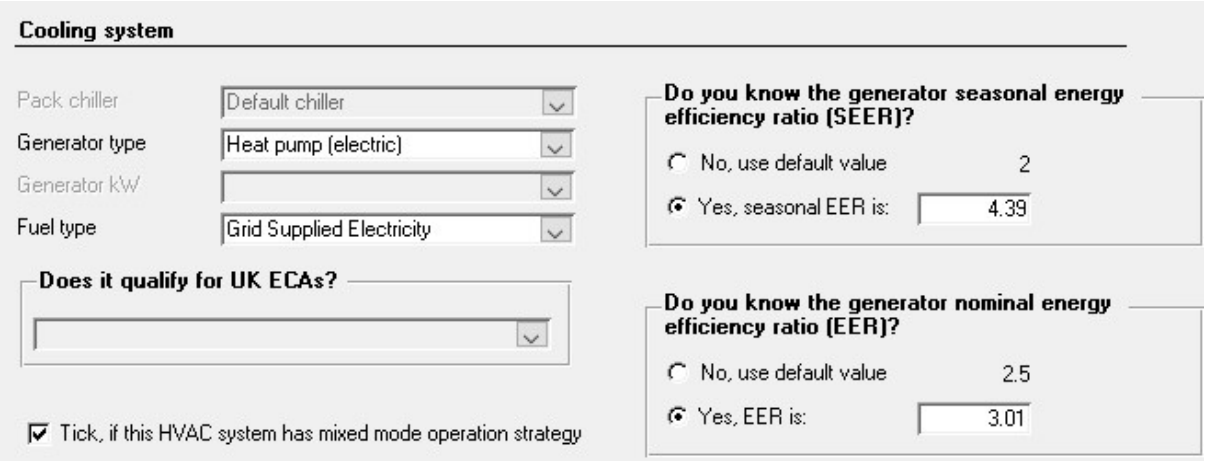


3.4.2 Instantaneous Electric Water Heating was specified as part of assessment. This would be on the basis that hot water will be available locally & instantly at the point of use for all hot water outlets. An electric system was specified here. See SBEM Water Heater inputs listed below:

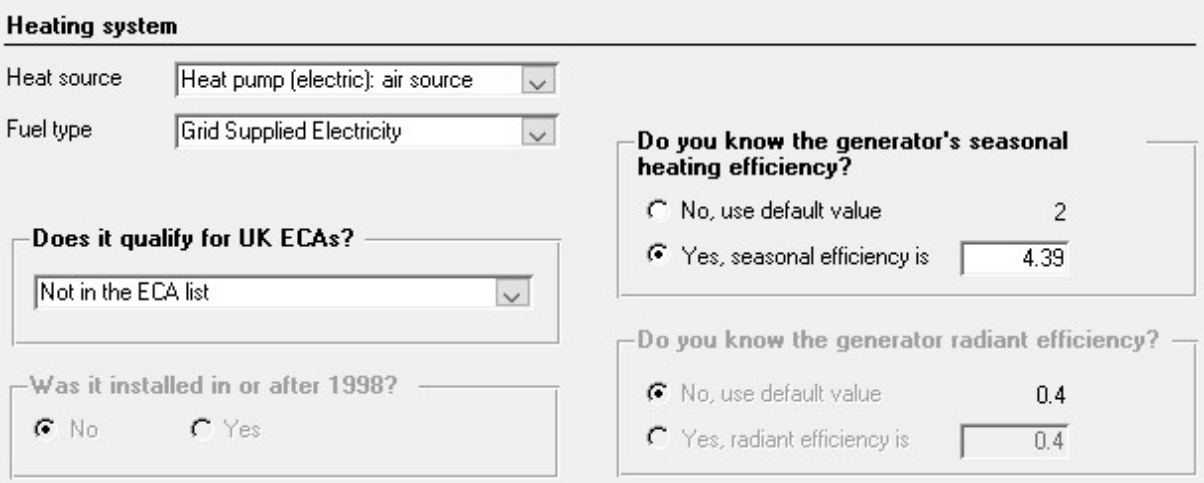


3.4.3 An Air Conditioning System using VRF was allowed for as part of the assessment to allow additional cooling if required to the building. The Air Conditioning System can also be set to heating mode if required. See SBEM Air Conditioning Unit inputs listed below:

AC Unit – Cooling Mode Inputs



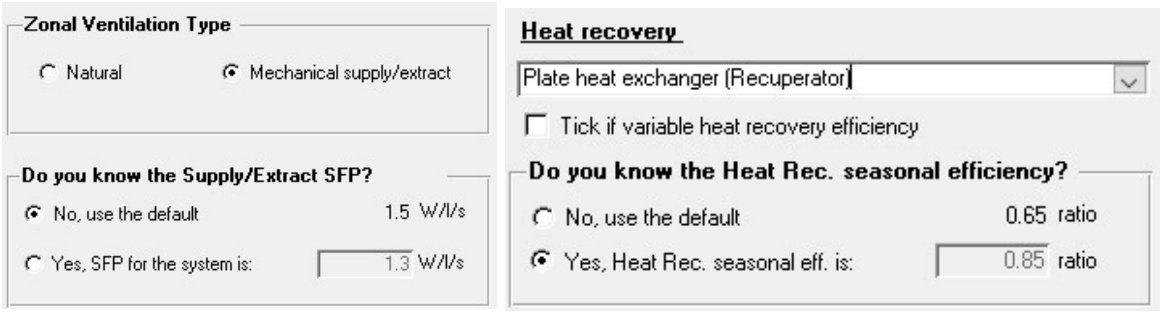
AC Unit – Heating Mode Inputs



To aid compliance with the Nzeb requirement for the building the HVAC systems are to be sub-metered. The sub-metering of HVAC systems is a recommended strategy in achieving compliance

3.4.4 The assessment is based on Air Supply and Extract systems using a specified Ventilation Unit with Heat Recovery (MVHR). This system will supply and extract air from the building via wall louvres making up part of the building façade.

To aid efficiency the heat recovery side of the ventilation unit will add to the heating requirement for the building. This will save on the overall heating costs. See SBEM Ventilation with Heat Recovery Unit inputs listed below:

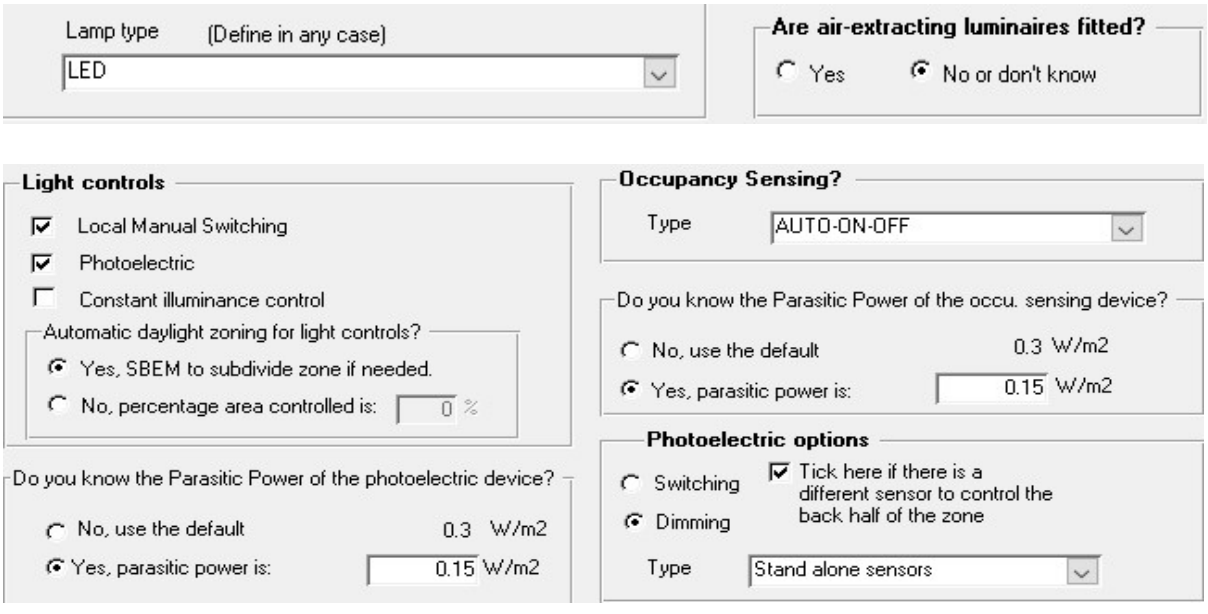


Ductwork & AHU Leakage will be tested & certified to CEN Standards. Minimum heat recovery efficiency required to satisfy the Eco Design Directive

