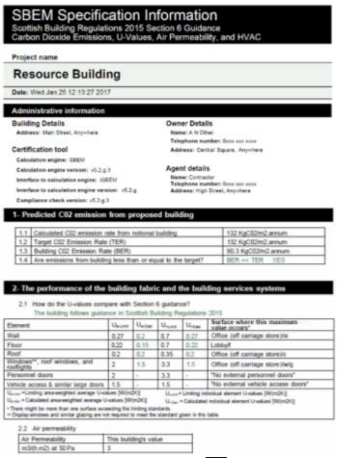
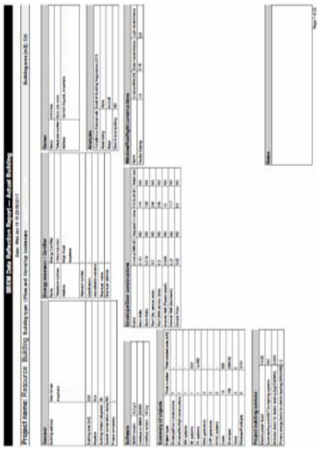
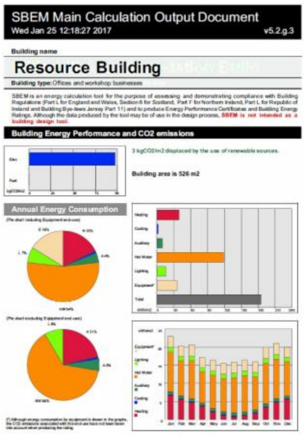
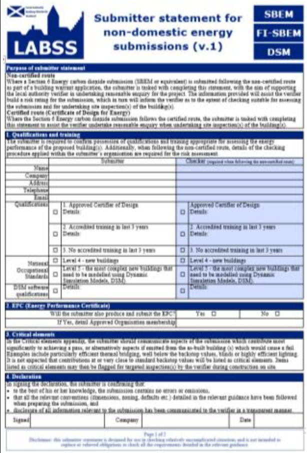
Data verification Checklist for non-domestic energy submissions (v.1)

iSBEM | **FI-SBEM** | **DSM**

The purpose of this checklist is to help support Building Standards surveyors undertake reasonable inquiry for non-domestic energy submissions. Guidance on how to use this checklist is presented in the Guidance Notes on page 8.

Part A: Submission paperwork

Specification Information *(includes Technical Data Sheet)*	**Data Reflection Report** [1] *(zoning data)*	**Calculation Output Document** *(breakdown of energy use)*	**Submitter statement** *(training and critical elements)*
			
Received ☐	Received ☐	Received ☐	Received ☐

[1] Dynamic Simulation Modelling (DSM) software does not automatically produce a Data Reflection Report, which details each zone within the building. However, the submitter will be able to provide an equivalent output from their DSM software (Part D.1 details the information required for each zone).

Part B: Risk assessment

1) Building and services complexity risk

a) Building complexity	Start = **1**	If 20 or more zones, **add 1** ☐	If more than 5 different zone activities, **add 1** ☐	If more than 1 storey, **add 1** ☐	1) a) total = ____	Add 1a) and 1b): Total = ____
b) Services complexity	The checking surveyor should follow guidance in Appendix A on page 9 to evaluate the services complexity risk for the submission and copy the complexity value of 1, 2 or 3 here:				1) b) value = ____	

2) Submitter and their checking risk (from Submitter statement)

a) Submission undertaken by	**1 = Low** (Approved Certifier of Design) ☐	**2 = Medium** (accredited EPC training) ☐	**3 = High** (no accredited training) ☐	Add 2a), b) and c) values: Total = ____
b) Check by (typically within submitter's organisation)	**1 = Low** (if Low in cell above, this cell will match) ☐	**2 = Medium** (accredited EPC training) ☐	**3 = High** (none or no accredited training) ☐	
c) Submitter's previous track record with verifier	**1 = Low** (submitted >3 compliant energy submissions in last year) ☐	**2 = Medium** (submitted >1 compliant energy submissions in last year) ☐	**3 = High** (not submitted a compliant energy submission in last year) ☐	

3) Submission risk category

Total building and services risk (Total from Section 1) above) * = highest risk

Total submitter and their checking risk (Total from Section 2) above)		2	3	4	5	6	7*
	3	☐	☐	☐	☐	☐	☐
	4	☐	☐	☐	☐	☐	☐
	5	☐	☐	☐	☐	☐	☐
	6	☐	☐	☐	☐	☐	☐
	7	☐	☐	☐	☐	☐	☐
	8	☐	☐	☐	☐	☐	☐
	9*	☐	☐	☐	☐	☐	☐

4) Recommended submission checks

Overall risk (from Section 3) above)	**Part C - Specification Information check** (input data check)												**Part D - Data Reflection Report** (zoning and bridging check)		**Part E - Technical Data Sheet** (Actual versus Notional)			
Green = Low ☐	C1	C2	C3	-	C5	-	-	-	-	-	-	-	D1	D2 - Minimum 1 zone	E1	-	-	E4
Amber = Medium ☐	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	-	D1	D2 - 10%, minimum 2	E1	-	E3	E4
Red = High ☐	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	D1	D2 - 20%, minimum 4	E1	E2	E3	E4

Disclaimer: this simplified LABSS checklist procedure is designed for use in checking relatively uncomplicated non domestic energy submissions and is not intended to replace or relieve obligations to check all the requirements detailed in the relevant guidance.

Part C: Specification Information (not all of the following sections will be in the document, as will depend on building and building services specified)

	Checked	Accept

SBEM (or Apache) Specification Information

SBEM Specification Information
Scottish Building Regulations 2015 Section 6 Guidance
Carbon Dioxide Emissions, U-Values, Air Permeability, and HVAC

Project name
Resource Building
Date: Wed Jan 25 12:13:27 2017

	Checked	Accept
Does title list ‘Scottish Building Regulations 2015 Section 6 Guidance’? The title varies depending on software used: 1) ‘SBEM Specification Information’ is the title for SBEM. 2) ‘Apache Specification Information’ is the title for FI-SBEM (Front-end Interface for SBEM) or DSM (Dynamic Simulation Modelling). 3) As of May 2018, ‘2017 Section 6’ guidance has not been implemented in the compliance module.	☐	C1 ☐
Does Project name refer to the correct project?	☐	
Does report date correspond to date of latest design proposals?	☐	

Administrative information

Administrative information

Building Details
Address: Main Street, Anywhere

Certification tool
Calculation engine: SBEM
Calculation engine version: v5.2.g.3
Interface to calculation engine: iSBEM
Interface to calculation engine version: v5.2.g
Compliance check version: v5.2.g.3

Owner Details
Name: A N Other
Telephone number: 0xxx xxx xxxx
Address: Central Square, Anywhere

