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User Guide

iSBEMie

An Interface for SBEMie (Simplified Building Energy Model for Ireland)

For calculating and rating the energy performance of new and existing non-domestic buildings in the Republic of Ireland - Part of the Non-Domestic Energy Assessment Procedure (NEAP)

How to use iSBEMie:

(1) Basics

iSBEMie version 5.5.h

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Version history

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Key changes and additions from previous versions of the User Guide

Changes and additions in version 5.5.h:

NEW

Modified

Further guidance

Changes related to **new** or **modified functionality** in the new version as well as further explanation or clarification of **existing** parameters and functionality in iSBEMie are listed below and denoted in this guide using the "NEW", "Modified" and "Further guidance" icons in the left margin.

- Key differences in the new version of the software compared to the previous version (see Section 2.1: What is iSBEMie, SBEMie, and the NEAP?).
- New guidance on installation instructions, including a new optional 64-bit version of the calculation engine (see Section 4.1: System Requirements and 4.2: Installing iSBEMie on your computer).

This manual and the adaptation of the software tools described in it, for the Republic of Ireland Building Regulations, were developed by the BRE for Sustainable Energy Authority Ireland (SEAI). This manual is a version specifically adapted for the Republic of Ireland from the original UK User Guide which, together with the software tools described in it, was developed by the BRE for the Ministry of Housing, Communities, and Local Government (MHCLG).

Disclaimer

The iSBEMie User Guide cannot provide legal advice or a definitive interpretation of the law. The guidance provided in this document is limited to the technical operation of the software tool. It is offered in good faith but is not binding on any person(s) or organization. The same applies to the default values in the interface, which should be viewed as conservative suggestions intended to be replaced by actual values.

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Acronyms used in iSBEMie and this guide

AHU	Air Handling Unit
BER	Building Energy Rating
BRIRL	Building Regulations Ireland Part L (The Building Regulations compliance checking module)
CCHP	Combined Cooling, Heat, and Power
CEN	Comité Européen de Normalisation (The European Committee for Standardisation)
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CPC	Carbon Performance Coefficient
ECA	Enhanced Capital Allowance
EER	Energy Efficiency Ratio
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Coefficient
BERgen	Building Energy Rating Generator (The BER generator module)
ETL	Energy Technology List
HEPA	High Efficiency Particulate Air
HTHW	High Temperature Hot Water (boiler)
HVAC	Heating Ventilation and Air Conditioning
HWS	Hot Water System
iSBEMie	Interface for SBEMie
LTHW	Low Temperature Hot Water (boiler)
LZC	Low or Zero Carbon
MPCPC	Maximum Permitted Carbon Performance Coefficient
MPEPC	Maximum Permitted Energy Performance Coefficient
MTHW	Medium Temperature Hot Water (boiler)
NEAP	Non-domestic Energy Assessment Procedure
PVS	Photovoltaic System
RER	Renewable Energy Ratio
SBEMie	Simplified Building Energy Model for Ireland
SSEER	Seasonal System Energy Efficiency Ratio
SSEff	Seasonal System Efficiency
SES	Solar Energy System
SFP	Specific Fan Power
VAV	Variable Air Volume
VRF	Variable Refrigeration Flow

1. WHAT IS IN THIS GUIDE

1.1. Scope of the guide

The objective of this document is to give an introduction to the use of iSBEMie, an interface for SBEMie (Simplified Building Energy Model for Ireland) - an approach for the Non-Domestic Energy Assessment Procedure (NEAP) for assessing the energy performance of buildings.

This guide includes:

- An explanation of the role of iSBEMie in the NEAP with a brief overview of the methodology.
- How to set up iSBEMie to operate on your computer.
- Guidance on how to assemble the required information for your own building.
- How to convert files created with previous versions of iSBEMie to be compatible with the current version (5.5.h).

This guide **does not** include:

- A detailed description of the structure of the NEAP.
- A full definition of the Reference building which is used to assess compliance with Building Regulations, or that of the Notional building which is used to generate the BER. This can be found in the NEAP Modelling Guide which is available from SEAI's website at www.seai.ie.
- A description of the contents of the NEAP Construction, Glazing, or Activity Databases.
- A detailed description of SBEMie, the calculation engine to which iSBEMie is an interface. This is described in the SBEMie Technical Manual, available for download from SEAI's website at www.seai.ie.

This manual is one volume in a set of documentations for the iSBEMie User Guide. The other volumes in this set are as follows:

- **How to use iSBEMie: (2) Compliance Assessment** - Contains step-by-step guidance on the use of iSBEMie for the purpose of assessing compliance with the building regulations for non-domestic buildings in the Republic of Ireland.
- **How to use iSBEMie: (3) BER Generation** - Contains step-by-step guidance on the use of iSBEMie for the purpose of generating Building Energy Rating certificates for non-domestic buildings in the Republic of Ireland.

2. INTRODUCTION TO iSBEMie, SBEMie, AND THE NEAP

2.1. What is iSBEMie, SBEMie, and the NEAP?

The Non-Domestic Energy Assessment Procedure (NEAP) is the methodology for demonstrating compliance with specific aspects of the Technical Guidance Document - Part L (TGD-L) of the Building Regulations in the Republic of Ireland. NEAP is also used to generate the Building Energy Rating (BER) certificate and Advisory report for new and existing non-domestic buildings.

Having established the generalised content of the NEAP, SEAI sought software implementations of it. In particular, they required software which would handle the majority of buildings and could be made available free to users. They commissioned BRE to adapt for the Republic of Ireland the national calculation tool which BRE had developed for the UK's Ministry of Housing, Communities, and Local Government (MHCLG) to fulfil a similar role for non-domestic buildings in the UK.

This tool has been developed into iSBEMie (Simplified Building Energy Model for Ireland and its default interface) by BRE as the default calculation for non-domestic buildings in the Republic of Ireland, to enable building regulations compliance checks and energy ratings to be carried out on a consistent basis.

This manual and the accompanying volumes in the set describe how to use iSBEMie to check for compliance of non-domestic buildings with the 2017 TGD-L of the Building Regulations and to generate a Building Energy Rating certificate for non-domestic buildings in the Republic of Ireland.

The approach to the NEAP embodied in this tool comprises a calculation engine called the Simplified Building Energy Model for Ireland (SBEMie[1]) operating with a user interface called iSBEMie[2]. The purpose of SBEMie and its interface is to produce consistent and reliable evaluations of energy use in non-domestic buildings for Building Regulations compliance assessments and for Building Energy Rating purposes. Although it may assist the design process, it is not primarily a design tool and should **not** be used for making strategic design decisions. It does not calculate internal temperatures, for example.

SBEMie consists of a calculation methodology (briefly described below), which runs together with a compliance checking module (BRIRL) and Building Energy Rating (BER) generator (BERgen) which utilise some of the same data during the calculation. The user sees iSBEMie, the interface software, which interweaves these components together and interacts with a series of databases to provide consistent data to the calculation while simplifying the user's need to obtain raw building construction data.

SBEMie is a compliance and certification procedure and not a design tool. If the performance of a particular feature is critical to the design, even if it can be represented in SBEMie, it is prudent to use the most appropriate modelling tool for design purposes. In any case, SBEMie should not be used for system sizing.

[1] Pronounced s-bem.
[2] Pronounced i-s-bem.

NEW 2.1.1. Key differences in the software

The main differences in iSBEMie_v5.5.h compared to previous versions for the Republic of Ireland are as follows:

- New building types and activity types in the NEAP Activity Database.
- New feature to allow definition of bi-valent space heating and/or water heating systems.
- Upgraded calculations of heating and cooling energy demands.
- Enhanced calculation for moveable shading devices on windows.
- Enhanced lighting energy calculation.
- Updated auxiliary energy calculation.
- Enhanced calculation for photovoltaic systems.
- New facility to model night cooling in zones.
- New facility for modelling transpired and non-transpired solar collectors.
- Updated options for ductwork and AHU leakage test classifications.
- Addition of new geometry parameters, such as roof pitch angle, maximum number of storeys, etc., to enhance energy and solar calculations.
- New field added to the building geometry definition to identify an overhang as a brise-soleil.
- New facility to model demand-controlled ventilation in zones.
- New facility to model variable-speed pumping in HVAC systems.
- Updated approach to dealing with time-switching of display lighting.
- New parameter added to allow the user to input the terminal unit SFP, if relevant for the HVAC system defined, to replace the fixed default value within SBEMie.
- Updated default values of luminaire luminous efficacy for lamp types.
- Updated default values for linear thermal transmittance (Psi) for thermal bridges.
- New feature to account for auxiliary energy of HVAC system with integral fans.
- Updated Constructions and Glazing Databases.
- Implementation of 2017 NEAP and 2017 Reference building.
- Updated Ratings form.
- Seasonal, rather than nominal, cooling energy efficiency ratio is checked for compliance with minimum standards in Building Regulations.

2.2. Calculation basics for Ireland's Building Regulations compliance purposes

The calculation procedure required by the NEAP is explained more fully in the NEAP Modelling Guide[3]. SBEMie complies with the NEAP. It is suitable for use with the majority of buildings, but some designs will contain features which mean that more accurate energy calculations may be obtained by more sophisticated calculation methods.

[3] Available from SEAI's website at www.seai.ie.

In summary, the Building Regulations compliance calculation compares the Actual building's Energy Performance Coefficient (EPC), Carbon Performance Coefficient (CPC), and Renewable Energy Ratio (RER) to a Maximum Permitted Energy Performance Coefficient (MPEPC), a Maximum Permitted Carbon Performance Coefficient (MPCPC), and a minimum permitted RER, respectively, as specified in the relevant building regulations and the NEAP Modelling Guide.

The EPC is calculated as the ratio between the calculated primary energy consumption rate of the Actual building and that of a Reference building (where both values are in kWh/m^2.annum) while the CPC is the ratio between the calculated CO_2 emission rate of the Actual building and that of the Reference building (where both values are in $kgCO_2/m^2$.annum).

The Reference building has the following general characteristics:

- The same geometry, orientation, and usage as the evaluated building.
- The amount of glazing in the Reference building is, however, not the same as that in the evaluated building. The area of glazing is a certain percentage of external walls and roofs and is dependent on the activity and building type.
- It is exposed to the same weather conditions as the evaluated building.
- Standard operating patterns (to allow consistent comparison between buildings in the same sector).
- Standardised assumptions for building fabric, glazing type, and HVAC plant efficiencies.

Detailed specifications of the 2017 Reference building are in the 2017 NEAP Modelling Guide[3], and further guidance is in the Technical Guidance Document - Part L of the Building Regulations 2017.

NB: Only the communal areas of apartment buildings containing self-contained flats should be assessed for compliance using SBEMie, for example, circulation areas (using the "Common circulation areas" activity under the building type "Residential spaces"). The self-contained flats themselves should be assessed using DEAP (for domestic buildings). For further guidance, refer to SEAI.

SBEMie calculates the energy demands of each space in the building according to the activity within it. Different activities may have different temperatures, operating periods, lighting standards, etc. SBEMie calculates heating and cooling energy demands by carrying out an energy balance based on monthly average weather conditions. This is combined with information about system efficiencies in order to determine the energy consumption. The energy used for lighting and hot water is also calculated. This requires information from the following sources:

Information	Source
Building geometry such as areas, orientation, etc.	Assessor reads from drawings or direct measurement.
Weather data	Internal database.
Selection of occupancy profiles for activity areas	For consistency, these come from an internal Activity Database – assessor selects by choosing building type and activity from the database for each zone.
Activity assigned to each space	Assessor defines within iSBEMie by selecting from internal database (the user should identify suitable zones for the analysis by examining

	the building or drawings).
Building envelope constructions	Assessor selects from internal Construction and Glazing Databases or inputs parameters directly ("Inference" procedures may be used for energy certification of existing buildings). Assessor can also define their own constructions in the user-defined construction database.
HVAC systems	Assessor selects from internal databases or inputs parameters directly.
Lighting	Assessor selects from internal databases or inputs parameters directly.

Table 1: Calculation parameters for SBEMie

The "inference" facility in iSBEMie guides the assessor through the data input procedures and directs them towards appropriate internal databases. This option is intended for use when certifying existing buildings if the drawings or construction information are not available.

2.3. Calculation basics for Ireland's Building Energy Rating purposes

This section briefly defines the "Notional" building, which is the basis of setting the energy rating scale for Building Energy Ratings (BERs). The BER of the Actual building is the ratio of the primary energy consumption rate of the Actual building to that of a Notional building (where both values are in kWh/m^2.annum). The CO_2 Emissions Indicator of the Actual building is also calculated as the ratio of the CO_2 emission rate from the Actual building to that from the Notional building (where both values are in kgCO_2/m^2.annum).

BERs are intended to send market signals about the relative performance of comparable buildings, and so it is necessary that the Notional building should be the same for all buildings of a given type. In order to provide this consistency, the Notional building must be the same irrespective of: (a) whether the Actual building is naturally or mechanically ventilated and (b) the fuel choice in the Actual building.

Detailed specifications of the Notional building are in the 2017 NEAP Modelling Guide[3]. Key among them are:

a. The heating and hot water service is always met by a gas-fired system irrespective of whether a fuel other than gas is used in the Actual building, or gas is even available in the locality of the Actual building.

b. Each space which is unconditioned, i.e., unheated and uncooled, in the Actual building will also be unconditioned in the Notional building. In all other cases, the spaces in the Notional building have a fixed servicing strategy regardless of the strategy adopted in the Actual building, such that:

    - Each space in the Notional building is heated to the heating setpoints defined in the Activity Database;
    - Each space in the Notional building is cooled, to a fixed cooling setpoint, irrespective of whether the particular space in the Actual building has cooling provision or not;

- Each space in the Notional building is naturally ventilated, irrespective of whether the corresponding space in the Actual building has natural or mechanical ventilation.

The BER is also converted into an energy band/grade on an "A-G" scale, as shown in Table 2 (with A1 being the most efficient and G being the least efficient).

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

Table 2: BER scale and energy bands

NB: The domestic type activities available under the building type "Residential spaces" in iSBEMie are to allow the energy calculations for the generation of one BER report for a building which contains residential accommodation above a non-domestic space (e.g., a shop or a pub) provided that the residential space can only be accessed from within the non-domestic space, i.e., the residential part is not designed or altered for use as a separate independent dwelling. In addition to common circulation areas of apartment buildings containing self-contained flats, these are the **only** cases where SBEMie can be used to model domestic areas. For further guidance, refer to SEAI.

2.4. Deciding whether SBEMie is appropriate

All calculation processes involve some approximations and compromises, and SBEMie is no exception. The most obvious limitations relate to the use of the CEN monthly heat balance method. This means that processes which vary non-linearly at shorter time-steps have to be approximated or represented by monthly parameters. The HVAC system efficiencies are an example of this. On the other hand, SBEMie does have provision to account for processes that may not be present in software packages that contain more sophisticated fabric heat flow algorithms, such as, duct leakage, thermal bridge calculations, and infiltration allowances.

The user interface, iSBEMie, provides the user with routes by which some non-standard systems and other features can be represented. For example, the ability to input specific fan powers provides a route by which demand-controlled ventilation might be handled,

using pre-calculated effective SFP. There are also possibilities to go beyond these within the existing SBEMie model via more general interfaces.

It is, therefore, difficult to give absolute rules about when SBEMie can and cannot be used. As broad guidance, it is more likely to be difficult to use SBEMie satisfactorily if the building and its systems have features that are (a) not already included in iSBEMie and (b) have properties that vary non-linearly over periods of the order of an hour. However, as the example above shows, this is not a universal rule. There is a balance between the time and effort required to carry out parametric studies to establish input values for SBEMie and detailed explicit modelling of a particular building.

Features which cannot currently be represented in iSBEMie:

- Ventilation with enhanced thermal coupling to structure;
- Light transfer within a building, for e.g., through highly glazed internal surfaces between atria and surrounding spaces;

2.5. Overview of how a building is defined in iSBEMie

There is a number of stages to inputting a building in iSBEMie:

a Enter general information about the building, the client who commissioned the calculation, and the assessor, and select the appropriate weather data.

b Build up a database of the different forms of constructions and glazing types used in the fabric of the building.

c After "zoning" the building (on the drawings), create the zones in the interface, and enter their basic dimensions, along with the air permeability of the space.

d Define the envelopes of each zone, i.e., walls, floor, ceiling, etc. The envelopes' areas, orientations, the conditions of the adjacent spaces, and the constructions used all need to be defined.

e Within each envelope element, there may be windows/rooflights or doors. The areas and types of glazing or door within each envelope element need to be entered.

f Similarly, within the envelope elements or within the window/door, there may be additional thermal bridges which need to be defined.

g Define the HVAC (heating, ventilation, and air conditioning) systems, the HWS (hot water systems), and any SES (solar energy systems), PVS (photovoltaic systems), wind generators, or CCHP (combined cooling, heat, and power) generators used in the building.

h Define the lighting system and local ventilation characteristics of each zone and assign the zones to the appropriate HVAC system and HWS.

i Run the calculation and assess compliance or generate a BER.

The building services systems, zones, envelope elements, windows, doors, etc. are all referred to as "**building objects**" in SBEMie. Figure 1 shows each of these building objects and demonstrates how they are linked together so that SBEMie can calculate the energy consumption of the building. This diagram gives you an overview of what information is required and where you have to enter it in the iSBEMie interface. It may be useful to return to this figure at the end of the tutorial (in the "Compliance" volume of the User Guide set), by which point you will have been introduced to all the building objects. Each building object should be given a unique name when modelling the building in iSBEMie, for e.g., do not give the same name to two different constructions in the *Project Database* form.

Figure 1 serves to provide an overview of the structure of the building objects that you will be introduced to in this User Guide. More details on each item and how they are defined and linked together will be provided in detail in the volume "**How to use iSBEMie: Compliance Assessment**" and through the *Help* menu accessible from within iSBEMie.

