building control northern ireland

INFORMATION PAPER

Topic: Information Note in Relation to changes to Parts F1 and F2

Ref No: Information Paper for Designers and Applicants

Date: May 2022

Standards and Performance Panel

Introduction

The basis of this Information Paper is to raise awareness for designers and applicants to the changes to Parts F1 and F2 and outline the key checks that will required for applications that they are submitting from the implementation date of the **30th June 2022.**

The proposed amendments are to guidance documents only only with the regulations remaining unchanged and another key point is that the changes will apply principally to new buildings only.

As SAP/SBEM software has not been updated these changes will mean a number of manual checks will be required and it is important to note that it is the ***designer / applicants responsibility to demonstrate compliance.***

This paper will look at how it is envisaged designers/applicants can show compliance with the new guidance and will break it down into the requirements for "dwellings" Part F1 first and then "buildings other than dwellings" Part F2.

Dwellings – Part F1

For dwellings there are now four new manual checks that need to be completed:-

- Check 1 is an improvement in the emissions performance from the previous assessment.
- Check 2 provides new more restricted limits on building fabric performance.
- Check 3 is a very straightforward change to the guidance on air tightness, removing some of the options to avoid air tightness testing.
- Check 4 relates to issues where renewable generating technologies, such as photo-voltaic panels, are used.

The information note will review each of the above checks

Check 1 – Improvement in Emissions Performance

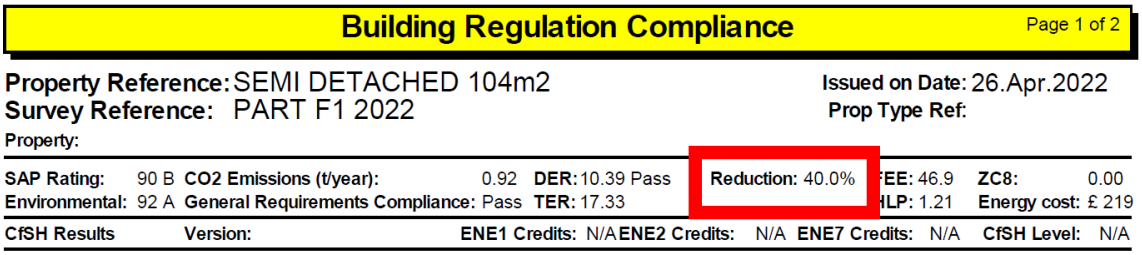
Where a new dwelling is constructed Regulation 43B applies and the new guidance now requires a betterment over the target emissions rate (the TER) of 40% in the case of houses, and 25% in the case of flats. *(See Paragraph 0.7 of Technical Booklet F1).* The betterment percentages are different because there should be more scope to improve houses than flats as houses have more fabric and roof are per m2 of floor.

The betterment values achieved can be simply checked by using the formulas given in Paragraph 2.48 of Technical Booklet F1

a) the DER for dwelling houses should better the TER by a minimum of 40%; and
DER (nzeb house) ≤ 0.6 x TER

b) the DER for flats should better the TER by a minimum of 25%.
DER (nzeb flat) ≤ 0.75 x TER

The percentage reduction achieved may be shown on the Building Regulation Compliance Report output from SAP software (see figure highlighted in red below). If not, designers should provide a calculation to demonstrate that the required betterment has been achieved.



Building Regulation Compliance Page 1 of 2

Property Reference: SEMI DETACHED 104m2 **Issued on Date:** 26.Apr.2022
Survey Reference: PART F1 2022 **Prop Type Ref:**
Property:

SAP Rating:	90 B	**CO2 Emissions (t/year):**	0.92	**DER:** 10.39 Pass	**Reduction:** 40.0%	**FEE:** 46.9	**ZC8:**	0.00
Environmental:	92 A	**General Requirements Compliance:**	Pass	**TER:** 17.33		**HLP:** 1.21	**Energy cost:**	£ 219

CfSH Results		**Version:**		**ENE1 Credits:**	N/A	**ENE2 Credits:**	N/A	**ENE7 Credits:**	N/A	**CfSH Level:**	N/A

Check 2 – Building Fabric Performance

The maximum U-values for each of the elements of the building fabric that separate a normally conditioned space from an unconditioned space or the external environment are given in Table 2.2. In the case of dwellings the guidance also prescribes a maximum limit of openings, which should be no greater than 25% of the total floor area. . *(See Paragraph 2.43 of Technical Booklet F1).*

Alternatively, a whole building area weighted U-value calculation can be carried out if a design has additional glazing or some elements which don't meet the new U-value.