2.5 ELECTRICAL PLANT PERFORMANCE

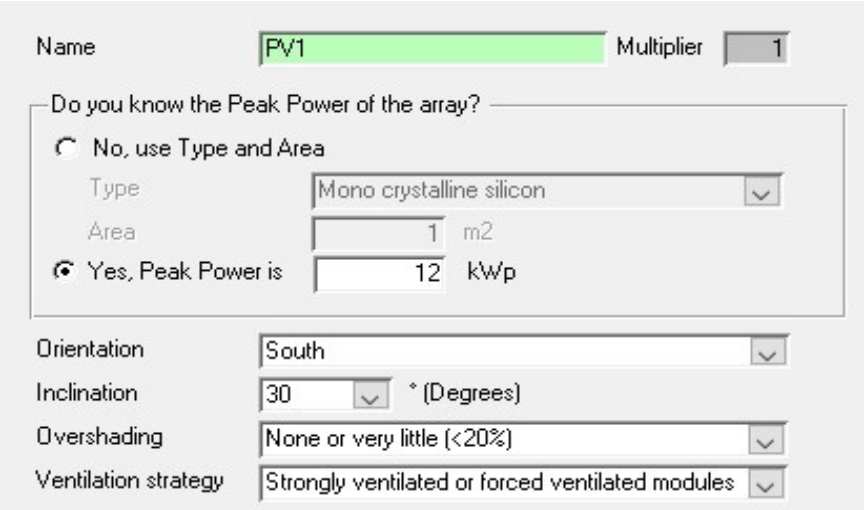
To aid Nzeb compliance for the building electrical systems were selected to help improve the building efficiency. The Electric Power Factor entry was <0.9 for the assessment. Efficient LED Lighting & intelligent controls such as photoelectric controls and occupancy sensing as per the SBEM inputs shown below, were entered for all areas of the building.

To further aid efficiency Sub-metering of the lighting might be considered.



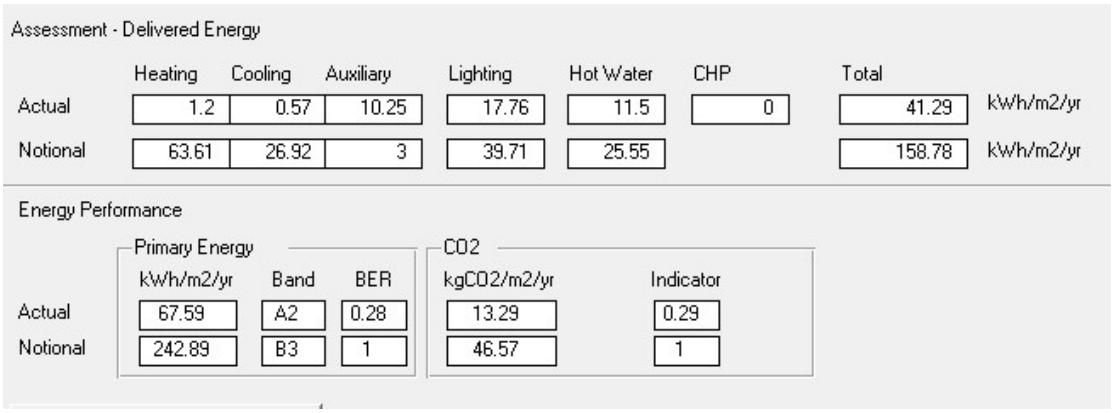
Lighting parameters contained within the table above are subject to changes as the design develops. The values shown are representative of typical target values for the project.