Building object	Key parameters needed to define this building object	Object(s) to which it needs to be linked	Where it is defined in iSBEMie
Zones	Dimensions, activity type, details on lighting, heating, and ventilation strategy.	HVAC and HWS	Geometry form > Zones tab and in the Building Services form > Zones tab
Envelope elements	Type of envelope (wall/floor/roof), area, orientation, construction type, thermal bridges, perimeter length, and condition of adjoining space.	Zone	Geometry form > Envelopes tab or the Geometry form > Zones tab > Quick-Envelopes sub-tab
Windows	Dimensions, glazing type, thermal bridges, shading system, frame factor, aspect ratio, and whether it is a display window or not.	Envelope element	Geometry form > Windows & Rooflights tab or the Geometry Form > Zones tab > Quick Envelopes sub-tab
Doors	Area, construction type, thermal bridges, and type of door.	Envelope element	Geometry form > Doors tab
HVAC	System type, heat source, fuel type, further details on efficiencies, duct leakage, specific fan power, and controls.	Zone	Building Services form > HVAC systems tab
HWS	Generator type, fuel type, details on efficiency and whether it is a storage system.	Zone	Building Services form > HWS tab
SES	Dimensions, orientation, inclination, storage.	HWS	Building Services form > SES tab
PVS	Dimensions, orientation, inclination, and type.	-	Building Services form > PVS tab
Wind generator	Terrain type, dimensions, and power.	-	Building Services form > Wind generator
CHP generator	Fuel type, details on efficiency, building heat and hot water supplied, and thermal and electrical efficiencies.	HVAC	Building Services form > CHP tab
Solar collectors	Type, operation, control type, absorptivity, and design air flow.	Zone and Envelope element	Building Services form > SC tab, Geometry form > Envelopes tab, and Building Services form > Zones tab

Hierarchy of SBEMie building objects

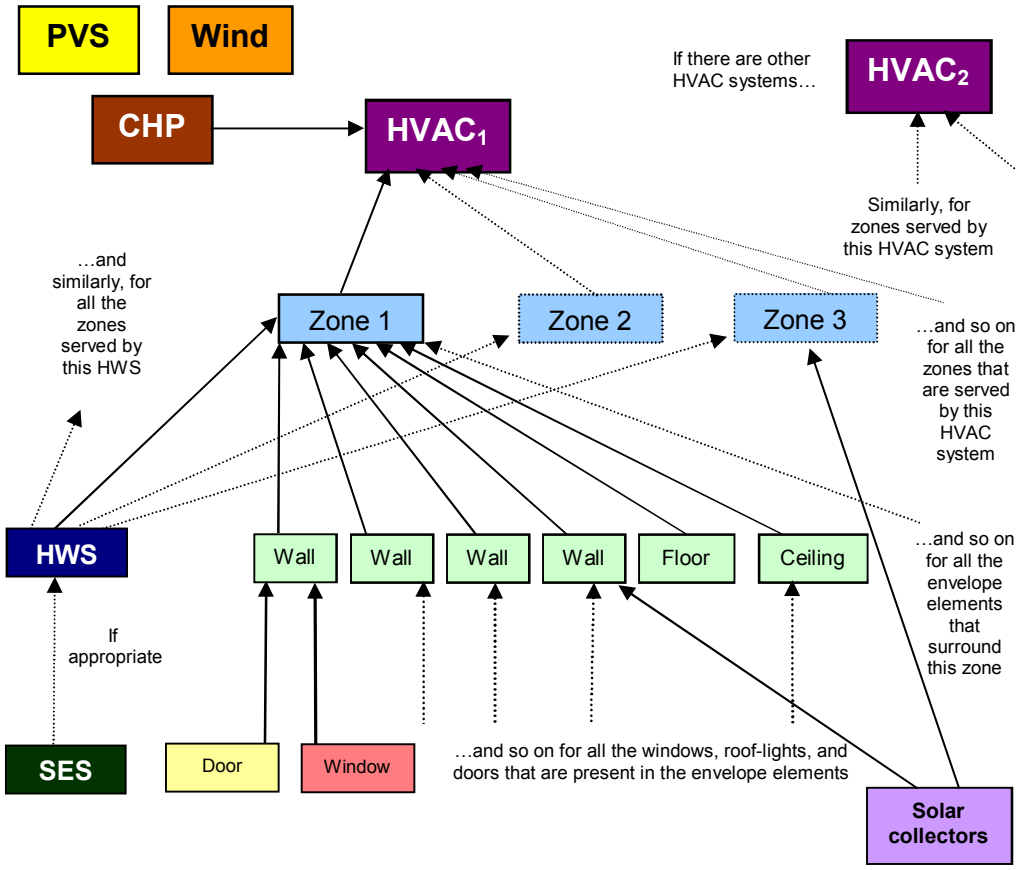

Figure 1: Structure of SBEMie objects

3. ASSEMBLING REAL BUILDING DATA

3.1. Introduction

There are four steps to calculating the ratings for a building. First, a decision needs to be made on whether SBEMie is the appropriate analysis tool. Then, information on the building needs to be gathered, analysed, and finally, entered into the interface. The tutorial in the "Compliance" volume of this User Guide focuses on the functionality of the tool. To ease that process, all the information on the Example building is provided in the appendices, and the zoning is done for you. However, when analysing a real building, you will need to collect and analyse the building data yourself. This chapter will guide you on what information you need to gather, and how you need to process this information before you can enter it into the interface, iSBEMie.

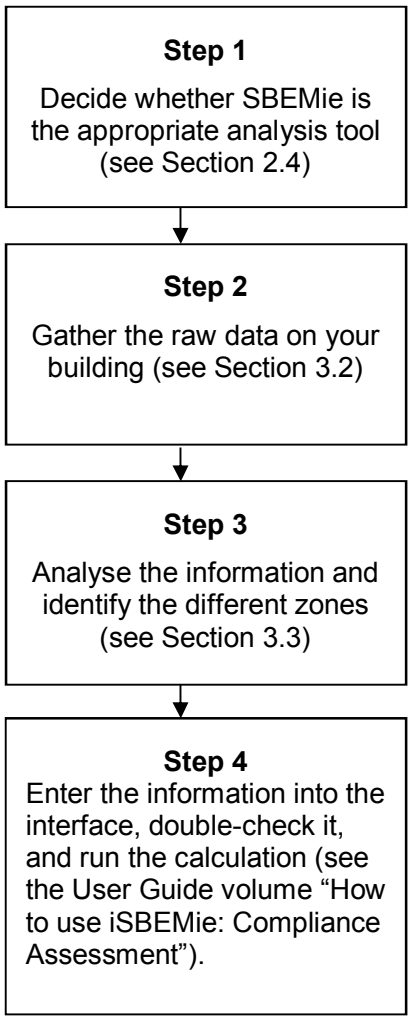

Figure 2: Steps for calculating the energy performance for a building

3.2. Tips for gathering information for iSBEMie

Item	Requirements	Potential issues and experiences	
		New build and refurbishment	**Existing building**
Architectural: building spatial layout of functions, geometry, and orientations	Building plans, sections, site plan	Plans and schedules should be available at this stage. What degree of detail do they show? For instance, have decisions been made on usage of each space in the building?	Are plans available? Have they been kept up-to-date? Can they be used? What degree of detail do the plans show? Have there been changes to the internal layout (with consequent effects on activity type, area, and geometry)? Don't assume that adequate information on an existing building can be obtained easily. Any planning should include time to physically survey at least some parts of the building. Note that there may be practical obstacles to overcome, such as gaining access to secure parts of the building, e.g., plant rooms or areas where confidential work takes place. This may need to be resolved with the building owner or occupier prior to the visit. There could also be safety issues to consider, such as access to the roof or looking into ceiling voids.
Envelope construction materials, air permeability	Detailed drawings, schedules of construction details, pressure test result	Detailed drawings and schedules should be available. What degree of detail do they show? For instance, do details show junctions and hence thermal bridges? Do they rely on the constructors to use initiative to select suitable materials? Has there been confirmation that as-built constructions are equivalent to or better than as-designed?	Are drawings and schedules available? How up-to-date are they? What degree of detail do they show? Have there been changes, for instance replacement of windows, re-roofing, or additional insulation? Any direct investigation of construction details, such as, wall or roof constructions and thermal bridges by opening them up should only be undertaken with the written approval of the building owner and consent of occupants. If this is not given (it would be unusual), then it is possible, using databases built into the software, to infer construction details from non-invasive observations and construction date (assuming compliance with the then current Building Regulations). Any assumptions made must err on the pessimistic side (i.e., constructions that are older and/or do not contain cavities unless their presence can be

			inferred from the external appearance).
Building Services	Description of plant and its controls, schedules of plant sizing including fans, information on construction standards (e.g., leakage tests on ductwork), confirmation whether M&T is being undertaken, lighting description and controls	Detailed drawings and schedules should be available. What degree of detail do they show? For instance, is it possible to work out specific fan power from fan power and air quantity? Has the fine detail of installation been left to equipment suppliers and installers – If so, could they inadvertently compromise the design intent? Are any test certificates available? Is there sub-metering for HVAC systems and/or lighting, and if monitoring and targeting are to be practiced, are out of range alarms built into the software or procedures? Is lighting design information available, rather than relying on simple lamp type information?	Are drawings and schedules available? Are they held on-site or by a maintenance or other remote contractor? Is there a building log book? How up-to-date are they? What degree of detail do they show? Have there been changes, such as, plant replacement or to the control process? Are there any results of tests on the equipment as installed, such as, seasonal system efficiencies, leakage tests on ductwork and/or air handling plant, confirmation of air volumes, etc.? You may be able to confirm with the energy manager whether there is sub-metering for HVAC systems and/or lighting, and if monitoring and targeting are practiced, that out of range alarms are built into the software or procedures. It would also be useful to confirm with the facilities manager which lamp types are used in each zone, and which zones have which types of lighting control applied. If written information is not available, the plant will need to be surveyed. Who has access to plant rooms and when? There are safety issues. Is the surveyor familiar with plant type and specifications? It can be difficult to identify systems from simple visual inspection. Default efficiencies will depend on the installation date and/or ECA listing of equipment – can this be verified from purchase documentation? Any assumptions made must err towards a less efficient plant and/or less precise control. If an external contractor has responsibility for operation or maintenance, it may be necessary to probe carefully how the plant is actually configured. This is to avoid misunderstandings on how it should work.

Table 3: Tips for gathering information for iSBEMie

3.3. Zoning guide – How to zone your building

The way a building is subdivided into zones will influence the predictions of energy performance. Therefore, the NEAP Modelling Guide[4] defines zoning rules that must be applied when assessing a building for Building Regulations purposes (compliance or energy certification). 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 HVAC system which serves it
- The lighting system within it
- The access to daylight (through windows or rooflights).

To this end, the suggested zoning process within a given floor plate is as follows:

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" (selected from the drop-down list available for each building type) 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.

NB: Currently iSBEMie is not able to realistically model sunspaces or atria as it cannot represent light transfer between highly glazed/reflective internal spaces such as these.

6. Merge any contiguous 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.

NB: Small unconditioned spaces like store cupboards, riser ducts, etc., can be absorbed into the adjacent conditioned spaces. In iSBEMie, this would involve adding their floor area to that of the adjacent conditioned space. Larger areas should be treated as indirectly conditioned spaces.

NB: <u>Indirectly conditioned/heated spaces</u> - For spaces such as corridors or access areas, which are not directly served 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 (for e.g., allowing the heated air to move freely through permanently-open doors or heat to escape through uninsulated envelopes from the directly conditioned spaces to the unconditioned ones), they should be considered heated/conditioned <u>indirectly</u> by the same HVAC system which serves the surrounding conditioned spaces. Therefore, you should assign the HVAC system of the adjacent conditioned spaces also to that indirectly conditioned zone in iSBEMie (although the space is not directly conditioned, the energy to overcome any losses from or gains to it is still required via the conditioned spaces

and, therefore, needs to be included in the calculation). Furthermore, when defining envelope elements between a directly conditioned space and an indirectly conditioned space, they should be labelled as adjacent to a "conditioned adjoining space".

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. SBEMie will then assume no transfer of heat, coolth, or light across the boundary, in either direction. In the context of iSBEMie, the building needs to be divided into separate zones for each activity area, subdivided where more than one HVAC system serves an activity area.

NB: If the internal envelopes between merged zones have been designed of heavy construction to have thermal mass, then their κ_m value (renamed from C_m value in older versions of the software) will contribute to how the building retains and emits heat, and hence they should be defined in iSBEMie. You can sum the areas of two or more internal walls (between merged zones) with the same construction and orientation and enter them 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 iSBEMie 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 your model as described above.

NB: The term "zone" is used as a short hand for "activity area" throughout this User Guide. It should not be assumed to be the same as a building services control zone, for instance, on the basis of building façade, although in some cases they may align.

NB: For building regulations calculations purposes, we recommend that users generally avoid creating more than 100-150 zones in iSBEMie. However, the processing time will depend on the total number of objects (not just zones), i.e., zones, envelopes, windows, etc. Note that for building regulations compliance checking, the calculation has to generate 2 buildings: the Actual and Reference, so the number of objects (all the zones, envelopes, windows, etc.) that the calculation has to process is multiplied by 2, while for the BER to be calculated, 3 buildings need to be generated: Actual, Reference, and Notional (the Typical building's performance is derived from that of the Reference), i.e., all the objects in the input are multiplied by 3 to give the total number of objects being processed by SBEMie. Hence, creating a project with a very large number of objects will slow down the calculation and may cause it to crash. That said, see guidance on the 64-bit version of the calculation engine in section 4.2: Installing iSBEMie on your computer).

3.4. Measurement and other conventions

In order to provide consistency of application, standard measurement conventions have been adopted to be used as part of the NEAP. These apply to all NEAP-accredited software. These conventions are specified in Table 4 below:

Parameter	Definition
Zone Height	Floor to floor height (floor to soffit for top floor), i.e., including floor void, ceiling void, and floor slab. Used for calculating length of wall-to-wall junctions, radiant and temperature gradient corrections, and air flow through the external envelopes due to the stack effect.
Zone Area	Floor area of zone calculated using the internal horizontal dimensions between the internal surfaces of the external

	zone walls and half-way through the thickness of the internal zone walls (see Figure 3). Used to multiply area-related parameters in databases. Area basis needs to be consistent with that for operational ratings. NB: If the zone has any virtual boundaries, e.g., no walls in certain orientations, the area of the zone is that delimited by the 'line' created by that virtual boundary.
(Building) Total Floor Area	Sum of zone areas. Used to check that all zones have been entered in iSBEMie.
Envelope perimeter length	Horizontal dimension of the wall. Limits for that horizontal dimension are defined by type of adjacent walls. If the adjacent wall is external or a perimeter wall, the limit will be the internal side of the adjacent wall. If the adjacent wall is internal, the limit will be half-way through its thickness.
Envelope Area	$Area\ of\ vertical\ envelopes\ (walls) = h \times w$ where: h = floor to floor height (floor to soffit on top floor), i.e., including floor void, ceiling void, and floor slab. w = horizontal dimension of wall. Limits for that horizontal dimension are defined by type of adjacent walls. If the adjacent wall is external or a perimeter wall, the limit will be the internal side of the adjacent wall. If the adjacent wall is internal, the limit will be half-way through its thickness. NB: Areas of floor, ceilings, and flat roofs are calculated in the same manner as the zone area. Area for an exposed pitched roof (i.e., without an internal horizontal ceiling) will be the inner surface area of the roof. Used to calculate the fabric heat loss so this is the area to which the U-value is applied.
Window Area	Area of the structural opening in the wall/roof, i.e., it includes the glass and the frame.
Aspect ratio (window)	Ratio of the window's height to its width.
Frame factor (window)	Ratio of the window area which is occupied by the frame to the total window area (see definition above).
Deadleg Length	Length of the draw-off pipe to the outlet in the space (only used for zones where the water is drawn off). Used to determine the additional volume of water to be heated because the cold water in the deadleg has to be drawn off before hot water is obtained. Assumes that HWS circulation maintains hot water up to the boundary of the zone, or that the pipe runs from circulation or storage vessel within the zone.
Flat Roof	Roof with a pitch of 10 degrees or less.
Pitched Roof	Roof with a pitch greater than 10º and less than or equal to 70º. If the pitch is greater than 70º, the envelope should be considered a wall.
Display Window	As defined in TGD-L.
Personnel Door	As defined in TGD-L.

High Usage Entrance Door	As defined in TGD-L.
Vehicle Access Door	As defined in TGD-L.
Glazed door	When doors have more than 50% glazing, then the light/solar gain characteristics must be included in the calculation. This is achieved by defining these doors as windows. (Otherwise, they are defined as opaque doors.)
Curtain walling	Fully-glazed curtain walling systems should be modelled as glazing, where the spandrel area (i.e., non-vision areas) can be accounted for in the frame factor.