When submitting an application there will be a number of things to be considered/checked:-

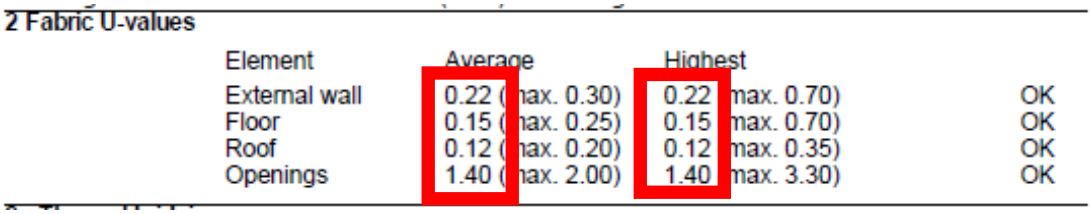
- ✓ Designers must demonstrate that the limiting extent of external doors and glazed openings in the dwelling is no greater than 25% of the floor area of the dwelling. Again, SAP software (see figure highlighted in red below) outputs can be used as the basis for presenting a calculation to building control.

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Opaque Door			1.8900	1.4000	2.6460			(26)
Half glazed door			1.8900	1.4000	2.6460			(26)
Window (Uw = 1.40)			19.3800	1.3258	25.6932			(27)
Heat Loss Floor 1				0.1300	6.7626			(28a)
External Wall 1	105.4200	23.1600	82.2600	0.2200	18.0972			(29a)
External Roof 1	52.0200		52.0200	0.1200	6.2424			(30)
Total net area of external elements Aum(A, m2)			209.4600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.0874			(33)
Party Wall 1			44.2200	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (User defined value 0.080 * total exposed area)							16.7568	(36)
Total fabric heat loss						(33) + (36) =	78.8442	(37)

Alternatively designers may use the calculated trade off approach for more highly glazed proposals.

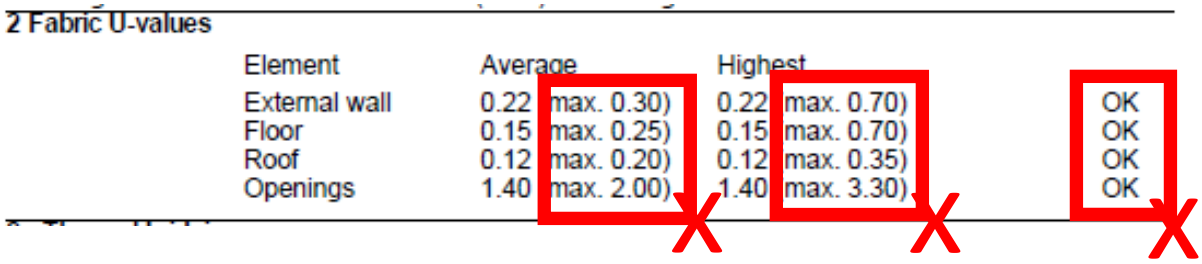
✓ The next step is to check the u-values in the SAP report against the values set out in Table 2.2. Fabric U-values can be demonstrated using the Building Regulation Compliance Report output from SAP software (see figure highlighted in red below). If the values are higher than those of Table 2.2 the designer has chosen the whole building calculated trade off approach they must provide a further calculation.



2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.22 max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 max. 3.30)	OK

The maximum permissible values output by the software may not reflect the revised limiting values in the updated Table 2.2- this will need to be checked in each scenario as the OK outputs may no longer be reliable. (see figure highlighted in red below).



2 Fabric U-values

Element	Average	Highest	
External wall	0.22 max. 0.30)	0.22 max. 0.70)	OK
Floor	0.15 max. 0.25)	0.15 max. 0.70)	OK
Roof	0.12 max. 0.20)	0.12 max. 0.35)	OK
Openings	1.40 max. 2.00)	1.40 max. 3.30)	OK

✓ If there is more than 25% glazing or if a particular average elemental U-value doesn't comply with new Table 2.2 limits, then a simple spreadsheet calculation should be provided by the designer to demonstrate that the whole building performance provides an equivalent performance to a building that would have complied.