Agent details
Name: Contractor
Telephone number: 0xxx xxx xxxx
Address: High Street, Anywhere

	Checked	Accept
Are the building details correct?	☐	C2 ☐
Is software (Calculation engine, Interface to calculation engine, Interface to calculation engine version, and Compliance check version) on list for Approved software tools for energy assessments in Scotland? See: http://www.gov.scot/Resource/0052/00526494.pdf 1) The Calculation engine will list SBEM if SBEM has been used and Apache if FI-SBEM or DSM has been used. 2) As of May 2018, the current edition of SBEM is v5.4a and the latest version of a software tool (i.e. software and associated databases) should generally be used in support of new building warrant applications. 3) Other than following a change in regulations, the previous version of a software tool may be used for a limited time following the introduction of a new version. **For further information, check the latest guidance (see link above).**	☐	

1 - Predicted CO2 emission from proposed building [Criterion 1 (mandatory): BER must not be greater than TER]

1- Predicted C02 emission from proposed building

1.1	Calculated C02 emission rate from notional building	132 KgC02/m2.annum
1.2	Target C02 Emission Rate (TER)	132 KgC02/m2.annum
1.3	Building C02 Emission Rate (BER)	90.3 KgC02/m2.annum
1.4	Are emissions from building less than or equal to the target?	BER =< TER YES

	Checked	Accept
1. Is the BER (Building Emissions Rate, for the proposed building) not more than the TER (Target Emissions Rate, for the notional building)? 1) If the BER is not more than the TER, the result in row 1.4 will show in green text. 2) If the BER is more than the TER, the result in row 1.4 will show in red text. 3) The TER is the CO_2 emission rate of the 2015 Notional building. Due to changes in guidance, the Improvement factor is no longer explicitly used.	☐	C3 ☐

2 - The performance of the building fabric and the building services systems [Criterion 2 (guidance): achieve reasonable standards]

2- The performance of the building fabric and the building services systems

2.1 How do the U-values compare with Section 6 guidance?
The building follows guidance in Scottish Building Regulations 2015

Element	$U_{a-Limit}$	U_{a-Calc}	$U_{i-Limit}$	U_{i-Calc}	Surface where this maximum value occurs*
Wall	0.27	0.2	0.7	0.27	Office (off carriage store)/si
Floor	0.22	0.15	0.7	0.22	Lobby/f
Roof	0.2	0.2	0.35	0.2	Office (off carriage store)/c
Windows**, roof windows, and rooflights	2	1.5	3.3	1.5	Office (off carriage store)/w/g
Personnel doors	2	-	3.3	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	1.5	-	"No external vehicle access doors"

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m2K)]
$U_{i-Limit}$ = Limiting individual element U-values [W/(m2K)]
U_{i-Calc} = Calculated individual element U-values [W/(m2K)]
* There might be more than one surface exceeding the limiting standards.
** Display windows and similar glazing are not required to meet the standard given in this table

2.2 Air permeability

Air Permeability	This building's value
m3/(h.m2) at 50 Pa	3

	Checked	Accept
2.1 Do the U-values in the design specification, the submitted U-value calculations and this summary table all correspond?	☐	
Do the U-values comply with backstop values for:		C4 ☐
a) Walls	☐	
b) Floors	☐	
c) Roofs	☐	
d) Windows, roof windows and rooflights	☐	
e) Personnel doors	☐	
f) Vehicle access and similar large doors	☐	
1) If all the U-values comply, ‘The building follows guidance in Scottish Building Regulations 2015’ will show in green text above this table. 2) If any U-values fail to meet backstops, the U-values in question will show in red text. 3) Example of Area weighted calculation: Roof 1 U-value = 0.18W/m^{2}K, Roof 1 area = 10m^2, Roof 2 U-value = 0.22W/m^{2}K, Roof 2 area = 2.5m^2, Area weighted U-value = [(0.18x10)+(0.22x2.5)]/(10+2.5) = [1.8+0.55]/12.5 = 0.19W/m^{2}K		
2.2 Does the air permeability correspond to the specification for the Design proposal or the As-built measured air permeability? **Note that the air permeability has a large impact on the BER.**	☐	C5 ☐

2.3 **Building services**
The standard values listed below are minimum values for efficiencies and maximum values for SFPs.
Refer to the Non-Domestic Building Services Compliance Guide 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	>0.95

	Checked	Accept
2.3 Building services (HVAC: Heating, Ventilation, Air Conditioning): Is the Power Factor correct for the actual building? 1) Power Factor is the measure of the efficiency of the power being used. A power factor of 1 would mean 100% of the supply is being used efficiently whilst a power factor of 0.5 means the use of the power is very inefficient. 2) If central power factor correction equipment or Automatic monitoring and targeting (AMT) systems are installed, the electrical energy consumption component of the BER is reduced by 1%, 2.5% or 5% (see Table 6.2 BER Adjustment Factors in the Non-Domestic Technical Handbook). 3) The electric power factor should not be left at the default value of <0.9 unless a power factor correction device and/or AMT system is specified. **Checking the Power Factor is important when the BER is close to the TER.**	☐	C6 ☐

Part C: Specification Information (continued)

Checked	Accept

2 - The performance of the building fabric and the building services systems (continued)

2.3 Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs.
Refer to the Non-Domestic Building Services Compliance Guide 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	>0.95

1- Altherma Hydrobox

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.88	-	-	-	-
Standard value	2.5*	N/A	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 all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- AHU Store

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	1.6	0.81
Standard value	N/A	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

2.3 Building services (continued)

What type(s) of heating and cooling systems are specified in the actual building? (see Appendix A)

- a) Unheated ☐
- b) Heated only, with natural ventilation ☐
- c) Heated and mechanically ventilated ☐
- d) Heated and cooled (air-conditioned) ☐
- e) Mixed-mode cooling ☐
- f) Ventilation with enhanced thermal coupling to the structure ☐

1) A space is only considered as having air-conditioning if the system serving that space includes refrigeration.
2) Night cooling using mechanical ventilation is not air-conditioning.
3) Mixed-mode cooling, where cooling operates only in peak season to prevent space temperatures exceeding a threshold temperature higher than that normally provided by an air-conditioning system.
4) Ventilation with enhanced thermal coupling to structure is where significant components of the building structure (e.g. ducts in the solid floors of the building) are exposed to night ventilation in order to enhance the building's capability of offsetting daytime cooling demands.

Are all the heating and cooling systems detailed in the actual building correctly listed here? ☐

1) Common abbreviations include AHU (Air Handling Unit).