Table 4: Measurement and other conventions

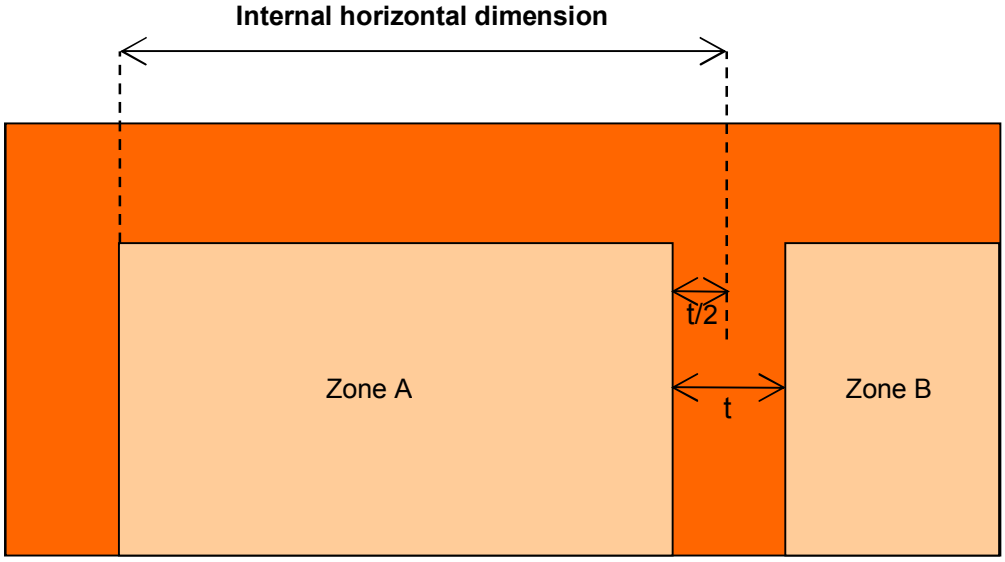

Figure 3: Internal horizontal dimension of a zone

3.5. iSBEMie Nomenclature

3.5.1. Naming zones, envelope elements, windows, and doors

There is no set nomenclature for the different items in the *Geometry* form. The only requirement is that they are all unique, for e.g., do not give the same name to two different constructions in the *Project Database* form. You may prefer to assign familiar/representative names. However, with a large building, a methodical nomenclature can make it easier to identify elements and keep track of what has been input.

Below is a suggested nomenclature. If you use *Quick Envelopes* or the "Copy Record" function, the elements you create will be named in this way.

Element	Suggested name	Explanation
Zone	**z#/##**	The **z** stands for zone, and the first number is the storey number (0 for ground floor and 1 for first floor etc.). After the slash, the number(s) stands for the number of the zone on that floor. These

		can run consecutively throughout the building or start again at 1 for each floor.
Walls	**z#/##/ot**	The first two groups of figures are to identify, as described above, which zone the wall is part of. Then the **o** is the orientation (n/nw/e/se etc.) and **t** is the type (**i** means internal, **u** means underground, and no letter means external).
Floors	**z#/##/ft**	Similar to walls, the first two groups of figures identify the zone. This is followed by an **f** for floor and then the type **t** (**i** for internal floor, **e** for external space, and no letter for ground floor).
Ceilings/ roofs	**z#/##/ct**	Similar to walls, the first two groups of figures identify the zone. This is followed by **c** for ceiling and **t** is the type (**i** is for internal ceiling and no letter means the ceiling has no occupied space above it, i.e., it is, in fact, a roof).
Window	**z#/##/ot/g**	The first three groups of figures identify which envelope the window is attached to, as described above. The **g** stands for glazing.
Door	**z#/##/ot/d**	The first three groups of figures identify which envelope the door is attached to, as described above. The **d** stands for door.
And for all the above elements	**(name).#**	If there is more than one element which would have the same name following the above nomenclature, "**.1**" is added for the second element and "**.2**" is added to the third, etc. For example, if there were two north walls in a zone (z0/01), with the same orientation and type, then the first wall would be named "z0/01/n" and the second would have a ".1" added to the end and therefore be named "z0/01/n.1".

Table 5: Suggested iSBEMie nomenclature

See Table 6 for examples.

Name	Description of element
z0/01	Zone 01 on the ground floor (0)
z0/01/n	First North facing external wall of zone 0/01
z0/01/n.1	Second North facing external wall of zone 0/01
z0/01/n.2	Third North facing external wall of zone 0/01
z0/01/ni	A North facing wall of zone 0/01, which is internal
z0/01/nu	A North facing underground wall of zone 0/01
z0/01/n/g	Glazing in the North external wall of zone 0/01
z0/01/n/d	Door in the North external wall of zone 0/01
z0/01/f	Ground floor of zone 0/01
z0/01/fi	Internal floor of zone 0/01, i.e., there is an interior space below
z0/01/fe	External floor of zone 0/01, i.e., there is an exterior space below
z0/01/c	Roof of zone 0/01, i.e., there is an exterior space above
z0/01/ci	Ceiling of zone 0/01, i.e., there is an interior space above

Table 6: Examples of building element names

Recommendations if you set up your own nomenclature:

- Use names which link subordinate parts of the construction (e.g., windows) to the element of which they are part (e.g., walls).
- Incorporate reminders about major distinctions like whether the wall is internal or external, or unusual features like suspended floors over an exterior space.
- Choose characters which avoid using shift keys, e.g., avoid capital letters.

Other points on naming:

- If you use the *Quick Envelopes* to create the walls, roofs, floors, ceilings, and windows, the names are created automatically for you based on the name you gave to the zone to which they are attached. If you follow the suggested nomenclature for the zones, the names for the walls/floors/windows, etc., will be exactly as described above. If you choose another way of naming your zones, the above endings will be added to your zone's name. For example, if you named your first zone, "room1", then the first north wall created for that zone would be automatically called "room1/n".
- It is not possible to have two elements with the same name. If you try to use the same name twice, iSBEMie automatically renames the second element for you. For example, if you attempt to create a second zone named "z0/01" or a second wall named "z0/01/n", iSBEMie will rename them "z0/01.1" and "z0/01/n.1", respectively.
- If you use the "Copy Record" function, a name is generated automatically for you. For example, if you copy zone "z0/01", the new zone will be automatically named "z0/01.1", which you can later rename. However, any building objects (i.e., envelopes, windows, doors) assigned to the zone, which are also copied as a result, retain the same names as those which they are copied from (e.g., z0/01/n, z0/01/n/g, etc.). It is recommended that you appropriately rename any copied elements.

3.5.2. Naming constructions and building services systems

As there are generally far fewer constructions and building services systems in a building, such a methodical nomenclature system, as that recommended for the geometrical definition of the building, is not generally required, as long as the names you give them are unique, for e.g., do not give the same name to two different constructions in the *Project Database* form. However, names which clearly identify the type and/or use of the construction or building services system are recommended.

4. iSBEMie BASICS – GETTING STARTED

This chapter will show you how to install and open iSBEMie, start a new project or open an existing project, and finally, close the application correctly.

NB: To open and edit files created with previous versions of iSBEMie (i.e., prior to the current version), you will first need to convert each file in order to make it compatible with this version of iSBEMie. See Chapter 8 for instructions on how to do this.

4.1. System Requirements

The current version of iSBEMie (iSBEMie_v5.5.h.mdb) runs on Microsoft Access. If you do not have a 'full' version of Microsoft Access on your computer, installing a run-time version would be sufficient for running iSBEMie. A run-time version of Access 2013 is available for download freely from the Microsoft website[4].

We recommend at least 512 MB RAM on your computer to run the application. To view all of the output documents produced by iSBEMie, you will also need Microsoft Internet Explorer, Microsoft Excel, and Adobe Acrobat Reader installed on your computer.

The approved version of iSBEMie has been developed to work on a Windows platform only. Unfortunately, iSBEMie is not compatible with Mac or Linux. SBEMie itself will run on most platforms as it is standard C++ and, subject to funding, can be compiled in Mac or Linux, but the iSBEMie interface is a Microsoft Access application which will not run on Linux or Mac operating systems.

NB: Ensure that you have full read and write access permissions on the NEAP folder (on the C:\ drive), where iSBEMie is installed by default on your computer. If you are unable to do this, you need to contact the IT department of your company and ask them to adjust your settings to give you full read and write access rights on the NEAP folder on your computer.

NEW **NB:** Please note that iSBEMie cannot run on an online cloud-based system, e.g., Access Online with MS Office 365 "subscription-only service". Therefore, you are advised to use a computer with a local MS Office installed or an Access runtime version if you do not have a full local version. Then, you can install iSBEMie on the local hard drive (C:\) in order to be able to run it.

NEW **NB:** Users with 64-bit versions of MS Office will need to follow the guidance in the installation instructions document[3] prior to installing iSBEMie, as iSBEMie cannot currently run with 64-bit MS Access.

4.2. Installing iSBEMie on your computer

The current version is: **iSBEMie_v5.5.h**. The tool can be downloaded from SEAI's website at: www.seai.ie.

NB: FILES CREATED WITH PREVIOUS VERSIONS OF iSBEMie ARE NOT AUTOMATICALLY COMPATIBLE WITH THIS VERSION AND WOULD REQUIRE CONVERSION BEFORE THEY CAN BE OPENED AND EDITED USING THE CURRENT VERSION (see Chapter 8: iSBEMie FILE CONVERSION).

How to install iSBEMie:

1. Click on the hyperlink to download the tool.

[4] https://www.microsoft.com/en-gb/download/details.aspx?id=39358.

2. Save the **iSBEMie_v5.5.h.exe** file to a folder of your choice on your hard drive (**do not try to open the file at this point**), such as the Desktop.
3. Once the download is complete, double-click on the **iSBEMie_v5.5.h.exe** icon, and then click on "**Unzip**' to initiate the self-extracting process. This will automatically install the application in a new folder on your hard drive (default folder: **C:\NEAP**). You may change the installation path if you wish.
4. Once the file has been unzipped to your hard drive, the message "xx file(s) unzipped successfully" will appear (this number may differ for different versions of the tool). Click on '**OK**', and then close the **WinZip** Self-Extractor window (click on '**Close**' or on the cross in the top right-hand corner of the window).

   iSBEMie is now installed on your computer.
5. To locate iSBEMie on your computer, open **Windows Explorer**, and navigate through the following (assuming the default installation path was not changed):

   My Computer

   C:\ (drive)

   NEAP\

   iSBEMie_v5.5.h

iSBEMie_v5.5.h.mdb (the tool itself) along with all of its integrated databases and files are located within this folder (iSBEMie_v5.5.h).

NB: If you changed the installation path (in step 4), the tool will be located in:

your selected path\iSBEMie_v5.5.h.

Users who intend to model and run calculations for particularly large projects (e.g., those containing hundreds of zones) in iSBEMie, provided their computers have 64-bit operating systems, may choose to download the file **iSBEMie_v5.5.h_x64.exe**, which contains a 64-bit version of the calculation engine, instead of **iSBEMie_v5.5.h.exe**. Note that this 64-bit version will not run if installed on computers with 32-bit operating systems.

TIP: You may wish to create a shortcut to the "iSBEMie_v5.5.h folder" on your **Desktop** or elsewhere in your system so that you can access it more easily. However, this is optional. To create a shortcut on the Desktop, right-click on the iSBEMie_v5.5.h folder, select "Send to" and then "Desktop (create shortcut)".

4.3. Opening iSBEMie

After installing iSBEMie and double-clicking on the "iSBEMie_v5.5.h" folder, you will be presented with the window in Figure 4. In order to start the application, you will need to double-click on the Microsoft Access file called **iSBEMie_v5.5.h.mdb**.

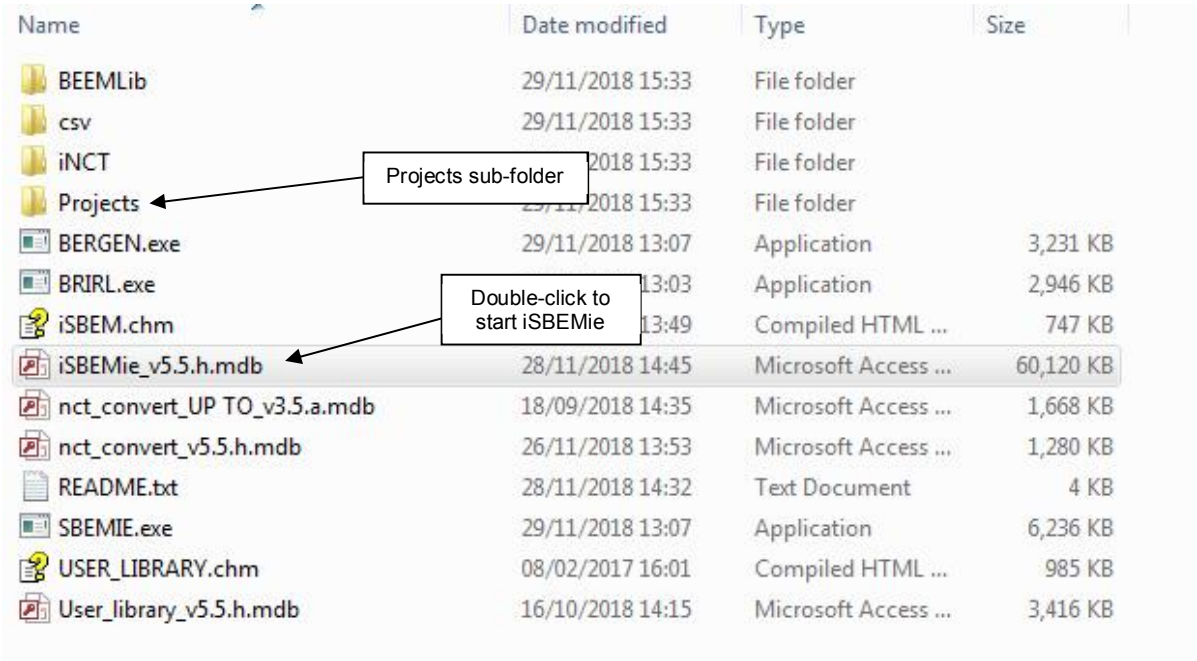

Figure 4: Location of the iSBEMie Microsoft Access file and Projects folder

The first time that the application is opened, a dialogue box will appear containing iSBEMie's licensing terms and conditions (Figure 5). You will need to accept the terms and conditions before you can proceed. If you tick the "Don't show this message again" box, this window will not appear again on starting the application.

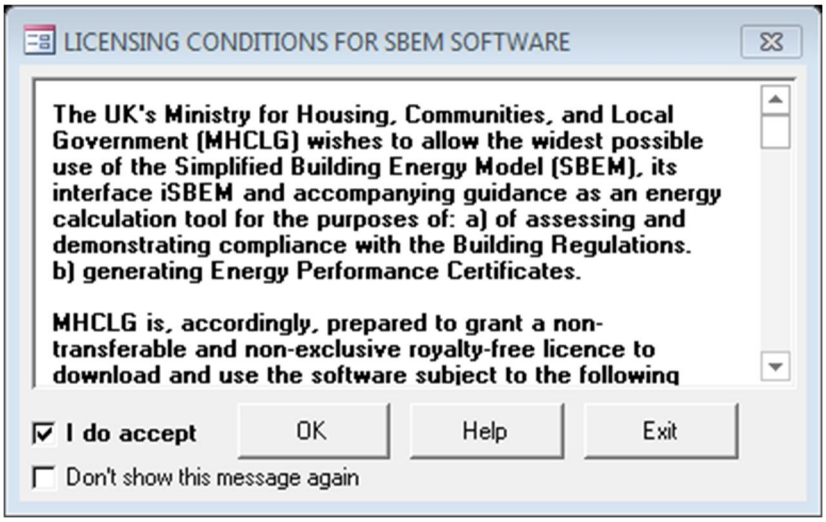

Figure 5: Terms and Conditions dialogue box

4.4. Creating new and opening existing projects

When the terms and conditions have been accepted, a new window will appear which gives **three** "iSBEMie Start-up Options" (Figure 6):

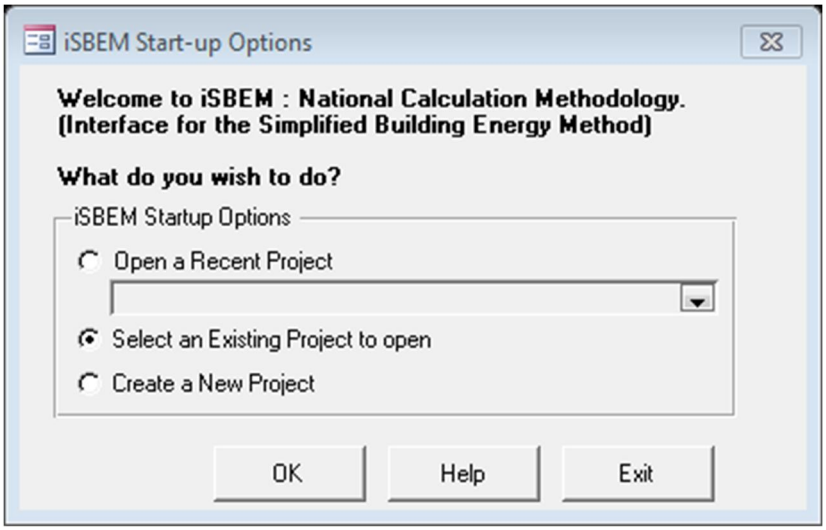

Figure 6: iSBEMie Start-up dialogue box

NB: FILES CREATED WITH PREVIOUS VERSIONS OF iSBEMie ARE NOT AUTOMATICALLY COMPATIBLE WITH THIS VERSION AND WOULD REQUIRE CONVERSION BEFORE THEY CAN BE OPENED AND EDITED USING THE CURRENT VERSION (see Chapter 8: iSBEMie FILE CONVERSION).

1. **Open Recent Projects** – This option has a drop-down menu which contains the 5 most recently-opened projects.
2. **Select an Existing Project** – Selecting this option and clicking on "OK" opens the "Open File" dialogue box, allowing you to browse through your network/computer to locate a project. It is set to automatically open in the "Projects" sub-folder within the iSBEMie_v5.5.h folder.
3. **Create a New Project** – If this option is chosen, the "Save New Project" dialogue box appears, and you need to do the following:
    a. Click on the "Create new folder" button on the top right-hand side of the "Save New Project" dialogue box, enter the project's name as the name for the folder, and then click on "Open".
    b. Click into the "File Name" field and enter the project name again and click on "Save". (This folder and project file will be saved to the iSBEMie "Projects" folder by default – see Figure 4).