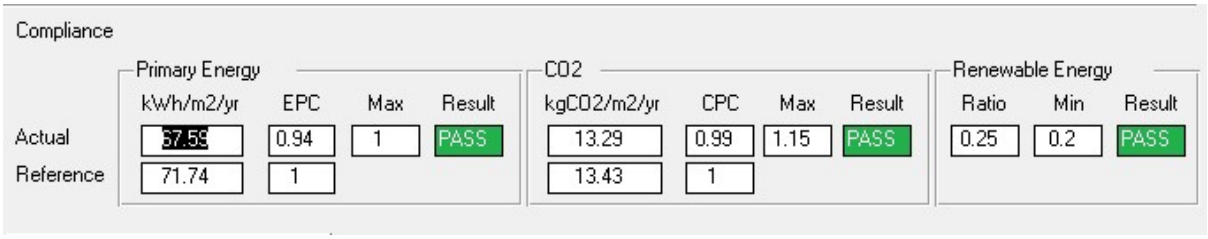
To achieve final Nzeb compliance in relation to EPC, CPC & RER values a PV Panel array was also added to the assessment. A 12kw array facing South with little over shading was included to achieve final compliance as per the SBEM inputs shown below.



Result

The final Energy Rating achieved was A2 showing full compliance with Part L of the building regulations. Nzeb compliance was achieved by using the parameters set out in this report. The proposed building complies with the current EPC, CPC & RER requirements as per Part L of the current Building Regulations. See screenshot of results below