Do the heating and cooling systems efficiencies listed comply? ☐

1) Efficiencies cover Heating efficiency, Cooling efficiency, Radiant efficiency and HR (heat recovery).
2) The Standard values listed are **minimum** values for efficiencies.
3) If the efficiencies comply (i.e. are **higher than or equal to** the standard value), the value for 'This system' will show in green text. Minimum energy efficiency standards for different systems are detailed in Table 1 of the Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015.

Do the SFP (Specific Fan Power) values listed comply? ☐

1) The Standard values listed are **maximum** values for SFPs (Specific Fan Power, in W per l/s, is a measure of the electric power needed to drive a fan (or collection of fans), relative to the amount of air that is circulated through the fan(s).
2) If the SFP complies (i.e. is **lower than or equal to** the standard value), the value for 'This system' will show in green text. Minimum energy efficiency standards for different systems are detailed in Table 1 (see air distribution systems) of the Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015.
3) The SFP may be above the standard value if the activity (e.g. physiotherapy) requires high efficiency filtration, thereby justifying an increased SFP for that space.
4) For complex systems, the SFP is calculated by the manufacturer at the duty point, which requires the design airflow and system pressure for the application.

C7 ☐

1- Default HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.015
Standard value	N/A	N/A

Is the default HWS (Hot Water System) correctly listed? ☐

1) This HWS category may be replaced by other systems, e.g. 'Electric Heating and DHWS' or 'DHW', depending on what is specified in the building.

Is the Storage loss factor detailed? ☐

1) If the storage losses are not input by the user, they are automatically calculated.

C8 ☐

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
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
DB Store	-	-	-	-	-	-	-	-	-	-	N/A
Plant	-	-	-	-	-	-	-	-	-	-	N/A
Office (off carriage store)	-	-	-	-	-	-	-	-	-	-	N/A
Open Office	-	-	-	-	-	-	-	-	-	-	N/A
Office (off maintenance store)	-	-	-	-	-	-	-	-	-	-	N/A
Briefing Room	-	-	-	-	-	-	-	-	-	-	N/A
Store	-	-	-	-	-	-	-	-	-	-	N/A
Disabled Toilet	-	-	-	0.9	-	-	-	-	-	0.8	0.5
Changing Rooms	-	-	-	0.9	-	-	-	-	-	0.8	0.5

Are all the Local mechanical ventilation, exhaust and terminal units correctly listed here? ☐

Do all the Local mechanical ventilation, exhaust and terminal units comply? ☐

1) If the SFPs comply (i.e. is **lower than or equal to** the standard value), the SFP values in the table will show in green text. Minimum energy efficiency standards for different systems are detailed in Table 1 (see air distribution systems) of the Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015.
2) The SFP may be above the standard value if the activity requires high efficiency filtration, thereby justifying an increased SFP allowance for that space.

C9 ☐

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			
	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
DB Store	101	-	-	52
Plant	101	-	-	100
Office (off carriage store)	100	-	-	131
Open Office	100	-	-	500
Office (off maintenance store)	100	-	-	131
Briefing Room	100	-	-	231
Office/ Meeting	100	-	-	178
Lobby	-	71	-	177
Entrance	-	71	-	40
Chemical Store	101	-	-	58
Carriage Store	101	-	-	52
Equipment Store	101	-	-	58
Maintenance Store	101	-	-	58
Store	101	-	-	26
Disabled Toilet	-	71	-	74
Changing Rooms	-	68	-	709
Mess Room	-	94	-	236
Server	94	-	-	55

Does the lighting in the actual buildings meet the recommended minimum standards for efficacy and controls in Table 42, **OR** the LENI (Lighting Energy Numerical Indicator) in Table 44? See: Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015 ☐

1) Luminous efficacy is a measure of how well a light source produces visible light.
2) If the Luminaire, Lamp or Display lamp efficacy comply (i.e. is **higher than or equal to** the standard value), the values in the table will show in green text. Minimum energy efficiency standards for different systems are detailed in Table 1 (see Internal lighting: Option 1 or 2 of the Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015.

Note that lighting has a large impact on the BER.

Is the lighting metered to record its energy consumption? ☐

1) See Options a, b or c in Table 43 of the Non-domestic Building Standards Compliance Guide for Scotland, Edition 2015.

C10 ☐

Part C: Specification Information (continued)

	Checked	Accept

3 - The solar gains [Criterion 3 (guidance): demonstrate appropriate passive control measures]

3- The solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Office (off carriage store)	NO (-70%)	NO
Open Office	YES (+6.1%)	NO
Office (off maintenance store)	NO (-54%)	NO
Briefing Room	NO (-21.7%)	NO
Office/ Meeting	NO (-40.7%)	NO
Mess Room	YES (+48.6%)	NO
Server	N/A	N/A

Are the solar gain limits **not** exceeded? ☐

1) The solar gain limit is calculated on a zone-by-zone basis in the actual building.
2) If the solar gains comply (i.e. is **lower** than the calculated limit), NO in the table will show in green text.
3) If the solar gains do not comply (i.e. is **higher** than the calculated limit), YES in the table will show in red text.

For information:

a) The Technical Handbook states that every non domestic building must be designed and constructed in such a way that the form and fabric of the building minimises the use of mechanical ventilating or cooling systems for cooling purposes.
b) The building designer should consider limiting solar gains entering spaces. According to CIBSE TM37 (2006), solar overheating can be reduced or avoided by:
   1) Planning the layout of buildings and rooms – to make shading easier, where possible, have main facades of buildings facing north and south.
   2) Limiting window area - solar gain is roughly proportional to the window area.
   3) Solar shading – may include external, internal or mid-pane shading devices, or solar control glazing.
   4) Thermal mass – an exposed heavyweight structure, with a long response time, will tend to absorb heat, resulting in lower peak temperatures on hot days.
c) Unfortunately, overheating due to solar gains is often only first identified when the SBEM is being finalised for a building warrant submission (which may be too late). The checking surveyor should refer to local policies for addressing such situations.
d) Note that overheating due to solar gains can no longer be resolved by simply introduced mechanical cooling to offset poor façade design.
e) Air-conditioned non-domestic buildings with high levels of aesthetic glazing are now very challenging to get to pass an SBEM calculation.
f) DSM allows for a wide range of passive and active solar shading measures, including self-shading and surrounding buildings, to be taken into account. Of note, SBEM cannot be called upon for this level of help.
g) According to IES, the g-value (or solar transmittance) is fraction of incident solar radiation transmitted by a window, expressed as a number between 0 and 1 (where 0 indicates no solar heat gain and 1 indicates the maximum possible solar heat gain). Typically g-values will range between 0.1 for highly reflective glass to 0.8 for clear glass (double glazed). The g-value for optimal solar/light is approximately 0.4-0.5. Generally, a higher g-value will be beneficial in cooler climates and a lower g-value in warmer climates.
h) According to IES, possible solutions where the overheating limits are exceeded by:
   1) **a small amount (up to 30%)** - consider the glazing specification and blinds. Windows with lower g-values will restrict the amount of solar radiation entering the space. Blinds also have the same effect but are not appropriate for all spaces.
   2) **a larger amount (up to 50%)** - consider the glazed area proposed, external shading, the glazing specification and blinds. A reduction in the number of openings or their size may be required.
i) For examples of external solar shading, see Annex 7.A in the Non-Domestic Technical Handbook.