    NB: It is recommended practice to create a sub-folder for each project (inside the "Projects" folder) in which all the project-related files are saved.

    c. A form then opens which allows you to enter some basic information about the project - see Figure 7. This includes: purpose of the analysis, weather location, name of the project, building type, etc. You will be able to edit all this information at a later stage in the *General* form if you wish.

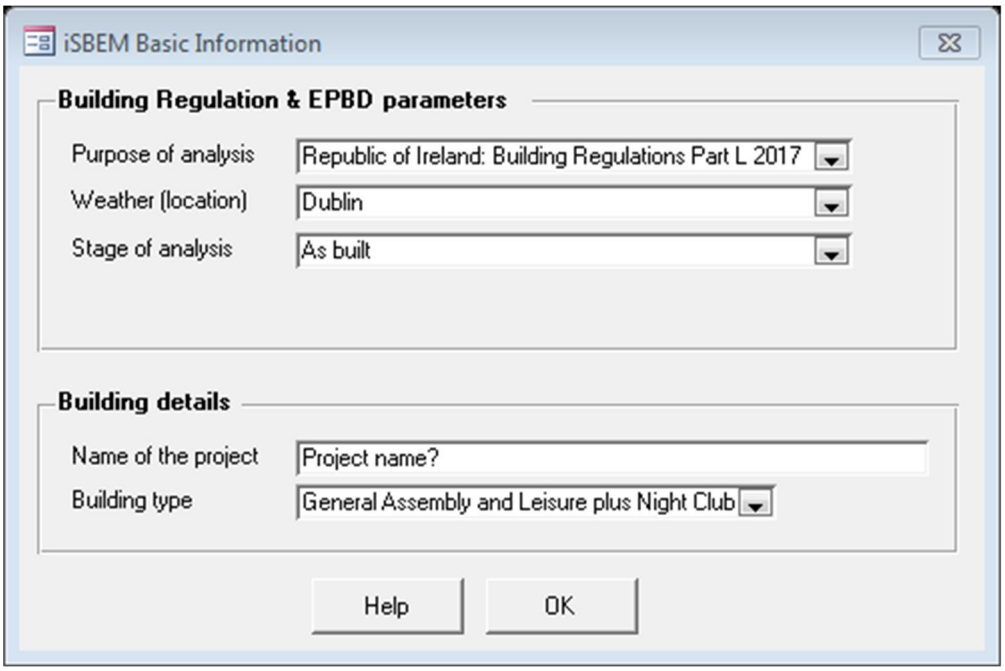

Figure 7: iSBEMie Basic Information form

4.5. Closing iSBEMie

There are two ways to close iSBEMie (circled in Figure 8):

1. Go to the *General* form and click on "Exit iSBEMie".
2. Go to the *General* form and click on the cross in the corner of the iSBEMie screen (the smaller window inside the main Microsoft Access window). **It is not advisable** to exit by clicking the cross in the corner of the main Microsoft Access screen.

What to do if you close the application incorrectly, or if there is a power cut

If you click on the cross in the corner of the main Microsoft Access screen, your work will not be saved to your project file but stored within a temporary file in Access until the next time you open the interface. When you do open the interface next, you will be presented with the "iSBEMie Project Recovery" dialogue box. It asks you whether you want to continue working with the last project which was not closed properly. Click on "Yes", and then, when you are in the *General* form, click on "Save". If you click "No" here, **all** your unsaved changes from the previous session will be lost. If there is a power cut, your work will be saved into the temporary file as described above, and you should follow the same instructions for recovering your data.

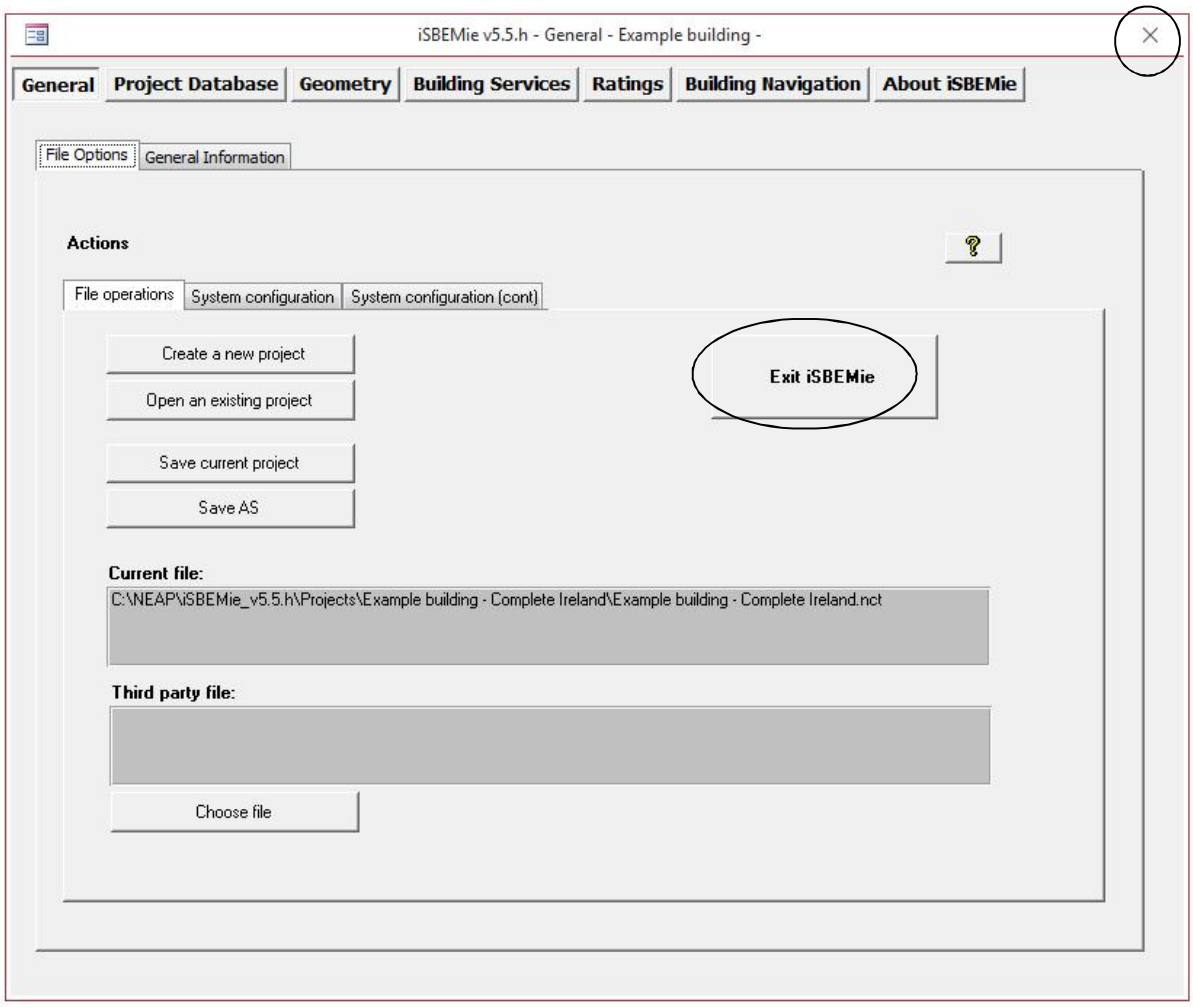

Figure 8: iSBEMie Basic Information form

After clicking on either of the 2 options (circled in Figure 8), the iSBEMie "END" dialogue box (Figure 9) will open to ask you whether you want to save your changes to the project. The project will be saved to the location determined when you clicked on "Create a New Project" as the project was first entered (the default location was the "Projects" sub-folder within the "iSBEMie_v5.5.h" folder).

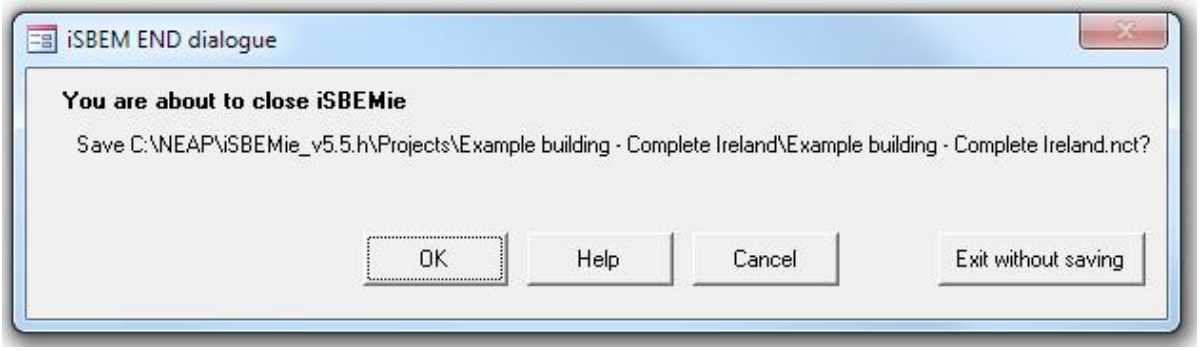

Figure 9: The iSBEMie END dialogue box

After you have chosen to save or exit without saving, the iSBEMie "END" (Figure 10) dialogue box will open. To exit, click on the button in the centre of the dialogue box.

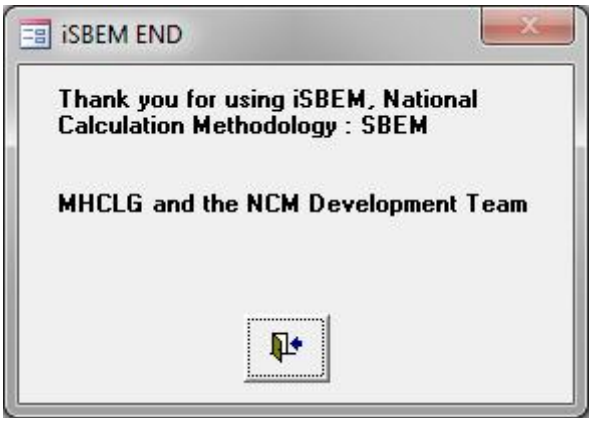

Figure 10: iSBEMie END dialogue box

4.6. Getting assistance with using iSBEMie

The following sources are available if you need assistance on the use of iSBEMie and have been unable to locate the information you need in this Guide:

- You can click "**F1**" while in any field within the iSBEMie interface to get Help information on any specific input item (see Section 6.2: iSBEMie Help).
- Frequently Asked Questions (FAQs) can be accessed from SEAI's website at www.seai.ie.
- Enquiries on using iSBEMie to undertake calculations for the Republic of Ireland should be directed to the Sustainable Energy Authority of Ireland (SEAI) via registered@ber.seai.ie for all registered assessors and trainers, and via info@ber.seai.ie for all other queries.

5. TOUR OF iSBEMie

The interface consists of a number of screens into which the data for a building needs to be entered in order to model your building. This chapter gives an overview of these screens.

5.1. Introduction to the main forms in iSBEMie

The iSBEMie opening screen (Figure 11) gives access to **seven** main forms:

- **General**
- **Project Database**
- **Geometry**
- **Building Services**
- **Ratings**
- **Building Navigation**
- **About iSBEMie**

Within each of these forms, there are various tabs and sub-tabs as shown in Figure 11.

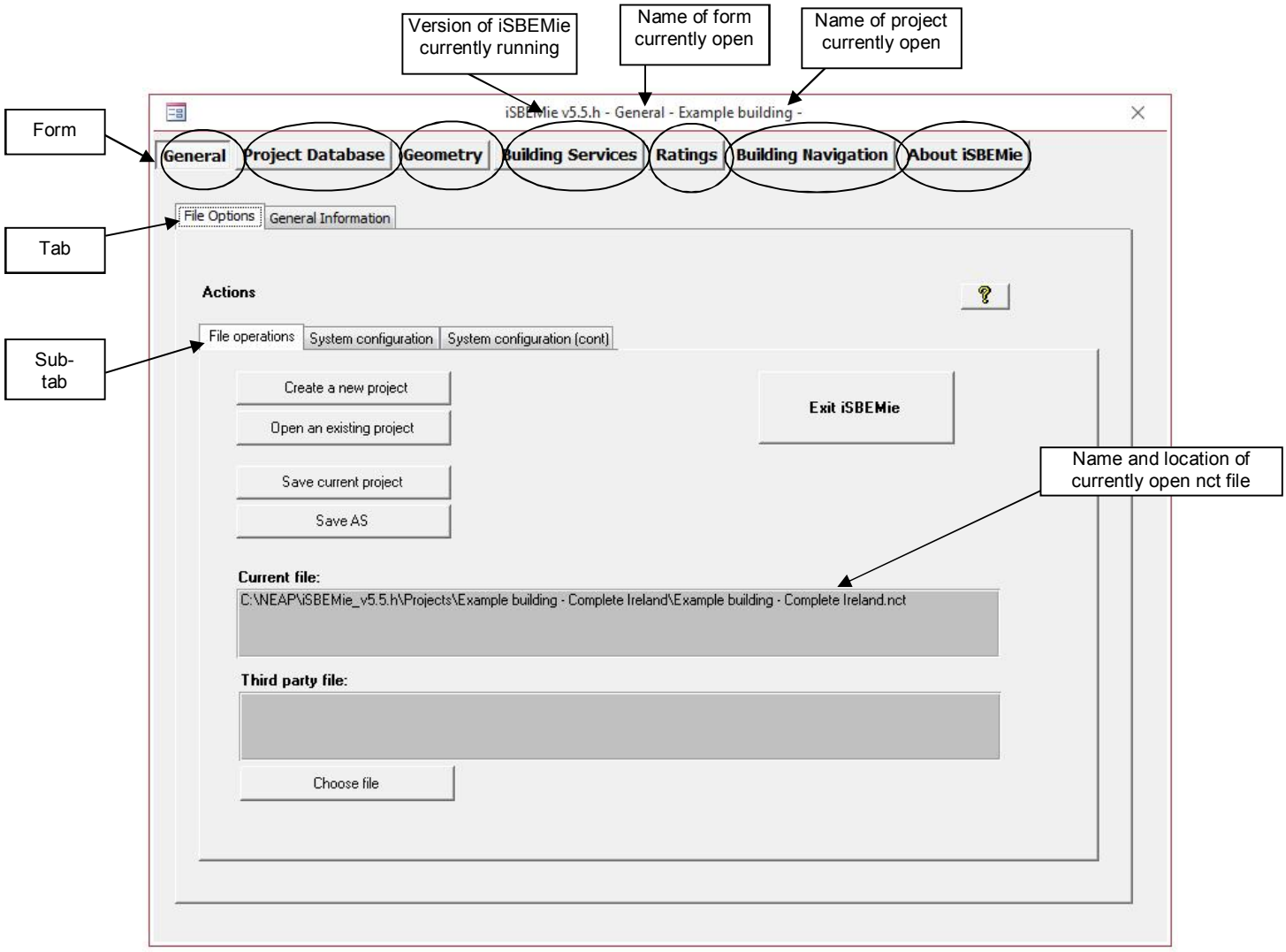

Figure 11: The seven forms in iSBEMie

As can be seen in Figure 11, the top bar of the window displays the version number of iSBEMie you are using, the name of the form currently open, and the name of the project. This bar is always visible in all the form, tabs, and sub-tabs of the interface.

Below is a summary of the data which needs to be entered into each form:

General: The *General* form is where projects can be saved and opened. General information relating to the project can also be recorded here, such as the name and address of the project, type of building, weather data, and details about the client who commissioned the calculation and energy assessor. This information may have already been entered when the project was first created (see Section 4.4: Creating new and opening existing projects, under 'Create a new project'), but they can be edited here.

Project Database: The *Project Database* form is where the glazing and construction details of your building fabric are entered.

Geometry: The *Geometry* form is where the activity, size, and envelope orientations of the "zones" are entered. Each zone requires a description of the walls, floor, roof/ceiling, doors, and windows which comprise its envelopes.

Building Services: The *Building Services* form is where all the building's systems are described, including: HVAC, HWS, PVS, SES, Wind, and CHP systems. Further information on the lighting and ventilation characteristics specific for each zone is also input through this form.

Ratings: The *Ratings* form is used to carry out the energy performance calculation and compliance checking, access the results, and obtain the Building Regulations compliance document along with the draft BER report/certificate. The only data entry in this form is related to modifying the energy efficiency recommendations for the Advisory report that accompanies the BER.

Building Navigation: The *Building Navigation* form provides a hierarchical summary of all the building objects that have been defined, assigned and unassigned, along with key details on some of the objects. There is no data entry in this form.

About iSBEMie: The *About iSBEMie* form displays the licensing conditions for the software. There is no data entry in this form.