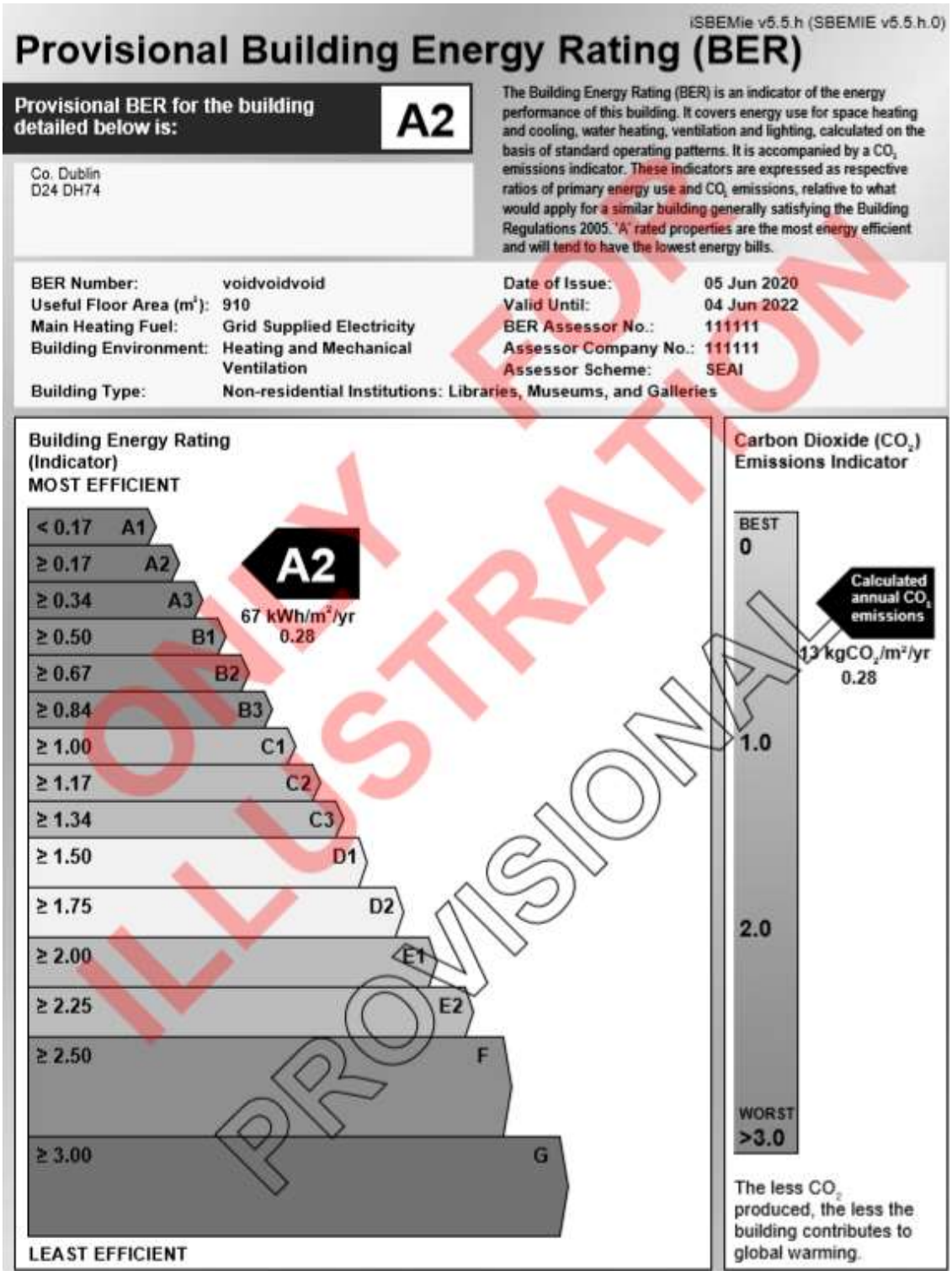




See Part L assessment below for more detailed report in relation to HVAC Performance & Specifications such as lighting parameters, plant efficiency, renewable technologies, building fabric etc.

4 APPENDICES

APPENDIX A - PRELIMINARY BUILDING ENERGY (BER) RATING ACHIEVED



iSBEMie v5.5.h (SBEMIE v5.5.h.0)

Provisional Building Energy Rating (BER)

Provisional BER for the building detailed below is: **A2**

Co. Dublin
D24 DH74

The Building Energy Rating (BER) is an indicator of the energy performance of this building. It covers energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard operating patterns. It is accompanied by a CO_2 emissions indicator. These indicators are expressed as respective ratios of primary energy use and CO_2 emissions, relative to what would apply for a similar building generally satisfying the Building Regulations 2005. 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

BER Number:	voidvoidvoid	Date of Issue:	05 Jun 2020
Useful Floor Area (m^2):	910	Valid Until:	04 Jun 2022
Main Heating Fuel:	Grid Supplied Electricity	BER Assessor No.:	111111
Building Environment:	Heating and Mechanical Ventilation	Assessor Company No.:	111111
		Assessor Scheme:	SEAI
Building Type:	Non-residential Institutions: Libraries, Museums, and Galleries		

Building Energy Rating (Indicator)
MOST EFFICIENT

< 0.17	A1
≥ 0.17	A2
≥ 0.34	A3
≥ 0.50	B1
≥ 0.67	B2
≥ 0.84	B3
≥ 1.00	C1
≥ 1.17	C2
≥ 1.34	C3
≥ 1.50	D1
≥ 1.75	D2
≥ 2.00	E1
≥ 2.25	E2
≥ 2.50	F
≥ 3.00	G

A2
67 kWh/m^2/yr
0.28

LEAST EFFICIENT

Carbon Dioxide (CO_2) Emissions Indicator

BEST
0
1.0
2.0
WORST
>3.0

Calculated annual CO_2 emissions
13 kgCO_2/m^2/yr
0.28

The less CO_2 produced, the less the building contributes to global warming.

APPENDIX B

TGD PART L 2017 (BUILDINGS OTHER THAN DWELLINGS) ASSESSMENT

BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.

Administrative information

Building Details

Address: Co. Meath, D24 DH74

NEAP

Calculation engine: SBEMIE

Calculation engine version: v5.5.h.0

Interface to calculation engine: iSBEMie

Interface to calculation engine version: v5.5.h

BRIRL compliance check version: v5.5.h.0

Client Details

Name:

Telephone number:

Address:

Energy Assessor Details

Name: <insert name>

Telephone number: 99999999999

Email: email

Address: <insert address>, <insert city>, XX XXX

Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

Calculated CO2 emission rate from Reference building	13.4 kgCO2/m2.annum
Calculated CO2 emission rate from Actual building	13.3 kgCO2/m2.annum
Carbon Performance Coefficient (CPC)	**0.99**
Maximum Permitted Carbon Performance Coefficient (MPCPC)	**1.15**
Calculated primary energy consumption rate from Reference building	71.7 kWh/m2.annum
Calculated primary energy consumption rate from Actual building	67.6 kWh/m2.annum
Energy Performance Coefficient (EPC)	**0.94**
Maximum Permitted Energy Performance Coefficient (MPEPC)	**1**
Renewable Energy Ratio (RER)	**0.25**
Minimum Renewable Energy Ratio	**0.2**