C11 ☐

EPRD (Recast): Consideration of alternative energy systems

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Have high efficiency alternative systems been considered for the proposal? ☐

1) For all new buildings, the technical, environmental and economic feasibility of high efficiency alternative systems (such as decentralised energy supply systems using renewable energy, co-generation, district or block heating/cooling and heat pumps) should be considered and taken into account in developing proposals.
2) A statement should accompany the building warrant application.
3) Further information on this process is available in the guidance note EPC 10 - 'Consideration of high-efficiency alternative systems in new buildings'.

C12 ☐

Part D: Data Reflection Report

1 – Introduction to Data Reflection Report ☐

Zone name: MEETING RM | **Activity:** Generic Office Area | **Multiplier:** 1

Area [m2]: 19.35043 | **Height [m]:** 4.96 | **Air permeability @ 50pa [m3/hm2]:** 3

HVAC system, ventilation, and exhaust

Name	HVAC 5
Destratification fans	NO
Ventilation type	Natural
SFP for local mechanical supply & extract [W/(l/s)]	-
Heat Recovery system	-
Heat recovery seasonal efficiency	-
Variable heat recovery efficiency	-
Local mechanical exhaust	YES
Exhaust air flow rate [l/s.m2]	6
SFP for mechanical exhaust [W/(l/s)]	0.3
Exhaust fans location	Fan within zone
SFP for system terminal units [W/(l/s)]	-
Demand-controlled ventilation	None
Flow regulation type for ventilation control	-
Night cooling maximum hours [hours/month]	-
Night cooling maximum air flow rate [l/s.m2]	-
SFP for night cooling [W/(l/s)]	-

General Lighting and controls

Total wattage [W]	-
Design illuminance [Lux]	-
Lamp and ballast efficacy [Lumens/W]	110
Light output ratio	0.8
Lamp type	-
Air-extracting luminaires	NO
Controls	MANUAL
Type of photoelectric control	-
Different sensor for back of zone	-
Photoelectric control parasitic power [W/m2]	-
Automatic zoning for daylight	YES
Occupancy sensing	AUTO-ON-OFF
Occupancy sensing parasitic power [W/m2]	0.3

Display lighting

Efficient lamps	NO
Lumens per circuit wattage	-
Time switching	NO

Thermal bridges Psi values [W/mK]

Junction type	Metal clad	Not metal clad
Roof-wall	0.42	0.18
Wall-ground floor	1.725	0.24
Wall-wall (corner)	0.375	0.135
Wall-not ground floor	0.04	0.11
Lintel (window/door)	1.905	0.45
Sill (window)	1.905	0.08
Jamb (window/door)	1.905	0.09

Hot water system

Name	Default DHW
Dead leg length in this zone [m]	0

Shell & core

Shell area for fit-out	-

Envelopes

(Multiplier) Name	(1) MEETING RM Wall 1	(1) MEETING RM Wall 6	(1) MEETING RM Exposed RM	(1) MEETING RM Exposed RM	(1) MEETING RM Partition	(1) MEETING RM Partition 2
Type	Wall	Wall	Flat roof	Floor or Ceiling	Wall	Wall
Area [m2]	32.5	14.4	18.8	18.8	14.4	31.6
Orientation	North	East	Horizontal	Horizontal	West	South
Adjacent space	Exterior	Exterior	Exterior	Underground	Conditioned	Conditioned
Construction name	EXPWALL 1	EXPWALL 1	EXPROOF 1	EXPFLOOR 1	PARTITION 1	PARTITION 1

Windows & rooflights

(Multiplier) Name	(1) MEETING RM Window	(2) MEETING RM Door 1
In envelope	MEETING RM Wall 1	MEETING RM Wall 1
Area [m2]	1.3	1.265
Glazing name	WINDOW 1	GLAZED-DOOR 1
Shading position	None (no shading)	External
Shading colour	-	White
Shading translucency	-	High translucent
Transmission factor	1	1
Frame / Aspect ratios	0.1 / 0.6349	0.1 / -5555

Doors

(Multiplier) Name	(1) MEETING RM Door 1 (High
In envelope	MEETING RM Wall 1
Area [m2]	1.035
Type	High usage entrance
Construction name	GLAZED-DOOR 1

Notes

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	Checked	Accept
1 – Introduction to Data Reflection Report (continued)		

The Data Reflection Report is used to check zoning data and thermal bridging (linear thermal transmittance, ψ, psi values), which are not detailed in the Specification Information document. The initial page(s) give an overall data summary (including PV and solar) and each following page details a zone within the building - data typically includes:

- zone name
- standard activity
- dimensions
- airtightness
- HVAC system
- lighting
- thermal bridging
- hot water provision
- constructional elements making up the zone envelope, including windows and doors.

1) Depending on the design of a zone, all or only some of the details listed above will be provided.
2) DSM software does not automatically produce a Data Reflection Report (see guidance in Part A).

2 - Checking thermal bridging, ψ (psi) values

Select a random zone from the Data Reflection Report = __________. Are the relevant (non-repeating) thermal bridging ψ (psi) values listed (see example circled in red on page 4) and correspond to the specification for the actual building? ☐

1) There are 3 methods to account for the ψ (psi) values:
   a) entering the relevant ψ (psi) values taken from a recognised source, such as published construction detail sets (e.g. see relevant part of Accredited Construction Details (Scotland) 2015) or have been calculated by a person with suitable expertise and experience following BR497.
   b) use defaults ψ (psi) values in Table 10 in National Calculation Methodology (NCM) Modelling Guide for Non-Domestic Buildings in Scotland
   c) by adding 10% to the standard area-weighted average U-values for each element (including windows, etc.).
2) A combination of methods 1) a) (sources/calculations) and b) (defaults) is also acceptable.

Note that the ψ (psi) values have a large impact on the BER.

D1 ☐

3 - Zoning check (note the term "zone" is used as a short hand for "activity area" in this Checklist)

Do all the zones within the building appear to be detailed in the Data Reflection Report? ☐

Note that each room does not necessarily count as one zone (or get detailed on a separate page in the Data Reflection Report).

Total number of zones = _____ Number of zones to be checked (see Part B, Section 4, of Risk assessment) = _____

1) Where the overall risk rating is Green - Low, the minimum of 1 zone to be checked should be the most complex (most highly serviced) in the building.
2) Where the overall risk rating is Amber - Medium or Red - High, the minimum number of zones to be checked should equally cover a selection from the most simple to the most complex zones.