5.2. Hierarchy of forms, tabs, and sub-tabs in iSBEMie

Detailed information on each of the listed forms, tabs, sub-tabs, and sub-forms within them is provided in the relevant sections in the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

Form	Tab	*Sub-tab*	*Sub-form*
General			
	File Options		
		File Operations	
		System Configuration	
		System Configuration (cont.)	
	General Information		
		Project Details	
		Building Details	
		Energy Assessor Details	
			Energy Assessor details
		Client Details	
Project Database			
	Constructions for Walls		

General
Assigned

Constructions for Roofs
General
Assigned

Constructions for Floors
General
Assigned

Constructions for Doors
General
Assigned

Glazing
General
Assigned

Geometry

Project
General and geometry
Thermal bridges

Zones
General
Envelope Summary
Quick Envelopes

Envelopes
General
Windows Summary

Doors
General

Windows and rooflights
General

Building Services

Global & Defaults
HVAC System Defaults (if the "Purpose of the analysis" selection in the General form > General Information tab > Project details sub-tab is to generate a BER)
Project Building Services

HVAC Systems
General
Heating
Cooling
Systems Adjustments
Metering Provision
System Controls (if the "Purpose of the analysis" selection in the General form > General Information tab > Project details sub-tab is to generate a BER)
Bi-valent Systems
Zone Summary

HWS
General
Storage & Secondary Circulation
Assigned
Bi-valent Systems

SES
Collector Parameters
Solar Storage & Collector Loop
Auxiliary Energy & Distribution Losses

PVS
General

Wind Generators
General

Solar Collectors
General
Air Flows

CHP Generator General Zones HVAC and HWS Systems Ventilation Ventilation (cont.) Exhaust Lighting Lighting Controls Display Lighting Solar Collectors
Ratings Building Regulations Check Compliance Calculation Logs SBEMIE.log BRIRL.log Calculation Errors SBEMIE.err BRIRL.err Supporting Documents *OR (if the "Purpose of the analysis" selection in the General form > General Information tab > Project details sub-tab is one to generate a BER)* Building Energy Rating BER Graphic Rating Recommendations BER Audit Construction Geometry HVAC & HWS Lighting Calculation Logs SBEMIE.log BERGEN.log BRIRL.log Calculation Errors SBEMIE.err BERGEN.err BRIRL.err Supporting Documents
Building Navigation Selections Object Properties
About iSBEMie

Table 7: Structure of the forms, tabs, and sub-tabs in iSBEMie

6. BASIC iSBEMie FUNCTIONALITY AND THE HELP MENU

6.1. Basic interface functionality and buttons

Within the *Project Database*, *Geometry*, and *Building Services* forms, you are required to enter information about various aspects of the building. The *Project Database* form requires you to enter the information about the properties of each of the construction and glazing types. The *Geometry* and *Building Services* forms require you to enter details about the zones, their envelope elements, windows, and doors and all of the building services systems found in the building (all these items are shown in Figure 1: Structure of SBEMie objects).

All of these items are 'records' within the interface, and there is a *General* sub-tab**,** like the one shown below (Figure 12), for each, where you can view, add, delete, and edit them.

Within iSBEMie, there is an alternative way of entering some types of records, in particular, the nvelope elements and windows. These can be entered using the *Quick Envelope* sub-tab. The functionality of this and any other screens in iSBEMie will be explained in the relevant sections of the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

The majority of the buttons and functionality of iSBEMie can, however, be demonstrated by the *General* sub-tab (Figure 12).

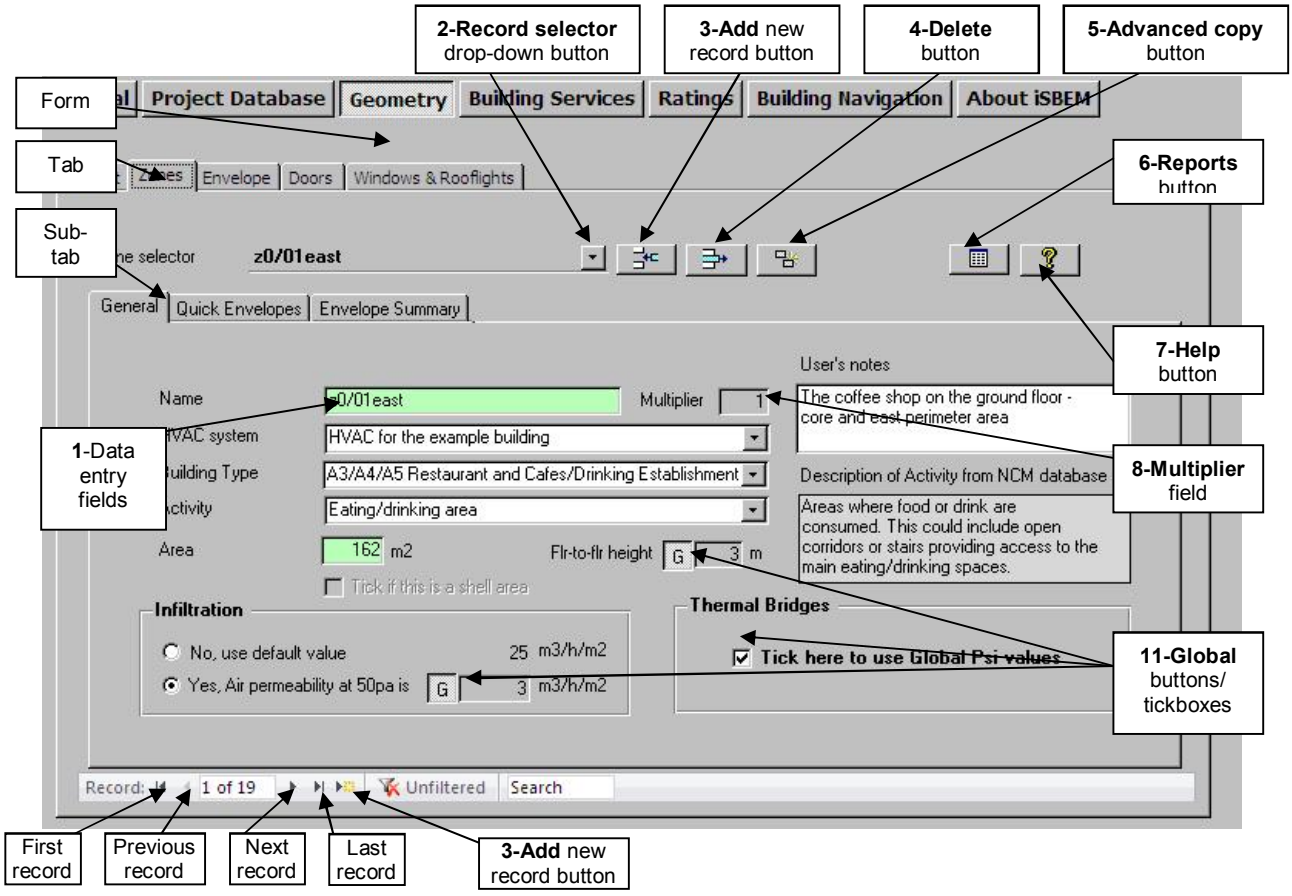

Figure 12: A General sub-tab: basic commands and buttons

1. Data entry fields

The data entry fields in iSBEMie require the user to either enter text/numbers or select an option from a drop-down menu. Some of the fields have a green background. These fields are mandatory and must be filled in before proceeding to the next record or navigating away from that screen.

2. Record selector button 

Clicking on the record selector drop-down button produces a drop-down list of all of the records in that sub-tab. For example, in the *Project Database* form > *Constructions for Walls* tab, clicking on the record selector drop-down button displays all of the constructions for walls that have already been defined in that project.

To the right of the name of the record, there is further information about the parent building objects for that record. For example, in the *Zones* tab, clicking the record selector button displays all of the zones in the building along with the HVAC system with which each zone is associated (the HVAC system that serves the zone).

3. Add new record button 

If you hover over this button with the mouse cursor, the text “Click here to insert a new X” will appear, where X could be a construction object, zone, HVAC system, etc. You can also click on the “Add new record” button  at the bottom of the screen. You will then be prompted to enter a name for the record. Once you have done this, press on the **Tab** or **Enter** button on your keyword. You will then be able to start entering the rest of the information necessary for that record.

NB: The name should be entered in the “Name” field. Do **not** try to add a name in the “Record selector” field.

4. Delete record button 

If you hover over this button with the mouse cursor, the text “Click here to delete current X” will appear. To delete a record, select the record you want to delete from the drop-down “Record selector” menu, and click on the “Delete” record button. Not only will the record be deleted but any associated sub-objects as well. For example, if you delete an envelope element, any associated windows and doors will also be deleted (If a Microsoft Access message box appears showing “Reserved error” or “No current record”, click on “OK” to proceed). A dialogue box will then appear to confirm that you intend to delete the record. Any deletion cannot be undone. It is very important that you determine which associated sub-objects are going to be deleted at the same time. If you are sure you want to delete the record and all its associated records, click on “Yes”.

5. Advanced copy button 

The “Advanced Copy” button is available in the *Geometry* and *Building Services* forms. By clicking on this button, the selected building object, along with all of its associated sub-objects, are copied. The new record is given a name automatically. For example, if you copied an envelope named X, a new envelope would be created and named “X.1”. At the same time, all of its associated objects would also be copied. For example, if an envelope element were copied, any associated windows and doors would also be copied. The copied windows and doors, however, keep the same name as those they were copied from. For a zone, this would mean all of its associated envelope elements, windows, and doors would be copied, and if any HVAC

systems were copied, so would every associated zone, along with all of its envelope elements, windows, and doors.

If you need to only copy the selected record and not any of its sub-objects, use the copy single object function found in the record selector menu (this function will be available in future versions of the tool).

6. Reports button 

Clicking on the "Reports" button produces two reports: the *Data Summary* report and the *Unassigned Objects* report. These reports are for double-checking the data entered. For more details on these two reports, see the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

7. Help button 

The "Help" button can be found in the top right-hand corner of every sub-tab of iSBEMie. Clicking on this button opens the Help menu (see Section 6.2: iSBEMie Help, for further information).

8. Multiplier field

If there is more than one identical zone, for example, this field allows the user to only define it once and then enter the number of these identical zones that exist in the building. Remember that this would also "multiply" all of its associated envelope elements, windows, doors, and additional thermal bridges during the calculation.

9. Record navigation buttons 

These buttons allow you to scroll through the records in that sub-tab quickly.

10. The Escape key – navigating away from incomplete records

Once a new record has been created, iSBEMie will not allow you to navigate away from that screen until you have completed all the mandatory fields (all the green fields). iSBEMie does not have default values for these fields, and they are needed for SBEMie to carry out its calculations. If you need to navigate away from the screen before it is completed, press the **Escape** key on your keyboard.

11. The Global buttons  or tick boxes

Global buttons and tick boxes allow you to use previously defined 'global' values for a variety of parameters. For example, in Figure 12 , the global 'air permeability at 50pa' button is pressed in. This means that the current record (in this case, zone z0/01east) takes the previously defined 'global' air permeability value (this global value is defined in the *Geometry* form > *Project* tab > *General and Geometry* sub-tab – see Table 8: Global parameters).

When the Global button or tick box is not pressed in or ticked, you are able to enter a value specifically for that record. Table 8: Global parameters - shows the global parameters available in iSBEMie, where they are defined, and where they are later used.

Parameter	Global value defined:	Location of Global button or tick box
Air permeability	*Geometry* form > *Project* tab > *General and Geometry* sub-tab	*Geometry* form > *Zones* tab > *General* sub-tab
Zone height	*Geometry* form > *Project* tab > *General and Geometry* sub-tab	*Geometry* form > *Zones* tab > *General* sub-tab
Thermal bridges	*Geometry* form > *Project* tab > *Thermal bridges* sub-tab	*Geometry* form > *Zones* tab > *General* sub-tab
Condition of adjoining space for envelope elements	*Project Database* form > *Construction for Walls* tab > *General* sub-tab *Project Database* form > *Construction for Floors* tab > *General* sub-tab *Project Database* form > *Construction for Roofs* tab > *General* sub-tab	*Geometry* form > *Envelope* tab > *General* sub-tab *Geometry* form > *Zones* tab > *Quick Envelopes* sub-tab

Table 8: Global parameters

6.2. iSBEMie Help

iSBEMie Help can be accessed in two ways:

1. By pressing the "Help"  button which appears on every sub-tab in the interface as described in Section 6.1. This opens the "Help Topics" window from which you can navigate to the item of interest (see Figure 13).
2. By clicking into the field of interest and pressing the **F1** key on your keyboard. This opens the specific Help entry relating to that particular field in the "Help Entries" window (see Figure 14). From there, you can click either "Contents", "Index", or "Find" to open the "Help Topics" dialogue box.

There are Help entries on each of the fields in the interface, and there is a selection of "How to" entries, such as, how to close iSBEMie, how to name the building objects, or how to go about describing a roof. Most of this information can also be found in this User Guide.

Help Topics window (Figure 13)

All of the Help topics are listed in the "Help Topics" window. It contains two screens from which you can navigate to your chosen topic: the "Contents" screen and the "Index" screen.

- The "Contents" screen lists all the entries under the iSBEMie form, tab, or sub-tab to which they relate or under the "How to.." menu.
- The "Index" screen lists all the entries in alphabetical order, and it contains a "Find" facility which brings back all the Help entries which contain, in their contents, a given word or phrase.

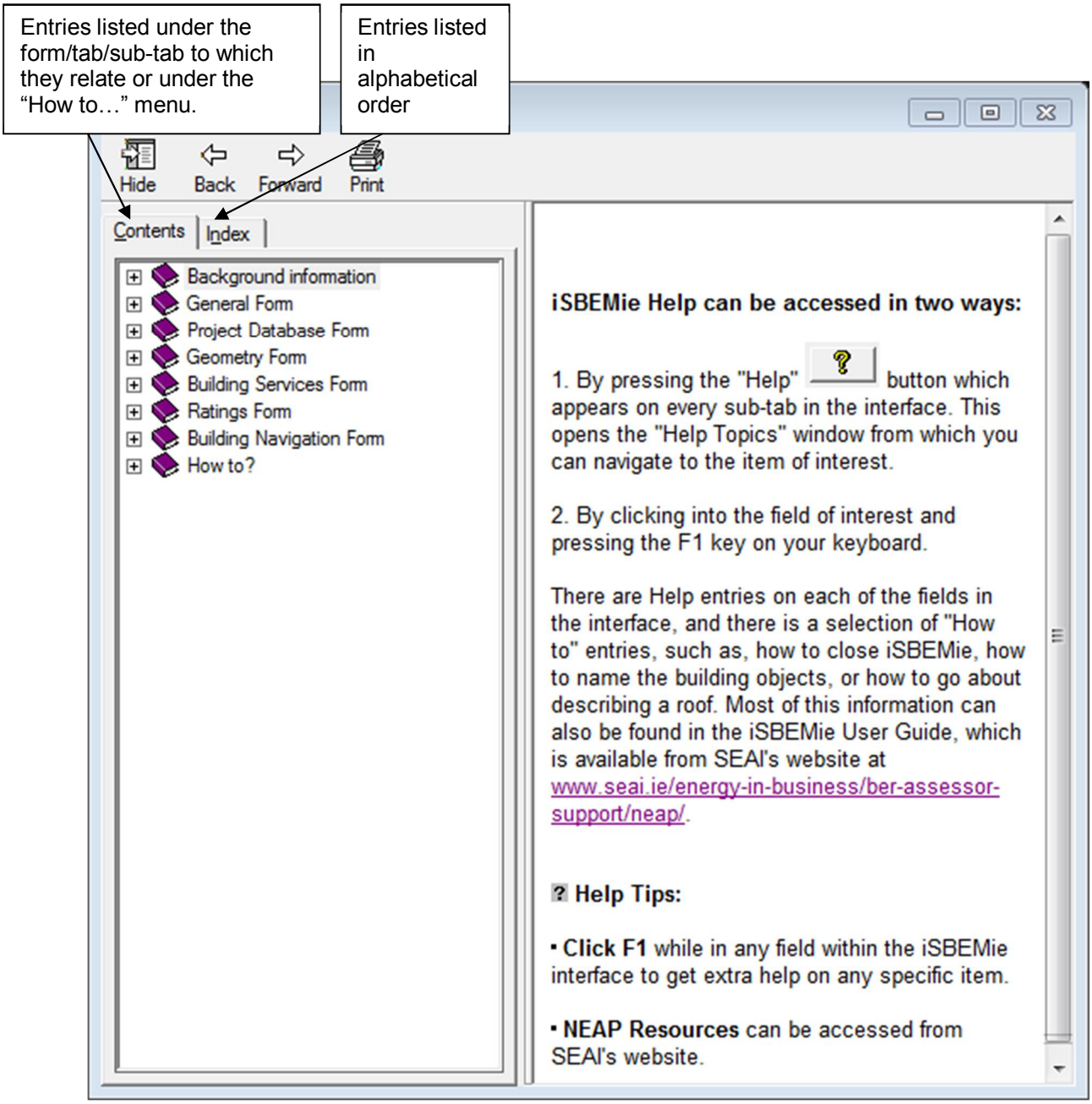

Figure 13: Help Topics window

Help Entries window (Figure 14)

Double-clicking on the item of interest in the "Help Topics" window, or clicking on **F1** on your keyboard, while the cursor is in the relevant field in the interface, opens the "Help Entries" window on the page of interest.