Heat Transmission through Building Fabric

Element	$U_{a\text{-Limit}}$	$U_{a\text{-Calc}}$	$U_{i\text{-Limit}}$	$U_{i\text{-Calc}}$	Surface with maximum U-value*
Walls**	0.21	0.18	0.6	0.18	Heat plant/e
Floors (ground and exposed)	0.21	0.1	0.6	0.13	aea 2 WC/f
Pitched roofs	0.16	0.1	0.3	0.1	Heat plant/c
Flat roofs	0.2	-	0.3	-	"No heat loss flat roofs"
Windows, roof windows, and rooflights	1.6	1.3	3	1.3	A5 Compute/s/g
Personnel doors	1.6	-	3	-	"No ext. personnel doors"
Vehicle access & similar large doors	1.5	-	3	-	"No ext. vehicle access doors"
High usage entrance doors	3	-	3	-	"No ext. high usage entrance doors"

$U_{a\text{-Limit}}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-Calc}}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-Limit}}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-Calc}}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

Air Permeability	Upper Limit	This Building's Value
m3/(h.m2) at 50 Pa	5	3

Building Services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Building Regulations documents for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- VRF AIRCon

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.39	3.01	-	-	-
Standard value	2.75	4.14**	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

** Standard shown is for split and multi-split air conditioners <6 kW. For systems 6-12 kW, limiting efficiency is 3.87.

2- HP01

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	-	-	-	-
Standard value	2.75	N/A**	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

** No automatic check on chiller efficiency has been performed by the tool in this case. Refer to Building Regulations documents for limiting efficiency.

1- Default HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Building Regulations documents
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Heat plant	-	-	-	1.5	-	-	-	-	-	0.85	N/A
A5 Computer	-	-	-	1.5	-	-	-	-	-	0.85	N/A
Stairwells	-	-	-	1.5	-	-	-	-	-	0.85	N/A
Aea 2 Study	-	-	-	1.5	-	-	-	-	-	0.85	N/A
area 2 WC	0.6	-	-	1.5	-	-	-	-	-	0.85	N/A
A3 Study	-	-	-	1.5	-	-	-	-	-	0.85	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
A6 Study	-	-	-	1.5	-	-	-	-	-	0.85	N/A
A5 Study	-	-	-	1.5	-	-	-	-	-	0.85	N/A
A5 WC	0.6	-	-	1.5	-	-	-	-	-	0.85	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Heat plant	50	-	-	88
A5 Computer	50	-	-	285
Stairwells	-	100	-	520
Aea 2 Study	-	100	-	1569
area 2 WC	-	100	-	70
A3 Study	-	100	-	1947
A6 Study	-	100	-	1752
A5 Study	-	100	-	571
A5 WC	-	100	-	190

Primary Energy Contributions to RER

Technology	kWh/annum
Photovoltaic systems	16644.5
Wind turbines	0
Solar thermal for water heating	0
Biomass for space and/or water heating	0
Biogas for space and/or water heating	0
Heat pumps for space and/or water heating	3830.6
CHP generators for space and/or water heating	0
District heating for space and/or water heating	0
Process energy	0
Total for renewables	**20475.1**
Total for renewables & non-renewables	**81510.2**

Douglas Carroll
Consulting Engineers

Technical Data Sheet (Actual vs. Reference Building)

Building Global Parameters

	Actual	Reference
Area (m2)	910	910
External area (m2)	1299	1299
Weather	DUB	DUB
Infiltration (m3/hm2 @ 50Pa)	3	3
Average conductance (W/K)	453.08	576.82
Average U-value (W/m2K)	0.35	0.44
Alpha value* (%)	32.51	29.36

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% area	Building Type
	Retail/Financial and Professional services
	Restaurants and Cafes/Drinking Est./Takeaways
	Offices and Workshop businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Inst.: Hospitals and Care Homes
	Residential Inst.: Residential Primary schools
	Residential Inst.: Universities and colleges
	Secure Residential Inst.
	Residential spaces
	Non-residential Inst.: Community/Day Centre
96	**Non-residential Inst.: Libraries, Museums, and Galleries**
4	**Non-residential Inst.: Primary Education**
	Non-residential Inst.: Primary Health Care Building

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	6	123.6	0.4	11	4.8	4.09	3.12	4.39	4.39
	Reference	16.5	76.4	5.6	7.9	3.6	0.82	2.7	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	19	227.4	1.2	0	10.5	4.23	0	4.5	0
	Reference	114.9	135.7	39	0	6.7	0.82	0	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type