Feature(s) to be checked	ID of checked Zone 1	2	3	4	5	6	7	8	9	10	Checked
1) Is the zone identifiable on the building floorplan(s)?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2) Is the zone dimensioned correctly (area and height)?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3) Has the zone been assigned the correct activity? See Appendix A in How to use iSBEM (1) Basics - UK, 20 November 2017	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4) Has the zone been assigned the correct HVAC?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5) Does the zone lighting system (general and/or display) match the specification?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6) Is the hot water system serving the zone correct? Note HWS is assigned to each zone.	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7) Are envelope elements assigned to the zone correctly?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8) Are windows and roof lights assigned to the zone correctly (see note [1])?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9) Are doors assigned to the zone correctly?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10) Does the zone appear to conform to the zoning rules guidance (see note [2])?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

D2 ☐

[1] Glazing specification and solar heat gain: Shade (Position - none, internal, mid or external; Colour - white, pastel, dark or black; Translucency (permitting light to pass through): opaque, medium or high); Transmission factor (reflects the loss of transmission due to shading e.g. from overhangs above a window, 1= no shading); and Frame factor (if e.g. 0.1, 10% of the total area is frame, 90% is glazing)/Aspect ratio (ratio of the height a glass pane in relation to its width, 1=square) are all important for calculating solar gains.

[2] Zoning rules: (as detailed in 3.3, How to use iSBEM (1) Basics - UK, 20 November 2017). The way a building is subdivided into zones will influence the predictions of energy performance and the NCM Guide defines zoning rules that must be applied. The end result of the zoning process should be a set of zones where each is distinguished from all others in contact with it by differences in one or more of the following:

- The activity attached to it
- The lighting system within it
- The HVAC system which serves it
- The access to daylight (through windows or rooflights)

For SBEM, a summary of the suggested zoning process within a given floor plate is:

1. **Divide** the floor into separate physical areas, bounded by physical boundaries, such as structural walls or other permanent elements.
2. If any part of an area is served by a different HVAC or lighting system, **create** a separate area bounded by the extent of those services.
3. If any part of an area has a different activity taking place in it, **create** a separate area for each activity.
4. **Attribute** just one "activity" to each resulting area.
5. **Divide** each resulting area into "zones", each receiving significantly different amounts of daylight, defined by boundaries which are:
   - At a distance of 6m from an external wall containing at least 20% glazing.
   - At a distance of 1.5 room heights beyond the edge of an array of rooflights if the area of the rooflights is at least 10% of the floor area.
   - If any resulting zone is less than 3m wide, absorb it within surrounding zones.
   - If any resulting zones overlap, use your discretion to allocate the overlap to one or more of the zones.
   - Currently iSBEM is not able to realistically model sunspaces or atria (as it cannot represent light transfer between highly glazed/reflective internal spaces). For buildings where these elements are a significant part of the design, approved DSM software should be used.
6. **Merge** any contiguous (i.e. neighbouring) areas which are served by the same HVAC and lighting systems, have the same activity within them (e.g., adjacent identical hotel rooms, cellular offices, etc.), and which have similar access to daylight, unless there is a good reason not to.
   - Small unconditioned spaces like store cupboards, riser ducts, etc., can be absorbed into the adjacent conditioned spaces. In iSBEM, this would involve adding their floor area to that of the adjacent conditioned space. Larger areas should be treated as indirectly conditioned spaces.
   - Indirectly conditioned/heated spaces - For spaces such as corridors or access areas, which are not serviced by an HVAC system (i.e., have no direct supply of heating or cooling) but are likely to be indirectly conditioned by the surrounding areas due to the high level of interaction with those spaces (allowing the heated air to move freely from the directly conditioned spaces to the indirectly conditioned ones), they should be considered heated or conditioned (indirectly) by the same HVAC system that supplies the most important surrounding area.

Part D: Data Reflection Report (continued)

Checked	Accept

3 – Zoning check (continued)

7. Each zone should then have its envelopes described by the area and properties of each physical boundary. Where a zone boundary is virtual, e.g., between a daylit perimeter and a core zone, no envelope element should be defined. SBEM will then assume no transfer of heat, coolth, or light across the boundary, in either direction.
8. SBEM calculations are also heavily influenced by the thermal capacity of all the internal and external construction elements. Thermal capacity can be expressed using two aspects, effective thermal capacity, Ƙm (kappa m) and Thermal mass parameter, TMP:
   a) Ƙm (kappa m) is the effective thermal capacity of an element (wall, floor, ceiling, etc.), given in kJ/m2K. The Ƙm value represents that part which affects the heating and cooling energy demands. In brief, the rules for calculating Ƙm are: for each construction element, calculate the contribution of each layer in the construction: density (kg/m3) x thickness (m) x specific heat capacity (kJ/kgK). Starting from the layer of the construction closest to the space (i.e. from the interior), add these values together until any one of the following conditions is satisfied: the sum of the layers thicknesses has reached 0.1 m, you have reached the mid-point of the construction, or you have reached an insulating layer (defined for SBEM purposes, as having a conductivity of 0.08 W/mK or less). Ƙm values for common constructions are detailed in Table 1e of SAP 2012 - the higher the Ƙm value, the more heat the construction is able to store.
   b) Thermal mass parameter, TMP is the sum of (area x Ƙm) over all construction elements, divided by total floor area. It can be obtained from the actual construction elements of walls, floors and roofs (including separating and internal walls, floors and ceilings).
   c) Guidance on thermal mass in SBEM: timber frame is usually low; medium if there are dense blocks in external or partition walls; high if at least two of external wall, internal partition wall, party wall have dense blocks; internal insulation makes thermal mass low irrespective of the construction; only the innermost 100 mm of the construction influences the thermal mass.
   - If the internal envelopes between merged zones have been designed of **heavy construction** to have thermal mass, they should be defined in iSBEM. The areas of two or more heavy construction internal walls (between merged zones) with the same construction and orientation can be added and entered as one envelope (assigned to the zone resulting from the merging) with the adjacency of "Same space".
   - If, on the other hand, the internal walls are partitions of **light construction** and very small thermal mass, then they should not cause any significant effects on the calculation if they were omitted from the iSBEM model. If in doubt about the thermal mass of the internal partitions, it is better to err on the side of caution and include them in the model as described above.
9. For building regulations calculations purposes, it is recommended that SBEM users generally avoid creating more than 100-150 zones in iSBEM

Part E: Technical Data Sheet (forms the final part of the Specification Information document)

Technical Data Sheet (Actual vs. Notional Building)

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	526	526
External area [m²]	1998.9	1998.9
Weather	GLA	GLA
Infiltration [m³/hm²@ 50Pa]	3	4
Average conductance [W/K]	425.93	485.06
Average U-value [W/m²K]	0.21	0.24
Alpha value* [%]	15.76	10.49

* 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
99	**Offices and Workshop businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Inst.: Hospitals and Care Homes
	Residential Inst.: Residential schools
	Residential Inst.: Universities and colleges
	Secure Residential Inst.
	Residential spaces
	Non-residential Inst.: Community/Day Centre
	Non-residential Inst.: Libraries, Museums, and Galleries
	Non-residential Inst.: Education
	Non-residential Inst.: Primary Health Care Building
	Non-residential Inst.: Crown and County Courts
	General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
1	**Others: Miscellaneous 24hr activities**
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Is the area (which is the internal building area) correct? ☐

Is the Weather selected as GLA? ☐
1) When 'Scottish building regulations' is selected in SBEM, a standard weather set for Glasgow (GLA) is adopted. Apache can use GLA or Edinburgh (EDI).