The approach is in keeping with the assessment for extensions to dwellings outlined in Section 3 of technical booklet F1.

The average area u-value is calculated using the following formula from Paragraph 3.14 of Technical Booklet F1

$$U_{av} = \frac{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \ldots\ldots\ldots}{A_1 + A_2 + A_3 + \ldots\ldots\ldots}$$

where A is the area and U is the U-value of each particular thermal element.

Sample Spread Sheet

CALCULATED TRADE OFF APPROACH U VALUE CALCULATOR				
ELEMENT	**TABLE 2.2 LIMITING U VALUES**	**AREA**	**CALCULATED TRADE OFF APPROACH U VALUES**	**AREA**
WALL	0.18	82.26	0.22	82.26
FLOOR	0.18	52.02	0.15	52.02
ROOF	0.16	52.02	0.12	52.02
PARTY WALL	0.00	0.00	0.00	0.00
WINDOWS, ROOF WINDOWS, GLAZED ROOFLIGHTS, CURTAIN WALLING & PEDESTRIAN DOORS*	1.40	26.01	1.40	23.16
TARGET AVERAGE AREA WEIGHTED U VALUE		**0.328**		
CALCULATED TRADE OFF APPROACH AVERAGE AREA WEIGHTED U VALUE		**0.308**		
*Area of openings for the target calculation is 25% of the floor area in all cases (or, if the total exposed façade is less than 25% of the total floor area, the total exposed facade area). The area used in the trade off approach should be as per the actual building.				

Check 3 – Air-tightness Performance

The new guidance has removed the option in Paragraph 2.24(b) of Technical Booklet F1 for air permeability assessment for a assumed value of 15 m3/(h.m2) at 50 Pa to be submitted on small sites for untested dwellings. So as part of plan assessments it is necessary to check that this value has not been used in the SAP software submission. This information should be readily available in the software outputs.

3 Air permeability		
Air permeability at 50 pascals:	5.00 (design value)	
Maximum	10.0	OK
4 Heating efficiency		

Check 4 – Electricity Generated by Renewable Technologies

The betterment requirement of the TER as set out in check 1 above is expected to lead to a greater use of renewable generation technologies. Where renewable generation technologies are used to produce electricity, designers are encouraged to engage at an early stage with Northern Ireland Electricity Networks (NIE) to confirm the type of connection that can be provided. *(See Paragraphs 2.17 to 2.22 of Technical Booklet F1).*

The following are items that designers/applicants need to consider when submitting a building control application:-

- ✓ Confirmation of type of connection i.e. export or non-export. Applicants should make an application to NIE at early stage and as part of this they will get a copy of a formal connection offer which will provided details of both import (MIC) and export (MEC) values where applicable if this is available at plan submission stage a copy of this should be provided to Building Control.

- ✓ If the design is for an export connection and the confirmation is not available at stage when application is submitted it will then need to be provided at completion stage or completion certificate may not be issued.

- ✓ If the design is for a non-export connection then the designer needs to provide evidence of compliance with a non-export connection at plans application stage. This evidence will be in the form of a report as outlined in Paragraphs 2.20 and 2.21 of Technical Booklet F1 and should include the following information:-

    - appropriate system sizing;
    - energy storage technologies such as a diverter to hot water or battery storage have been considered;
    - potential future loads (e.g. electric vehicle charging) that could increase the extent to which the energy generated would be used;
    - any particular occupancy pattern (e.g. dwellings for elderly or live/work units);
    - any other information that details any limitation or potential performance gap; and
    - confirmation that the extent of the gap has been notified to the building owner.

- ✓ Applicants/designers need to be aware that at completion stage confirmation will be required that an export connection has been provided as per the approved submission, if at this stage it is not then a report demonstrating compliance with a non-export connection will be required.

- ✓ If a non-export connection was part of the initial design a similar report will be required on completion to take into account any adjustments in the as built construction.

Dwelling Checks Summary

The checklist on the next page may be submitted with each application to capture the relevant information in each of the checks outlined above.