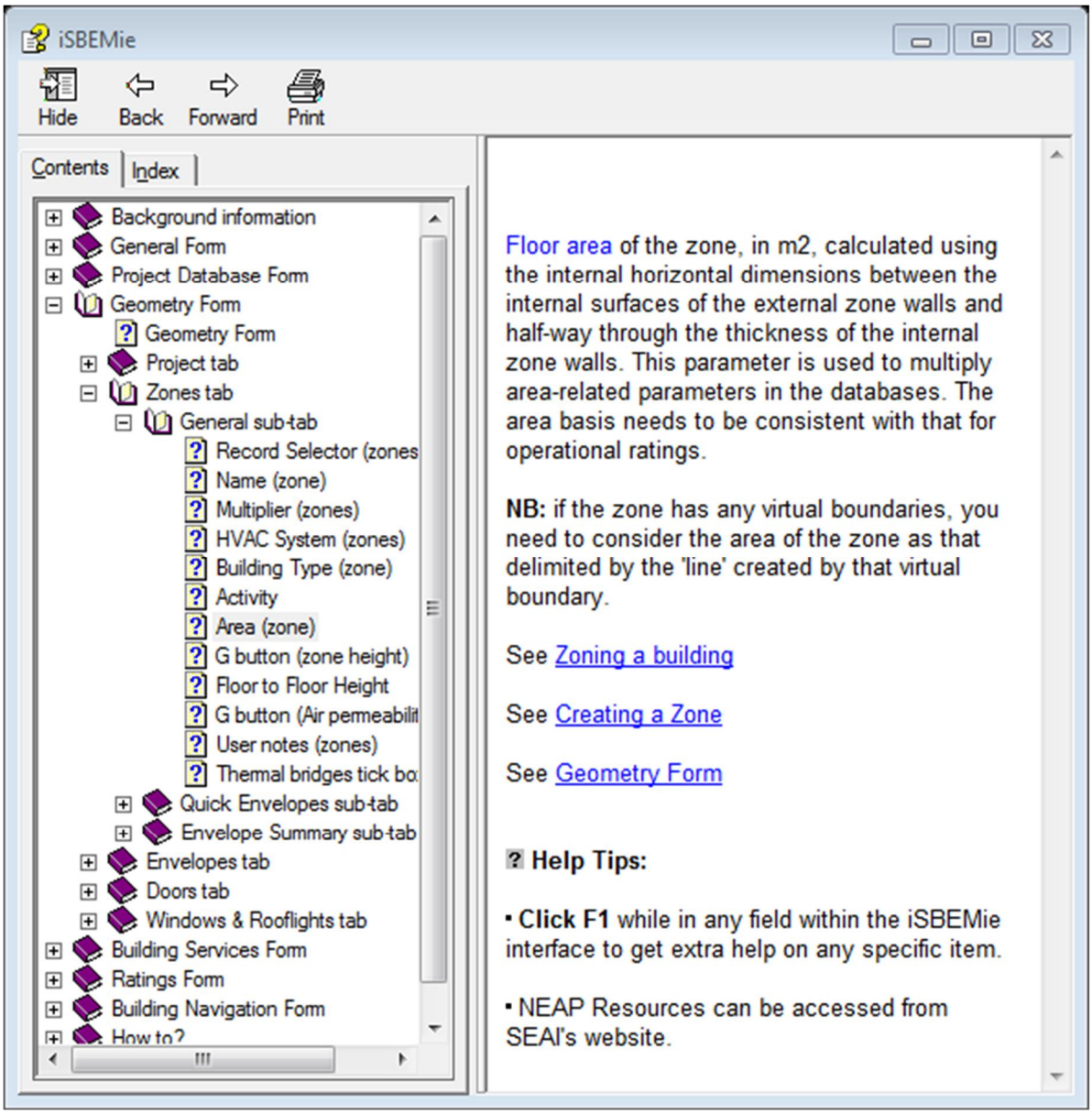

Figure 14: Help Entries window for area of a zone

7. ENTERING A BUILDING INTO iSBEMie

7.1. Order of data entry

Some items need to be defined before others in iSBEMie. For example, the building fabric needs to be defined before the walls, doors, and windows can be fully described. This hierarchy between the different elements defined in iSBEMie can be seen in Figure 1: Structure of SBEMie objects. However, there is a degree of flexibility too.

Figure 15 shows which elements need to be entered before others and also gives a suggested order of data entry. It is this order that is followed in the tutorial.

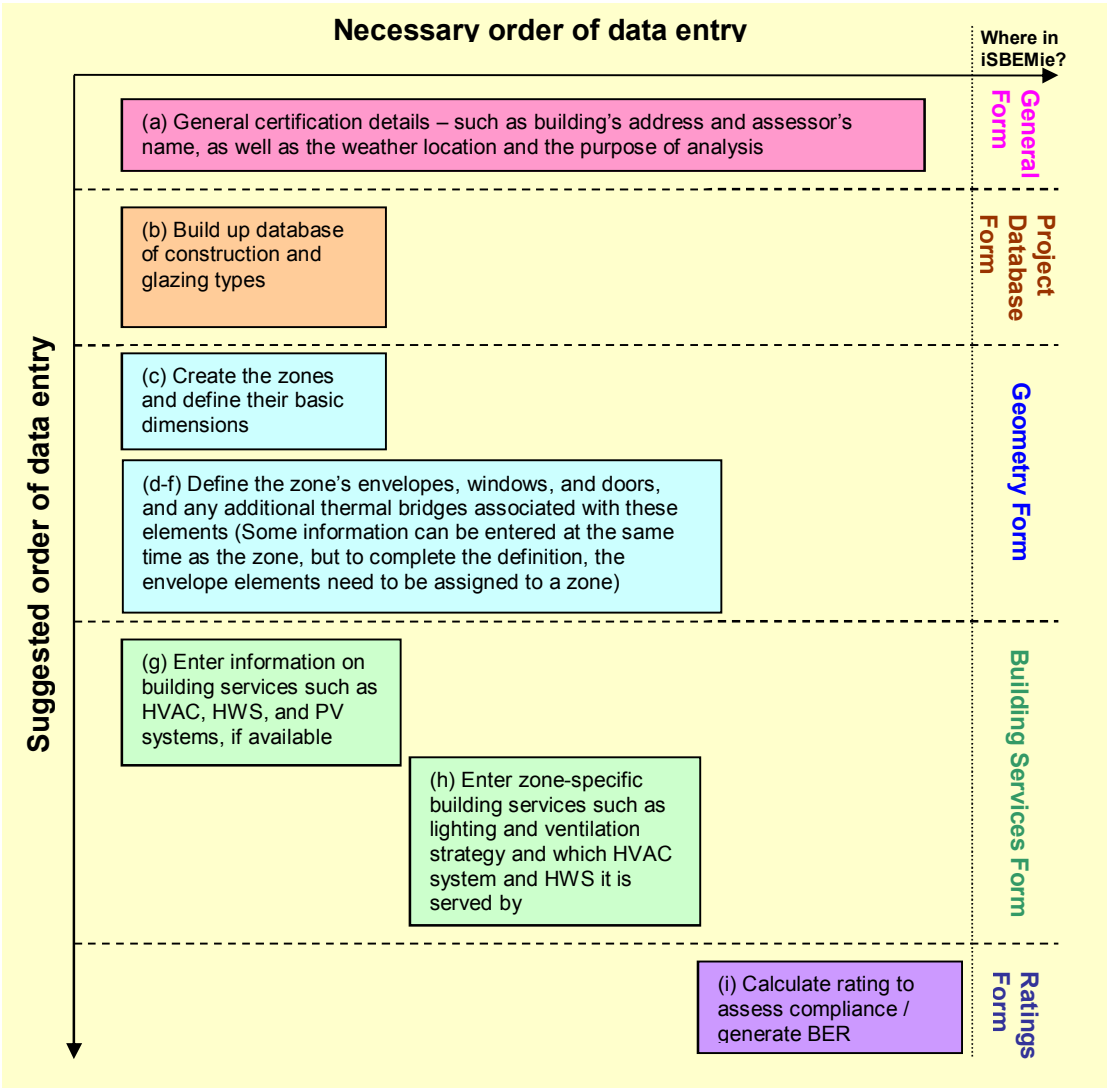

Figure 15: Order of data entry

(The stages, indicated by the letters in Figure 15 (a – i) correspond to the stages described in Section 2.5: Overview of how a building is defined in iSBEMie).

7.2. Important note on the default values in iSBEMie

In iSBEMie, there are default values included for various parameters. For example, there are default seasonal efficiencies for HVAC systems and default constructions for envelope elements so that you can select them when defining the envelopes of a zone when learning how to use the tool. These default values are not generous (i.e., usually pessimistic), should be checked by the user, and, if appropriate, changed or added to.

NB: If none of the default values in iSBEMie are changed when modelling a new building, it is very likely that the building will not comply with Building Regulations and will not achieve a favourable BER.

8. iSBEMie FILE CONVERSION

If you want to open and edit files which were created with the previous versions from iSBEM_v3.5.a onwards using this current version (iSBEMie_v5.5.h), you will need to convert them to v5.5.h using the conversion tool “nct_convert_v5.5.h.mdb”, as described below. If you wish to open and edit versions which were created with iSBEM versions prior to v3.5.a, you will need to convert them first to iSBEM_v3.5.a using the conversion tool “nct_convert_UP TO_v3.5.a.mdb “, and then convert the v3.5.a. nct file to iSBEMie_v5.5.h using the conversion tool “nct_convert_v5.5.h.mdb”. Both file conversion tools are downloaded and installed to your computer at the same time as you download and install the new version of iSBEMie. There are 6 stages to converting the files from iSBEM_v3.5.a or iSBEM_v3.5.b to iSBEMie_v5.5.h:

1. **Open the file conversion tool** - Double-click on the ‘nct_convert_v5.5.h.mdb’ file in the iSBEMie_v5.5.h folder, as shown in Figure 16.

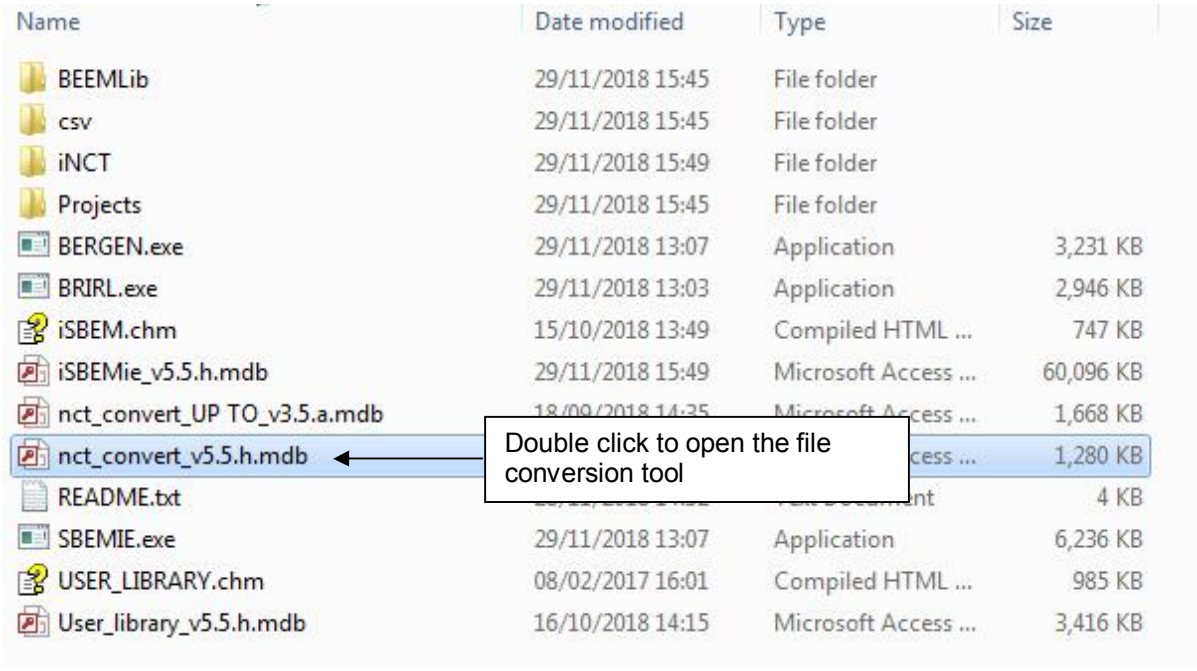

Figure 16: Folder showing the file conversion tool

2. **Select the file you want to convert** - To do this, click on the button shown in Figure 17. This opens a dialogue box, shown in Figure 18, from which you need to browse to find the file you want to convert. Once you have found the file, click on ‘Open’. This file must have been created using iSBEM_v3.5.a or iSBEM_v3.5.b or converted to iSBEM_v3.5.a or iSBEM_v3.5.b.

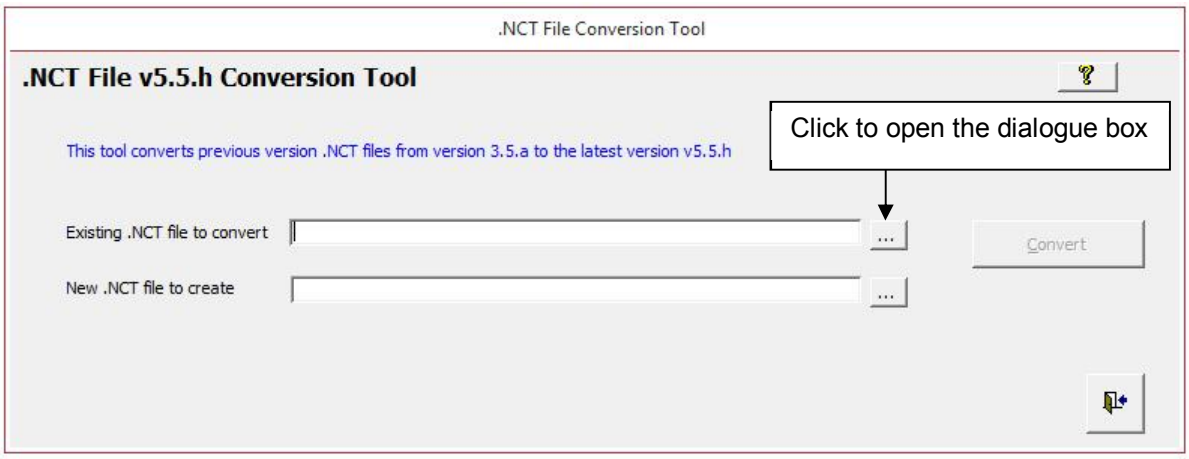

Figure 17: Selecting a file to convert - stage 1

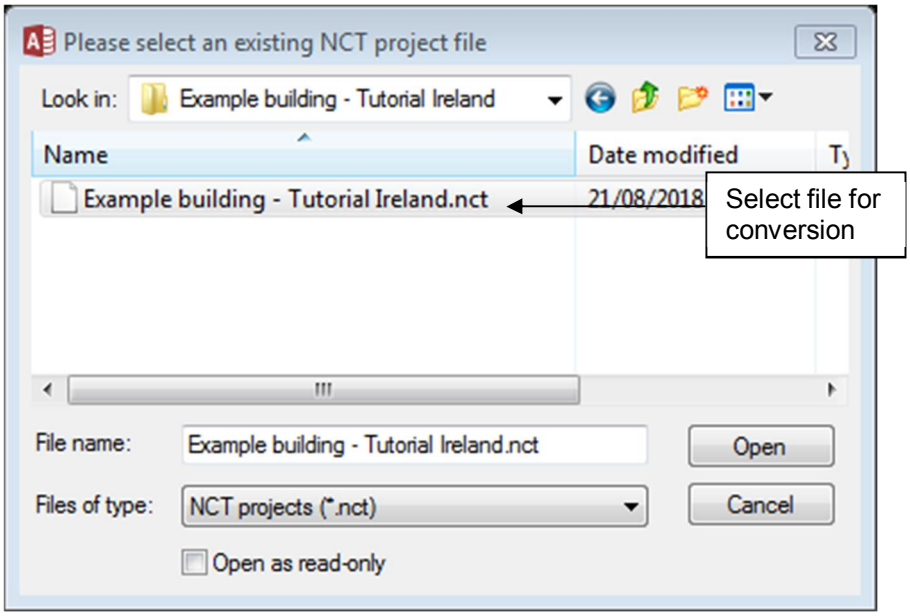

Figure 18: Selecting a file to convert - stage 2

3. Choose a name for the converted file - There are two options:

i. Click on the button shown in Figure 19. This opens a dialogue box (the same as in stage 2). Re-select the file you are converting and click on 'Save'. The new file will automatically be given the name: "original file name**_v5.5.h.nct"**. The original file will not be over-written by the conversion tool, and you should keep it for future reference.

ii. If you want to give the converted file a new name of your own, type a new name and its full path into the field (shown in Figure 19).

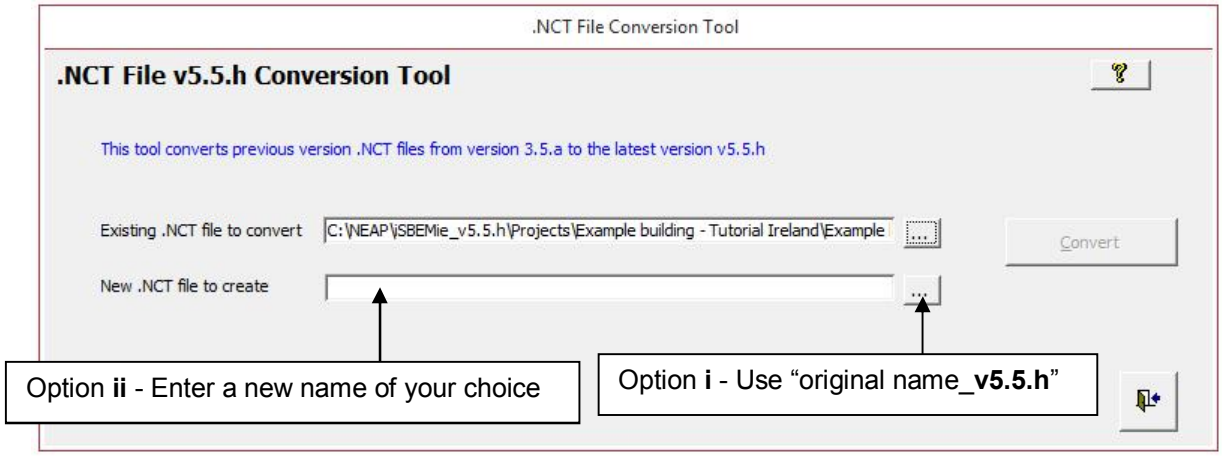

Figure 19: Naming the new file

4. **Convert the file** – When both of the fields are filled, the 'Convert' button becomes active (see Figure 20). Clicking on this button converts the files and produces the message shown in Figure 21. Click on 'OK'. The new file will be saved to the same folder as the original file by default, unless you specify otherwise.