Is the % actual alpha value lower than the % notional alpha value? ☐
1) The alpha value is a measure of the overall thermal performance of the entire building envelope, taking into account the positive effect of the U-values of all plane elements (roof, rooflights, walls, etc.) and the negative 'heat draining' thermal bridging effect of junctions, details and interfaces, which act as direct heat conductors from the inside to the outside of the building.
2) The "Alpha value" detailed here is the % of the alpha value due to thermal bridging.
3) Specifying thermal bridging ψ (psi) values no better than (i.e. not less than) the default thermal bridging values will increase the actual alpha value.
4) Similar values are acceptable but it may be questionable for the % actual alpha value to be considerably more than the % notional value. As helpful indicator, if the actual % alpha value is 120% or more of the notional % alpha value, the checker should revisit the psi values (see D2) to check for any anomalies (e.g. input errors in lengths of thermal bridges, psi values etc.) and if inconsistent, query with submitter.

Is the building use correct in '% Area Building Type' list? ☐
1) If the building use is questionable, refer to Appendix A Matrix of activity areas and building types in How to use iSBEM (1) Basics - UK, 20 November 2017
2) The activity chosen may not exactly match the occupancy, loads etc in the real building, but should be reasonable for a space of that usage type.
3) It is acceptable to choose more than one building type in a project.
4) Only the communal areas of apartment buildings containing self-contained flats should be assessed for compliance using SBEM, for example circulation areas (using the "Common circulation areas" activity under the building type "Residential spaces"). The self-contained flats should be assessed using SAP.

E1 ☐

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	39.5	47.73
Cooling	2.11	1.5
Auxiliary	9.79	3.25
Lighting	15.41	11.14
Hot water	118.09	202.87
Equipment*	35.66	35.66
TOTAL**	**184.9**	**266.49**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Does the distribution of energy consumption across the categories heating, cooling, auxiliary, lighting and hot water appear to be correct for the Actual building? ☐
1) "Auxiliary" is the energy used by fans, pumps, and controls of a system, irrespective of whether this supports heating, cooling, or ventilation.
2) Energy used by "Equipment" (e.g. production plant in a factory) does not count towards the total energy consumption for calculating emissions.
3) The total energy consumption is the sum of the heating, cooling, auxiliary, lighting and hot water categories.

E2 ☐

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	6.38	5.4
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	21.16	0

Rule of thumb PV calculation factors for orientation and overshading

Orientation of PV panel(s)	**Overshading** (% sky blocked by obstacles)			
	Heavy (>80%)	Significant (>60% - 80%)	Modest (20% - 60%)	None or very little (<20%)
1) South or SE/SW	400	519	639	799
2) E/W	350	455	561	701
3) NE/NW or North	293	381	469	586

Factors apply to horizontal, 30°, 45° and 60° tilt but **do not apply to vertical tilt** (base source: SAP 2009)

Does the photovoltaic (PV) production match the proposed design? ☐
1) The total energy produced by the Actual PV systems = Actual PV (circled in blue) x total floor area (circled in orange) = ______ x _____ = _______ (kWh per year)
2) PV orientation = _______, PV inclination/tilt = _______, Overshading = _______
3) Identify relevant calculation factor in Rule of thumb table (see left) = _________
4) Divide answer from part 1) with the calculation factor from part 3) = __________
5) Does the answer in part 4) approximately equal the PV Peak power?
6) If your calculated value does not match the PV Peak power, check for different PV panel orientations. If reason remains unclear, query with submitter.

PV details can be found in the front page(s) of the Data Reflection Report.

Does the wind turbine production match the proposed design? ☐
The total energy produced by the Actual Wind Turbines = Actual Wind Turbines x total floor area = ______ x ______ = _______ (in kWh per year). Typical blade diameter yearly production: 3m: 4,000kWh, 5m: 9,000kWh, 10m: 30,000kWh.

Does the CHP appear to match the proposed design? ☐
Combined Heat and Power (CHP) uses waste heat produced by generating electricity.

Does the Solar thermal appear to match the proposed design? ☐

E3 ☐

Disclaimer: this simplified LABSS checklist procedure is designed for use in checking relatively uncomplicated non domestic energy submissions and is not intended to replace or relieve obligations to check all the requirements detailed in the relevant guidance.

Part E: Technical Data Sheet (continued)

	Checked	Accept

Technical Data Sheet (Actual vs. Notional Building) (continued)

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	246.4	272.01
Primary energy* [kWh/m²]	553.44	797.66
Total emissions [kg/m²]	90.3	132

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Note:
Primary energy accounts for the total energy used to produce a particular energy.
Primary energy is solely detailed on the EPC and is not used for CO_2 emissions

What is the CO_2 Emission Factor for the main fuel? = ___________ ☐
See Table 19 in National Calculation Methodology (NCM) Modelling Guide for Non-Domestic Buildings in Scotland

Does the Total emissions value appear correct? ☐

1) Total emissions = total energy consumption x CO_2 Emission Factor
2) The CO_2 Emission Factor for electricity = 0.519
3) In this example, total emissions = 184.9 (circled in purple) x 0.519 = 96.0kg/m², which is different to the quoted value of 90.3kg/m² (circled in green).
4) If your calculated total emissions value does not match the quoted value, check the Submitter statement for likely pointers (e.g. more than one fuel is specified).
5) For deriving the CO_2 Emission Factor for District Heating, see guidance above.