Part F. NZEB Manual Checks for Domestic Applications (From 30th June 2022)

Building Regulation Applicant	
Proposed Site Address	
Agents Details	

(1) SAP (TER/DER) 40% Betterment Dwelling House, 25% Betterment Flats.

Design TER		Design DER		% Lower	

(2) Limiting U-values (W/m2.K)

Element	Area-weighted average U-value (Max allowed)	As-designed	Maximum U-value at any point	As-designed
Wall	0.18		0.60	
Floor	0.18		0.60	
Roof	0.16		0.30	
Party Wall	0.00		0.60	
Windows, roof windows, glazed roof lights, curtain walling & pedestrian doors .	1.40		3.00	

External doors and glazed openings in a dwelling no greater than 25% of the floor area of the dwelling.	Floor Area (a)	M^2	b ÷ a x 100
	Ext Doors/Glazed Openings (b)	M^2	= %

Note:
(1) Where the source of space heating is underfloor heating, the maximum floor U-value should be 0.15 W/m2K

Note: Proposed Alternative Approach Used (whole building calculated trade-off approach) *If Yes supporting calculation to be submitted	Yes	No

(3) Air Permeability $m^3/(h.m^2)$

As Designed Proposed	

(4) Electricity generated by renewable technologies

Has a renewable technology been proposed that generates electricity?	Design Stage	
	Yes	No
Where electricity is generated, is an export connection proposed?	Design Stage	
	Yes	No
*If an non-export connection has suitable report been provided	Yes	No

Buildings Other than Dwellings – Part F2

For building other than dwellings there are also four new manual checks that need to be completed:-

- Check 1 is an improvement in the emissions performance from the previous assessment.
- Check 2 provides new more restricted limits on building fabric performance.
- Check 3 is a very straightforward change to the guidance on air tightness, removing some of the options to avoid air tightness testing.
- Check 4 relates to issues where renewable generating technologies, such as photo-voltaic panels, are used.

Each of these checks will now be looked at it a bit more detail.

Check 1 – Improvement in Emissions Performance

Where a new building is constructed the emissions rate is generally expected to be bettered by at least 15%, although there is some potential easement of this where the building is heated with a heat pump. *(See Paragraph 0.7 of Technical Booklet F2).*

If the building is not new then the betterment does not apply as NZEB requirements are not applicable. In some cases, however, an emissions assessment may still be required. The most obvious example of this is where the emissions assessment is for an extension of more than 100m2 and greater than 25% of the total useful floor area of the existing building. In this case the 15% betterment requirement would not apply but the BER would still need to be no greater than the TER.

The betterment values achieved can be simply checked by using the formulas given in Paragraph 2.61 of Technical Booklet F2.

BER(nzeb) ≤ 0.85 x TER

The emissions values should be readily obtained from the BURKL output report (see below) and it is the Designer's responsibility to show the simple calculation of the betterment achieved.

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	18.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	18.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

The percentage betterment can be eased where the space heating is provided by a heat pump. This is applied on a pro-rata basis. For example if 50% of the annual space heating

demand is delivered by a heat pump, the BER should better the TER by 7.5%. If all the space heating is provided by a heat pump then no betterment is required.

The percentage of heating demand provided by heat pumps can be found in the software outputs see example below. In this example a 32% of the heating demand comes from a heat pump therefore the overall betterment requirement will reduce from 15% to 11% reduction of the TER.

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] Flued forced-convection air heaters, [HS] Air heater, [HFT] Natural Gas, [CFT] Electricity									
Actual	195.9	523.6	66.3	0	5.1	0.82	0	0.9	0
Notional	95.8	437.6	33.6	0	5.8	0.79 / 0.81	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	145.6	310.8	20.6	57.7	0	1.96	1.5	2	2
Notional	189.8	154.6	21.7	11.9	0	2.43	3.6	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	109.4	61.8	36.3	0	13.4	0.84	0	0.89	0
Notional	195.5	52.7	68.6	0	10	0.79 / 0.81	0	----	----

Actual heat demand figures are available from HVAC report on software

$$\frac{145.6}{195.9 + 145.6 + 109.4} = 32\%$$ **of heat demand comes from heat pump in this particular case**

Betterment required = (0.85 x TER x (1-0.32)) + (TER x 0.32)
= (0.57 x TER) + (0.32 x TER) = 0.89 TER

The betterment pro-rata reduction is calculated using the formula given in Paragraph 2.62 of Technical Booklet F2

$$BER_{(hp\ nzeb)} \leq (0.85 \times TER \times (1-fQ_{sp(hp)})) + (TER \times fQ_{sp(hp)})$$

Where;

$BER_{(hp\ nzeb)}$ = the BER for a NZEB where part of the space heating is provided by a heat pump; and

$fQ_{sp(hp)}$ = the fraction of the total space heating demand provided by a heat pump.