5. **Close the tool** – Click on the 'Exit' button (see Figure 20).

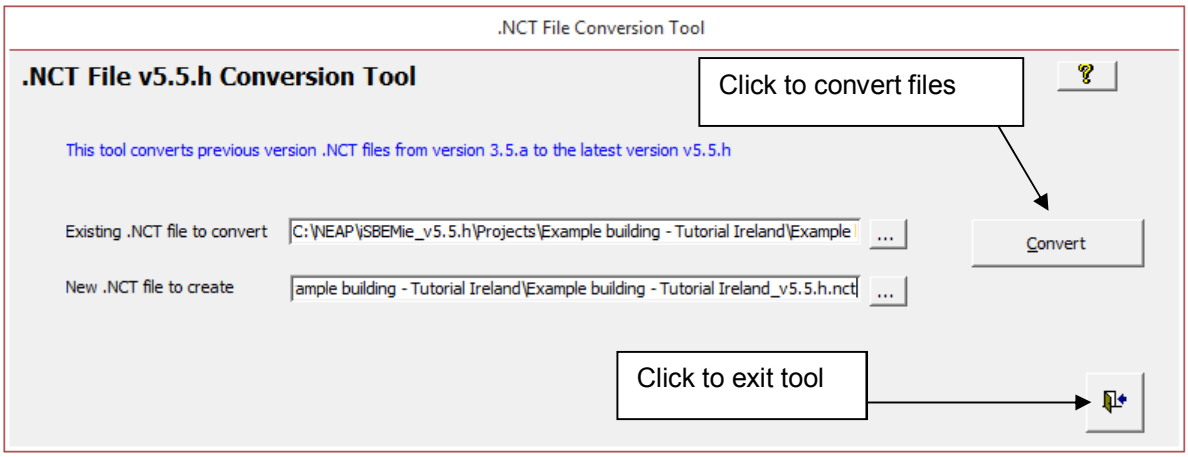

Figure 20: The Convert and Quit buttons

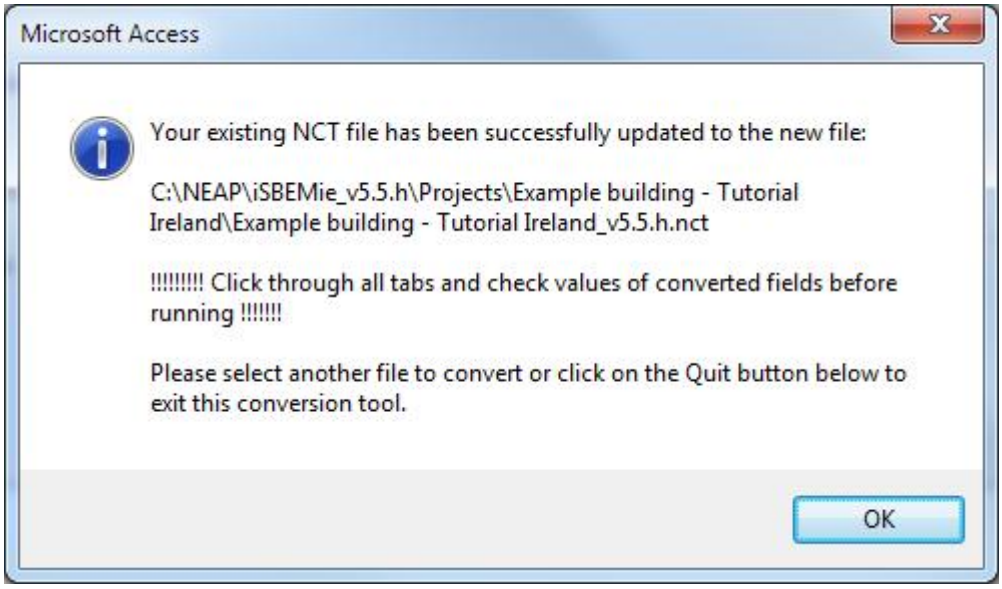

Figure 21: Message which appears after conversion

6. **Open iSBEMie and open the newly created nct file** - Due to the nature of the changes introduced in the new version, some fields in some projects may not get refreshed automatically. In order to ensure all the fields in your project are refreshed and updated, after converting files generated by a previous version, it is essential that you do the following (using the record navigation arrows at the bottom):
   - Click through all the zones in the *Geometry* form > *Zones* tab.
   - Click through all the envelope elements in the *Geometry* form > *Envelope* tab.
   - Click through all the HVAC systems in the *Building Services* form > *HVAC systems* tab > *General* sub-tab.
   - Click through all the sub-tabs in the *Building Services* form > *Zones* tab.
   - Due to the construction database having been updated in certain parts, you may wish to review your construction definitions in the *Project Database* form if the constructions were selected either from the library or using the inference method.

7. **Double check and note the points which have changed since the previous version:** Please see section 2.1.1: Key differences in the software for a list of the changes introduced in this version of the tool and manual. It is essential that you click through and review **all** the different forms, tabs, and sub-tabs of iSBEMie and ensure that you provide input for parameters that did not exist in previous versions. This would also allow any changes that have been made to iSBEMie's default values to be adopted into the input correctly. You might also wish to modify your input for any of the existing parameters based on any further guidance added in this manual or the Help pages.

NB: The development of each new version of iSBEMie has incorporated improvements to the calculation algorithms, added features, modifications to some of the underlying databases, and correction of identified minor bugs. Hence, the generated results may differ either way from those generated by previous versions, depending on the individual projects. This is especially true if you are comparing results from the current version to those produced by a much older version of the tool.

9. USER-DEFINED CONSTRUCTION DATABASE

The User Library (User_library_v5.5.h.mdb) is a feature first introduced with iSBEM_v2.0.c. You can now build up a database of your commonly used constructions so that you do not need to re-enter them each time you start a new project. You can also import constructions into your Library from a project you have been working on in iSBEM or iSBEMie or from another User Library.

This chapter will take you through the basics of:

1. How to add a construction type to your library – and add this to iSBEMie
2. How to add a glazing type to your library – and add this to iSBEMie
3. How to add a frame type to your library – and add this to iSBEMie
4. How to edit the list of opaque constructions categories and the list of sources
5. How to import constructions previously entered into an iSBEMie project or in another User Library into your own User Library

For definitions of a particular parameter, place the curser in that field and press F1. This will open a window with the Help item for that field, in the same way that the Help can be accessed within iSBEMie. These definitions are not included in this chapter.

The User library can be found as shown in Figure 22:

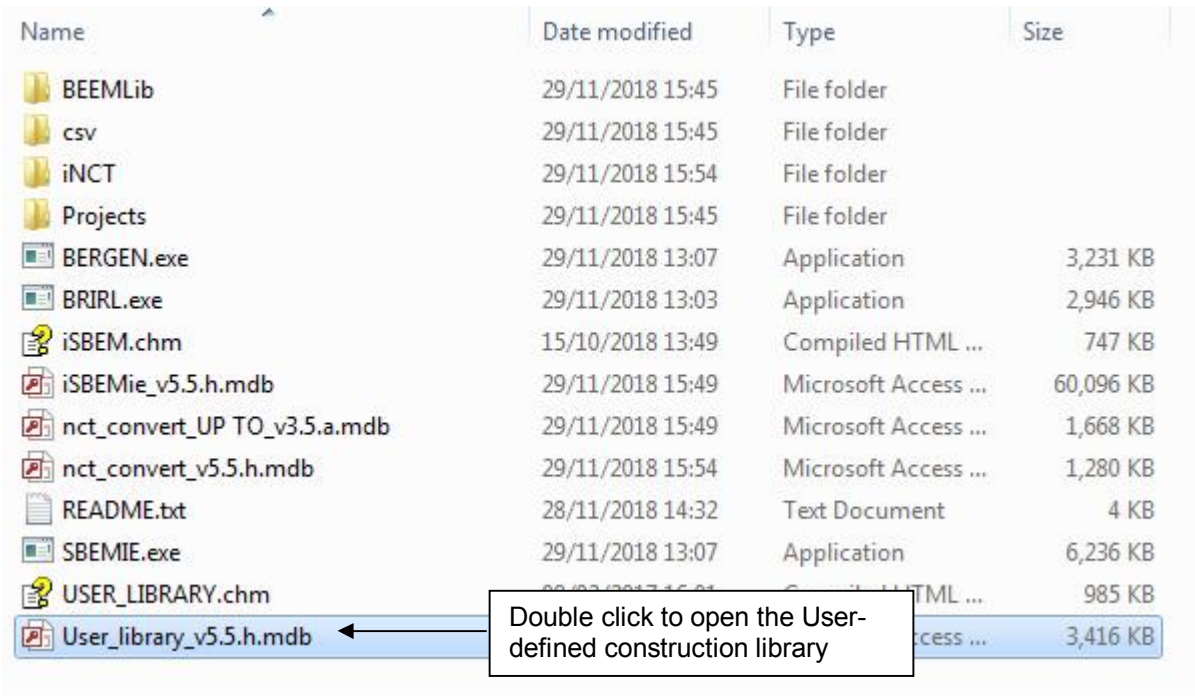

Figure 22: Location of the User-defined construction library

1. How to add a construction type to your library – and add this to iSBEMie

To add a construction to the User Library, click into the *Constructions* form and follow the instructions starting by clicking on the “create new construction” button and finishing by updating the library in iSBEMie.

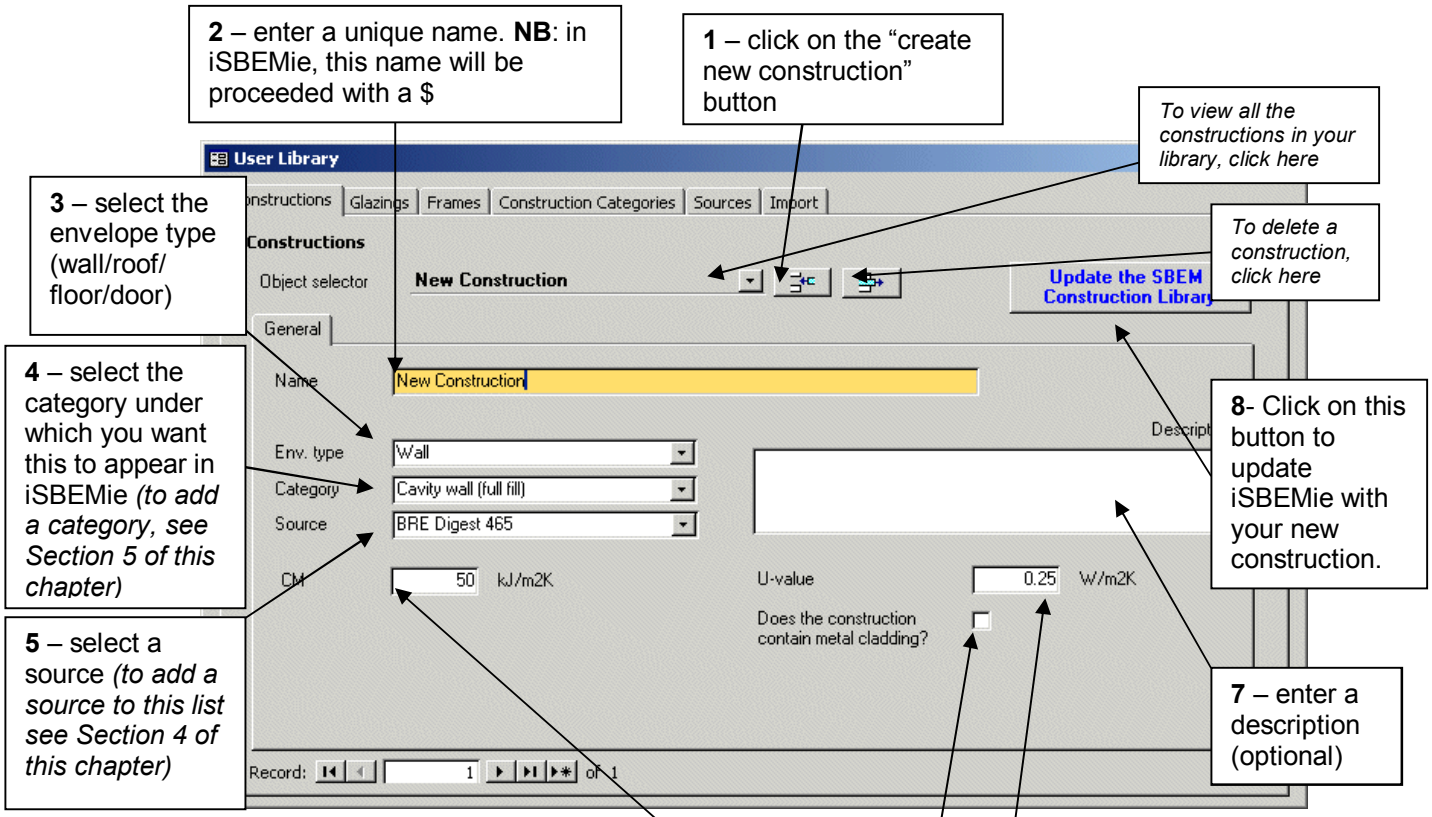

Figure 23: Description of Constructions tab in User-defined construction library

6 – enter κ_m value, U-value, and tick if construction contains metal cladding. For further details on these parameters, press F1 in the library or refer to the User Guide volume "How to use iSBEMie: Compliance Assessment".

A construction created in this way will be accessible in iSBEMie from the *Project Database* form. It will be located in the "Constructions for X" tab, where X is the type of envelope as selected in the envelope type field (stage 3) and under the category as selected in the category field (stage 4). The construction will be called $*Construction Name,* where *Construction Name* is the name entered in the name field.

2. How to add a glazing type to your library – and add this to iSBEMie

Adding a new glazing type to the glazing Library and updating iSBEMie with this information is done in the same way as for constructions but in the *Glazing* form. For glazing, in addition to requiring a unique name, U-value, and source of the information, you are required to enter parameters which describe the solar and light transmission properties of the glazing. For details of any of the parameters, press F1, or see the User Guide volume "**How to use iSBEMie: Compliance Assessment**".

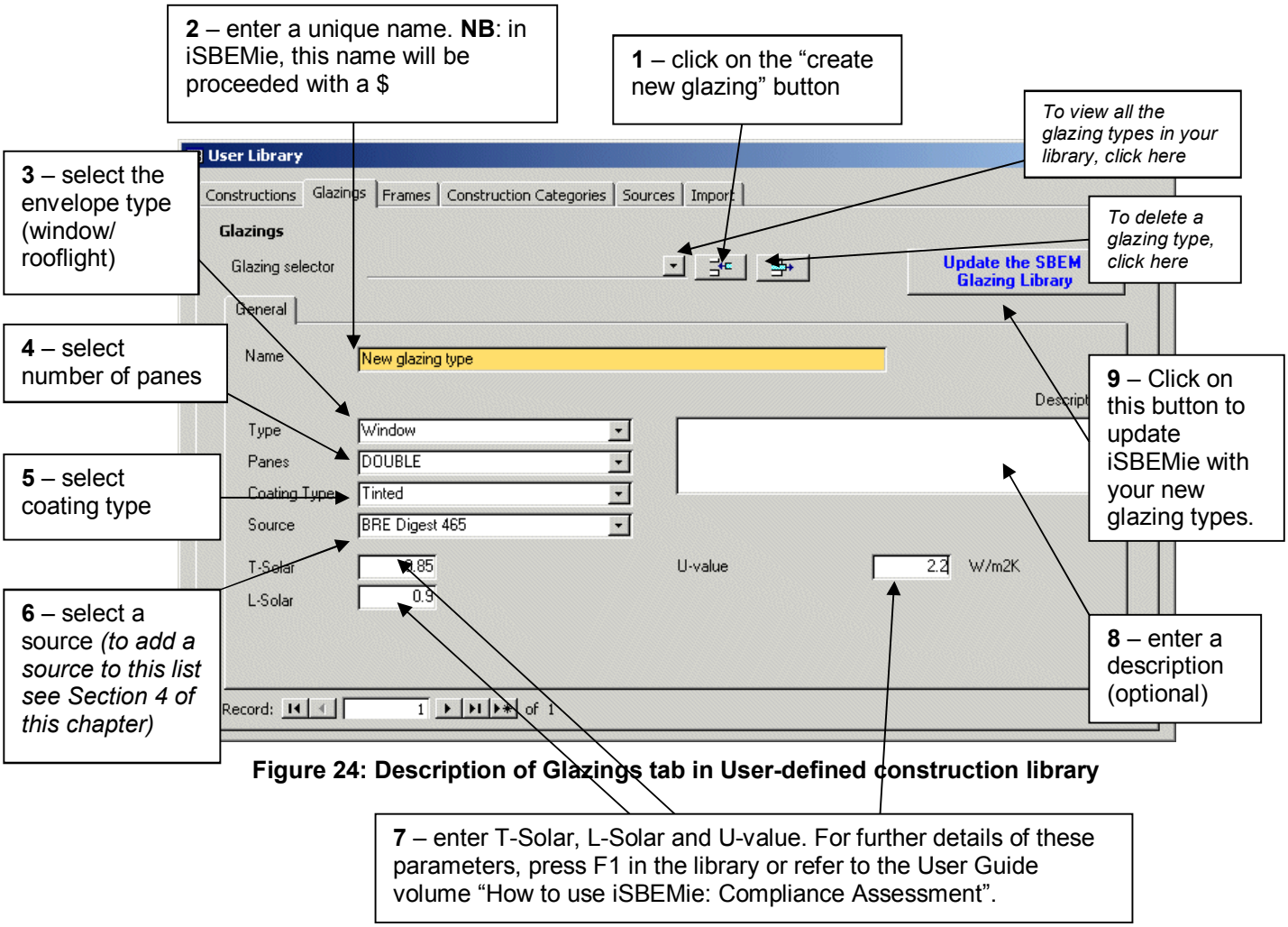

Figure 24: Description of Glazings tab in User-defined construction library

7 – enter T-Solar, L-Solar and U-value. For further details of these parameters, press F1 in the library or refer to the User Guide volume "How to use iSBEMie: Compliance Assessment".