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] No Heating or Cooling										
	Actual	93.7	0	0	0	0	0	0	0	0
	Notional	110.2	0	0	0	0	0	0	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	175.6	57.6	19	0	1.1	2.57	0	2.88	0
	Notional	189.5	91.6	33.4	0	1	1.58	0	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	439.4	0	134.6	0	36.1	0.91	0	1	0
	Notional	400.9	0	123.7	0	6.1	0.9	0	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electr										
	Actual	119.2	8	12.9	0	4.1	2.57	0	2.88	0
	Notional	186	7.1	32.8	0	4	1.58	0	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	65.3	101	7.1	0	3.2	2.57	0	2.88	0
	Notional	51.5	105.7	9.1	0	3.4	1.58	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	0	1457.9	0	158.4	0	0	2.56	0	3.6
	Notional	0	1457.4	0	112.5	0	0	3.6	----	----

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

Do the System Type (ST) entries for heating and cooling (see [ST] row headings) match the systems specified in the building(s)? ☐

For information only:

1) The Seasonal Coefficient of Performance for heating (SCoP) is the ratio of the sum of the heating demands of all spaces served by a heating system to the energy content of the fuels (or electricity) supplied to the boiler or other heat generator of the system. The SCoP includes, amongst other things, the efficiency of the heat generator, thermal losses from pipework and ductwork, and duct leakage. It does not include the energy used by fans and pumps. SCoP is referred to as Seasonal System Efficiency (**SSEff**) in the iSBEM User guide.
   Heating Energy consumption = ∑(Zone Heating Load/SCoP)
2) The Seasonal System Energy Efficiency Ratio for cooling (**SSEER**) is the ratio of the sum of the sensible cooling demands of all spaces served by a cooling system to the energy content of the electricity (or fuel) supplied to the chiller or other cold generator of the system. The SSEER includes, amongst other things, the efficiency of the cold generator, heat gains to pipework and ductwork, duct leakage, and removal of latent energy (whether intentional or not). It does not include energy used by fans and pumps (but does include the proportion of that energy that reappears as heat within the system). The electricity used by heat rejection equipment associated with chillers is accounted for in the SSEER (not as auxiliary energy). The electricity used within room air-conditioners for fan operation is also included in the SSEER value.
   Cooling Energy consumption = ∑(Zone Cooling Load/SSEER)

E4 ☐

Part F: Inspections

Inspections checklist – to be completed by verifier

Details of elements that should be targeted for inspection should be listed here, typically including:

- very high performing constructional elements (floors, walls, roof, windows, doors, thermal bridges etc.),
- highly efficient heating, cooling and/or ventilation systems,
- specific hot water services or features,
- shading and blinds,
- specific lighting and controls, and
- additional energy production technologies.

Additional information on the critical elements that help a non-domestic energy submission to pass may be detailed in the 'Appendix - Critical Elements' of the Submitter statement.

Guidance notes

1. Section 6 Energy submissions

Section 6 of the Technical Handbook promotes a low carbon building standards strategy, which aims to increase energy efficiency and reduce carbon emissions. The National Calculation Method (NCM) is the procedure for demonstrating compliance. At the core of the NCM, the calculation process compares the annual carbon emissions of the proposed building with target emissions which are based on those of a comparable “notional building”.

The calculation can be carried out using a free, regularly updated BRE program called **SBEM** (**S**implified **B**uilding **E**nergy **M**odel) and its basic user interface called **iSBEM**, or by other approved software. The 2 two categories of approved software are Front-end Interface for SBEM (**FI-SBEM**, which interfaces with the SBEM engine) and Dynamic Simulation Modelling tools (**DSM**, which produce a more detailed environmental model). Where accredited to do so, all of these software tools can also be used to produce EPCs. Submitters should be familiar with their chosen software tool, and be able to explain the input and calculation process.

SBEM takes inputs from the software user and various databases, and calculates the annual CO_2 emissions (as kg CO_2 per m^2 per year) resulting from the energy used by the building and its occupants (including heating, hot water, ventilation and lighting). SBEM calculates the energy demands of each space or zone in the building according to the activity within it. Different activities may have different temperatures, operating periods, lighting levels, etc. The calculation summary information (detailed in the Specification Information document) covers 3 criteria: 1) CO_2 emissions, 2) Building fabric and services and 3) Solar gains.

Compliance is demonstrated if the Building Emissions Rate (BER, for the proposed building) is not more than the Target Emissions Rate (TER, for the notional building). SBEM is a compliance procedure and not a design tool.

2. Local authority verifiers

Each local authority verifier should have a local procedure in place for checking and accepting or rejecting Section 6 non-domestic Energy submissions. A ‘reasonable inquiry’ check will typically involve interrogating a proportion of the output of the calculation(s), to verify compliance with the Technical Guidance and standard conventions.

This checklist offers local authority verifiers a structured, step-by-step procedure for checking of Section 6 non-domestic Energy submissions, based on the risk presented by the proposed building(s) and associated services, and the proficiency of the submitter and their associated checking regime. The recommended checks are based on sampling of the most significant elements contributing to the BER/TER calculations.

This checklist does not claim to cover all the complexities of iSBEM, FI-SBEM or DSM calculations submitted as part of Section 6 non-domestic Energy submissions. Where a submission is highly complex, local authority verifiers should consider whether the training and experience of the checking surveyor is sufficient, and/or whether additional expertise (e.g. a Certifier of Design for Energy) is required to ensure an acceptable level of reasonable inquiry can be undertaken.

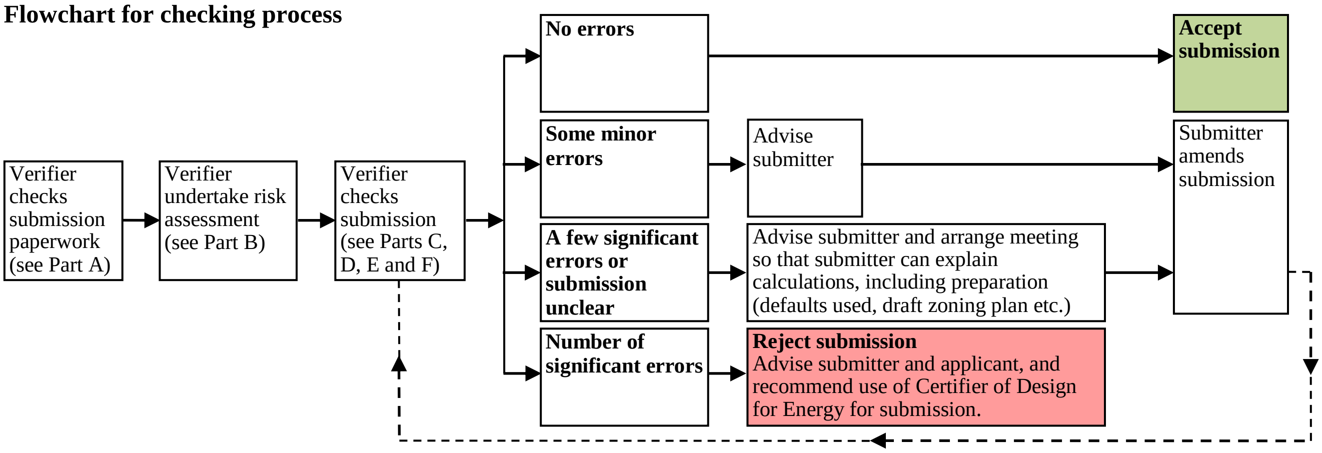
3. Checking surveyor - How to use this checklist