If there is an option for space heating to be provided by either a heat pump or another source the heat pump should be ignored and the BER should better the TER by at least 15%

Check 2 – Building Fabric Performance

The maximum U-values for each of the elements of the building fabric that separate a normally conditioned space from an unconditioned space or the external environment are given in Table 2.3. Unlike dwellings there is no limit on the extent of glazing that can be provided due to the variety of building types.

Alternatively, a whole building area weighted U-value calculation can be carried out if a design has some elements which don't quite meet the new U-value.

The emissions values should be available in the BRUKL output report (see figures outlined in red) If values are higher than those of Table 2.3 and the designer has chosen the whole building calculated trade off approach they must provide a further calculation.

Again the limiting u-values (see figures outlined in blue) may not correspond to the values in new Table 2.3 and will need to be checked.

Building fabric

Element	$U_{a\text{-Limit}}$	$U_{a\text{-Calc}}$	$U_{i\text{-Calc}}$	Surface where the maximum value occurs*
Wall**	0.35	0.21	0.21	"Wall4988418"
Floor	0.25	0.1	0.11	"Wall4988430"
Roof	0.25	0.15	0.15	"Wall4988420"
Windows***, roof windows, and rooflights	2.2	1.2	1.2	"Window519020"
Personnel doors	2.2	1.6	1.6	"Door158215"
Vehicle access & similar large doors	1.5	1.5	1.5	"Door158216"
High usage entrance doors	3.5	1.6	1.6	"Door158217"

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

If a particular average elemental U-value doesn't comply with new Table 2.3 limits, then a simple spreadsheet calculation should be provided by the designer to demonstrate that the whole building performance provides an equivalent performance to a building that would have complied.

The approach is in keeping with what is used for dwellings but should be simpler to verify as there is no glazing restriction to take account so the extent of glazing in the assessment is the same as the actual building proposal.

The average area u-value is calculated using the following formula taken from Paragraph 3.22 of Technical Booklet F2

$$U_{av} = \frac{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \ldots\ldots\ldots}{A_1 + A_2 + A_3 + \ldots\ldots\ldots}$$

where A is the area and U is the U-value of each particular thermal element.

Sample Spread Sheet

CALCULATED TRADE OFF APPROACH U VALUE CALCULATOR				
ELEMENT	TABLE 2.2 LIMITING U VALUES	AREA	CALCULATED TRADE OFF APPROACH U VALUES	AREA
WALL	0.18	79.41	0.24	79.41
FLOOR	0.18	52.02	0.15	52.02
ROOF - PITCHED	0.16	52.02	0.13	52.02
ROOF - FLAT	0.20	0.00		0.00
PARTY WALL	0.20	0.00		0.00
WINDOWS, ROOF WINDOWS, ROOF LIGHTS	1.40	23.16	1.40	23.16
CURTAIN WALLING	1.80	0.00		0.00
PEDESTRIAN DOORS	1.60	9.45	1.40	9.45
VEHICLE ACCESS & SIMILAR LARGE DOORS	1.50	6.00	1.50	6.00
HIGH USAGE ENTRANCE DOORS	3.50	3.00	3.50	3.00
ROOF VENTILATORS (INCLUDING SMOKE VENTS)	3.50	0.00		0.00
SWIMMING POOL BASIN (WALLS & FLOOR)	0.25	0.00		0.00
TARGET AVERAGE AREA WEIGHTED U VALUE		0.440		
CALCULATED TRADE OFF APPROACH AVERAGE AREA WEIGHTED U VALUE		0.439		

Check 3 – Air-tightness Performance

The new guidance has removed the option in Paragraph 2.86(b) of Technical Booklet F for air permeability assessment for a assumed value of 15 m3/(h.m2) at 50 Pa to be submitted on on non-domestic buildings smaller than 500 m2.

So as part of the application submission it is necessary to check that this value has not been used in the SBEM software submission. This information should be readily available in the software outputs.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

Check 4 – Electricity Generated by Renewable Technologies

The betterment requirement of the TER as set out in check 1 above is expected to lead to a greater use of renewable generation technologies. Where renewable generation technologies are used to produce electricity, designers are encouraged to engage at an early stage with Northern Ireland Electricity Networks (NIE) to confirm the type of connection that can be provided. *(See Paragraphs 2.34 to 2.39 of Technical Booklet F1).*

The following is items that designers/applicants need to consider when making a building control application:-

- ✓ Confirmation of type of connection i.e. export or non-export. Applicants should make an application to NIE at early stage and as part of this they will get a copy of a formal connection offer which will provided details of both import (MIC) and export (MEC) values where applicable if this is available at plan submission stage a copy of this should be provided to Building Control.

- ✓ If the design is for an export connection and the confirmation is not available at stage when application is submitted it will then need to be provided at completion stage or completion certificate may not be issued.

- ✓ If the design is for a non-export connection then the designer needs to provide evidence of compliance with a non-export connection at plans application stage. This evidence will be in the form of a report as outlined in Paragraphs 2.37 and 2.38 of Technical Booklet F2 and should include the following information:-

    - appropriate system sizing;
    - energy storage technologies such as a diverter to hot water or battery storage have been considered;
    - potential future loads (e.g. electric vehicle charging) that could increase the extent to which the energy generated would be used;
    - any particular occupancy pattern variation from the NCM Activity Database assumptions;
    - any other information that details any limitation or potential performance gap; and
    - confirmation that the extent of the gap has been notified to the building owner.

- ✓ Applicants/designers need to be aware that at completion stage confirmation will be required that an export connection has been provided as per the approved submission, if at this stage it is not then a report demonstrating compliance with a non-export connection will be required.

- ✓ If a non-export connection was part of the initial design a similar report will be required on completion to take into account any adjustments in the as built construction.

Buildings Other Than Dwelling Checks Summary

The checklist on the next page may be submitted with each application to capture the relevant information in each of the checks outlined above.

Part F. NZEB Manual Checks for Non- Domestic Applications (From 30th June 2022)

Building Regulation Applicant	
Proposed Site Address	
Agent Details	

(1) SBEM (TER/BER) 15% Betterment.

Design TER (A)		Design BER (B)		% Lower			
Has a Pro-rata reduction for use of heat pump being applied	Yes		Calculation Provided	Yes		Revised Percentage reduction to BER	%
	No			No			

(2) Limiting U-values (W/m2.K)

Element	Area-weighted average U-value (Max allowed)	As-designed	Maximum U-value at any point	As-designed	As-built
Wall	0.21		0.60		
Floor	0.21		0.60		
Roof- pitched	0.16		0.30		
Roof - flat	0.20		0.30		
Party Wall	0.20		0.60		
Windows, roof windows, rooflights	1.60		3.00		
Curtain walling	1.80		3.00		
Pedestrian doors	1.60		3.00		
Vehicle access and similar large doors	1.50		4.00		
High-Usage entrance doors	3.50		6.00		
Roof Ventilators	3.50		6.00		
Swimming pool	0.25				

Note:		
Proposed Alternative Approach Used (whole building calculated trade-off approach) *If Yes supporting calculation to be submitted	Yes	No

(3) Air Permeability m3/(h.m^2)

As Designed Proposed		As Built Tested	

(4) Electricity generated by renewable technologies

Has a renewable technology been proposed that generates electricity?	Design Stage	
	Yes	No
Where electricity is generated, is an export connection proposed?	Design Stage	
	Yes	No
*If an non-export connection has suitable report been provided	Yes	No

Conclusion

The intention of this Information Paper is to raise awareness of the manual checks that will be required when making applications for new buildings that are received on or after the 30th of June 2022.

This is only a quick overview of the key changes and it is the designers/applicants responsibility to demonstrate compliance with all part of the Building Regulations.

'This Information Paper has been produced as an interpretation of the information available at a point in time. It is the Applicant/Designers responsibility to ensure that they are in compliance with the Building Regulations. This document is subject to revision in the event of changes to the legislation or other mitigating circumstances'.