The checklist enables a Building Standards surveyor to collate and ‘walk through’ a Section 6 non-domestic Energy submission in a structured way, checking for errors and omissions against backstop guidance. The process is also geared to identify the elements that are critical to the building(s) passing and therefore could be targeted for inspection on site. To assist the surveyor, an indication of the content and layout of the relevant documents are presented throughout the checklist:

- **Part A - Submission paperwork:** Lists the documentation that should be included in the submission.
- **Part B - Risk assessment:** Uses a risk matrix of the building complexity/services and the submitter/checker to decide if the submission should overall be risked as low (green), medium (amber) or high (red). Once the checker has worked through steps 1) to 4), the checker has a list of items in Parts C, D and E that should be checked. Of note is the greater the overall risk for the submission, the greater the amount of checking that is recommended.
- **Part C - Specification Information:** List technical queries for the submitted Specification Information document. The elements to be checked will follow the risk category detailed in Part B (for example, for Low risk, check C1, C2, C3 and C5).
- **Part D - Data Reflection Report:** List details of the envelopes and services for each zone within the building.
- **Part E - Technical Data Sheet:** List technical queries for the submitted Technical Data Sheet. The elements to be checked will follow the risk category detailed in Part B (for example, for High risk, check E1, E2, E3 and E3).
- **Part F - Inspections:** Allows the checker to list the critical elements for site inspection(s).

Of note, due to the nature of the non-domestic energy calculation and the limited extent of the outputted information, following this step-by-step checking process does not guarantee that all unintentional errors or omissions by the submitter are readily identified. Likewise, if the submitter knowingly includes incorrect information (e.g. does not consistently follow relevant conventions for all dimensions, zoning, defaults etc.), again it is unlikely that the checking process will identify all issues. However, by following the process, a checker will undertake reasonable inquiry in interrogating the submission. Following the process will also assist in targeting critical elements, features and/or controls for inspection during site visits.

Flowchart for checking process



References

The reference below are for the most recent publications at time of preparing this checklist. **Always check for the latest guidance.**	
1) Building Standards Division - National Calculation Methodology (NCM) & Approved software tools for energy assessments in Scotland	http://www.gov.scot/Resource/0052/00526494.pdf
2) Non-domestic Building Services Compliance Guide for Scotland 2015 Edition	http://www.gov.scot/Resource/0046/00460117.pdf
3) Technical Handbook - Non-Domestic	http://www.gov.scot/Resource/0052/00521761.pdf
4) Guidance Leaflet EPC 10 - Consideration of high-efficiency alternative systems in new buildings	http://www.gov.scot/Resource/0042/00427425.pdf
5) Accredited Construction Details (Scotland) 2015 – Parts 1 to 5	http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/techbooks/techhandbooks
6) National Calculation Methodology (NCM) Modelling Guide for Non-Domestic Buildings in Scotland (2015)	http://www.gov.scot/Resource/0048/00486061.pdf
7) How to use iSBEM (1) Basics - UK, 20 November 2017	http://www.uk-ncm.org.uk/download.jsp?id=17
8) Design for improved solar shading control, CIBSE TM37 (2006)	The Chartered Institution of Building Services Engineers, London.
9) Submitter statement for non-domestic energy submissions (v.1)	

Appendix A – Services complexity

For use in Part B on page 1

Services complexity may not only encompass heating and ventilation, but may also include additional services such as water, lighting, controls, alternative energy systems, energy storage, etc. However, for this checklist, the level of servicing applied to a building refers to the broad category of environmental control detailed in the NCM Modelling Guide for Non-Domestic Buildings, summarised in categories a) to f) below. Selecting the appropriate category a) to f) is usually quite straightforward. Selecting the complexity associated with category can be more difficult, as the range of systems falling within a category can have considerably different complexities. Where more than one complexity is listed below (typically Medium or High), the checking surveyor is required to apply his/her judgement in his/her assessment of the services, based on the complexity of the submitted design.
Once the complexity has been evaluated, the complexity value of 1, 2 or 3 is transferred to Part B, 1 b) on page 1 above.

Servicing strategy	Additional details	Complexity			
		1 = Low	2 = Med	3 = High	Value
a) Unheated	-	☐			Value = ____
b) Heated only, with natural ventilation	1) Low complexity heating system.	☐			
	2) High complexity heating system, e.g. bivalent heating (twin system, such as heat pump and boiler combination), complex controls, complex thermal storage arrangements.		☐	☐	
c) Heated and mechanically ventilated	1) Local/decentralised ventilation plant, e.g. local extract ventilation (with/without heat recovery).	☐			
	2) Centralised ventilation plant, e.g. centralised extract ventilation plant serving multiple rooms.	☐	☐		
	3) Either of the above plus high complexity heating system.		☐	☐	
d) Heated and cooled (air-conditioned, see notes 1 and 2)	1) Local/decentralised air-conditioning plant, e.g. split and multi-split systems (see notes 3 and 4).	☐			
	2) Centralised air-conditioning plant.		☐	☐	
	3) Either of the above plus high complexity heating system.		☐	☐	
e) Mixed-mode cooling	1) Cooling operates only in peak season to prevent space temperatures exceeding a threshold temperature higher than that normally provided by an air-conditioning system.			☐	
f) Ventilation with enhanced thermal coupling to the structure	1) Significant components of the building structure (e.g. ducts in the solid floors of the building) are exposed to night ventilation in order to enhance the building's capability of offsetting daytime cooling demands.			☐	

Notes:
1. The cooling of air alone, often described as 'air conditioning', is more correctly referred to as 'comfort cooling'. Air conditioning however involves full control over the humidity within the conditioned space, as well as temperature control.
2. Refrigerant air conditioning systems are highly efficient, easy to control and are best for meeting medium to large buildings' complete heating and cooling requirements. There a 2 systems categories, either VRF (variable refrigerant flow) or VRV (variable refrigerant volume).
3. Single splits are an efficient and affordable type of air conditioning system, typically suitable for use in smaller buildings. Single splits can be used to provide heating and cooling to individual rooms or can be used to serve multiple rooms or larger spaces.
4. Multi-splits work in the same way as single splits but many indoor units can be connected to one outdoor unit. This is beneficial where outdoor space is limited or a building's appearance would be affected by many outdoor single splits. Multi-splits are usually more expensive and complex than single splits, due to the additional pipework required.