A glazing type created in this way will be accessible in iSBEMie in the *Project Database* form > *Glazing* tab. It will be accessible when the "import one from the library" radio button is selected, from the glazing library. The glazing type will be called $*Glazing Name,* where *Glazing Name* is the name entered in the name field.

3. How to add a frame type to your library – and add this to iSBEMie

As with the glazing, you can add a frame to your frames library in the same way that you add a construction to the constructions library but in the *Frames* form. The only parameters required to define a frame is the type (PVC, hardwood, softwood, steel, etc.) and the U-value. You are able to enter a description as with the constructions and glazing libraries.

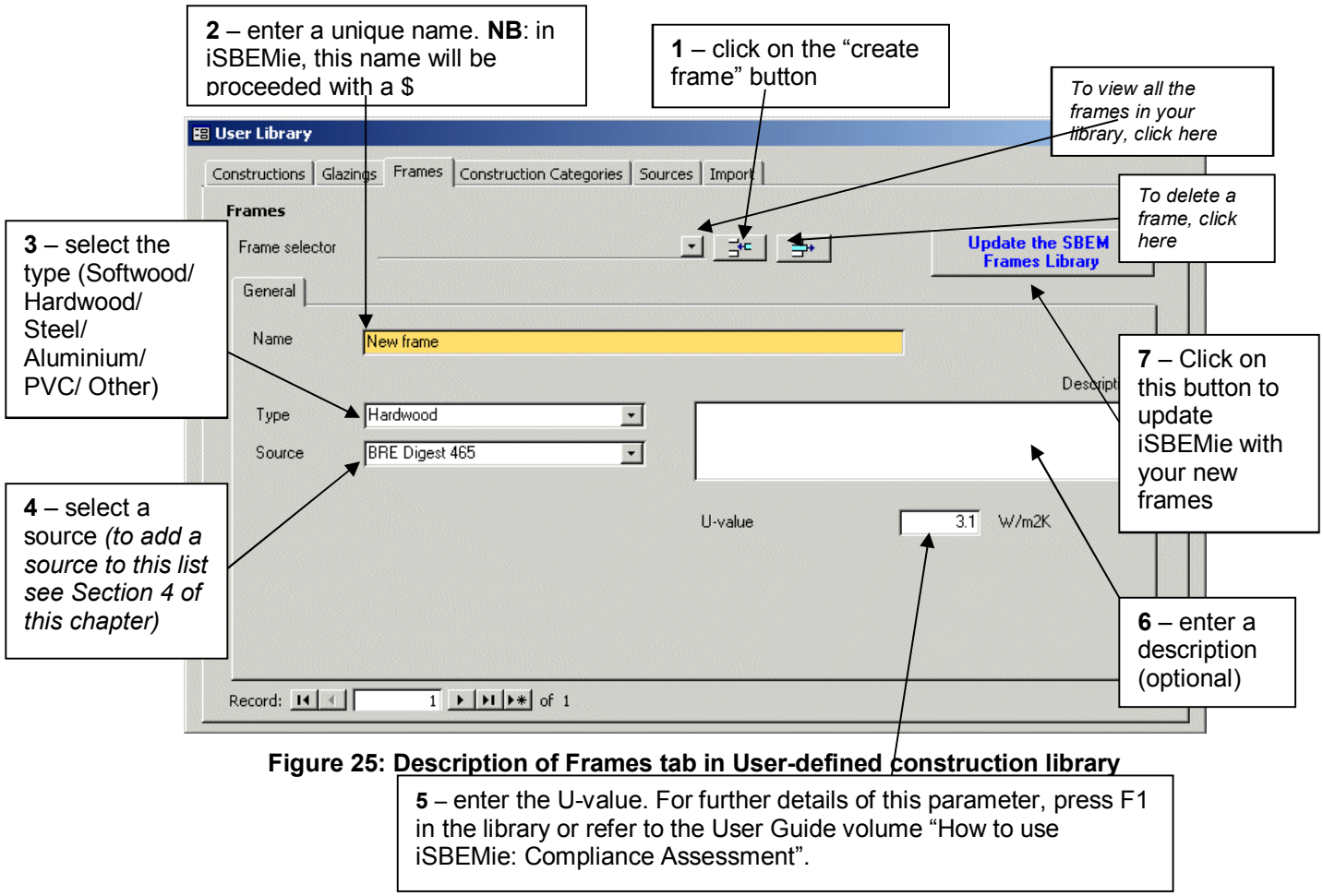

Figure 25: Description of Frames tab in User-defined construction library

A frame type created in this way will be accessible in iSBEMie in the *Project Database* form > *Glazing* tab. It will be accessible when the "import one from the library" radio button is selected, from the frame library. The frame type will be called $*Frame Name,* where *Frame Name* is the name entered in the name field.

4. How to edit the list of opaque constructions categories and the list of Sources

- ***Editing the list of categories for opaque constructions***

  As described in Section 1, when creating a new construction type for your library, you need to select a category under which your construction will appear in iSBEMie. If none of the pre-defined categories are appropriate, you can add a new one to the library in the *Category* form. To do this, enter the *Category* form, click on the "create new category" button, add a unique name in the name field, select an envelope type, and if you want, add a description. This category will now appear in the "Category" field in the *Constructions* form.

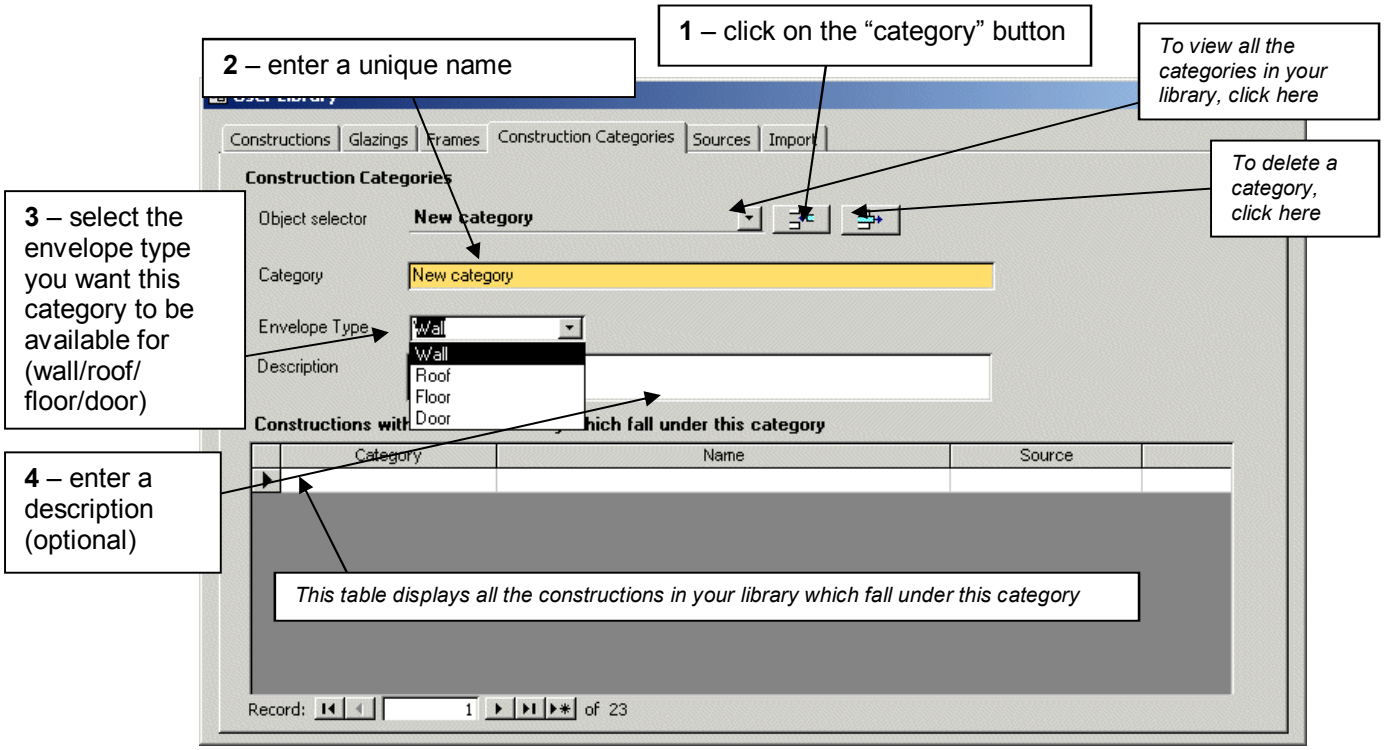

Figure 26: Description of Construction Categories tab in User-defined construction library

- ***Editing the list of sources which you can select when defining opaque constructions, glazing types, or frame types***

  The list is viewable and editable in the *Sources* form. To add a new source, click on the "enter new source" button and write the name of the source in the source field. This source will now be available for selection in the *Construction*, *Glazing*, and *Frames* form.

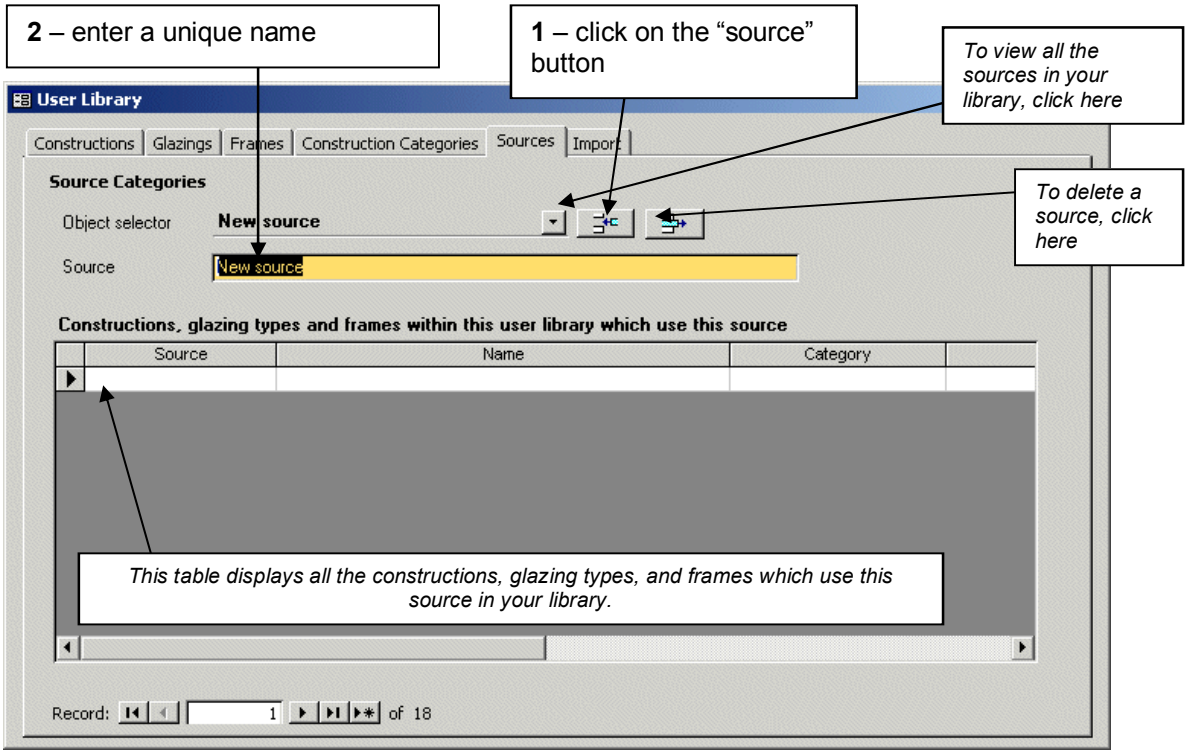

Figure 27: Description of Sources tab in User-defined construction library

5. How to import constructions previously entered into an iSBEMie project or in another User Library into your own User Library

You may wish to import constructions from an existing User Database into your own, for example, from a colleague's User Database. This can be done in the *Import* form. Similarly, In iSBEMie, there is already a library of constructions which you can choose from in the *Project Database* form. If you wanted to edit any of these, you could import these into your User Library. This is done by selecting the mdb (User Database) file or nct (iSBEMie file) and clicking on the appropriate import button as shown in Figure 28.

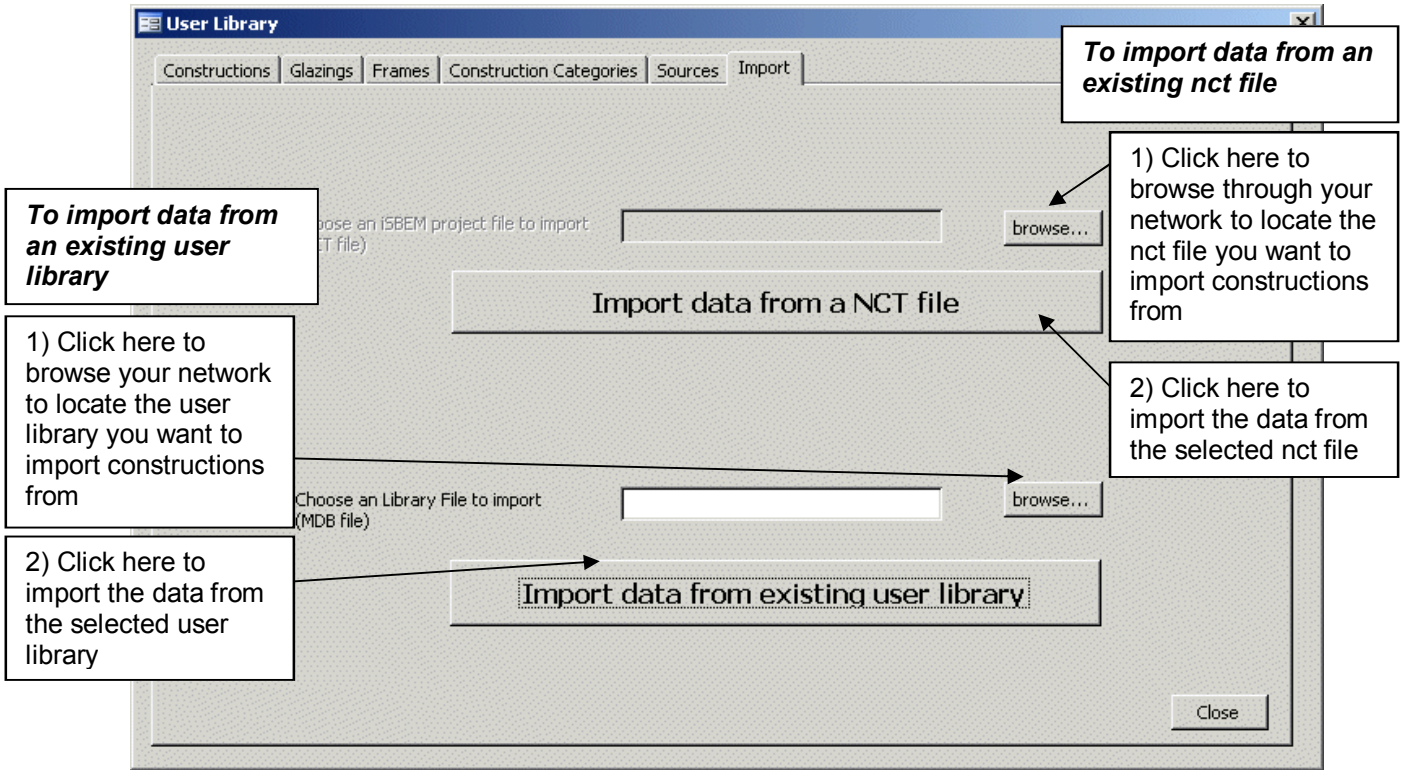

Figure 28: Description of Import tab in User-defined construction library

Once this procedure is successfully completed, these records will be available for editing within the User Library tool, and should also be automatically available for use within iSBEMie without any further updates needing to be carried out.

NB: All user-updated constructions, glazings, and frames from the User Library (including those that have been imported) will have the prefix "§ " added to them (unless it already exists, in which case an additional § will NOT be added).

NB: Should a construction/glazing/frame of the same name as an existing construction/glazing/frame be imported into the User Library, a number will be appended to the end of it, according to the number of records in the User Library with a similar name, i.e., a record with name *Name* will have its name changed to *Name.1*, *Name.2*, *Name.3,* etc. depending on whether there are already 1, 2, 3, etc. records in the database already with a similar name (excluding the suffix).

NB: Frames cannot be imported from NCT files due to the nature of their table layouts. Only constructions and glazings can be imported by this procedure.

APPENDIX A: Matrix of activity areas and building types

Activity Type / Building Type	Retail and Financial/Professional services	Restaurant and Cafes/Drinking Establishments and Hot Food takeaways	Offices and Workshop businesses	General Industrial and Special Industrial Groups	Storage or Distribution	Hotels	Residential Institutions - Hospitals and Care Homes	Residential Institutions - Residential primary schools	Residential Institutions - Universities and colleges	Secure Residential Institutions	Residential spaces	Non-residential Institutions - Community/Day Centre	Non-residential Institutions - Libraries Museums and Galleries	Non-residential Institutions – Primary Education	Non-residential Institutions - Primary Health Care Building	Non-residential Institutions - Law Courts	General Assembly and Leisure plus Night Clubs and Theatres	Others - Passenger terminals	Others - Emergency services	Others - Miscellaneous 24hr activities	Others - Car Parks 24 hrs	Others - Stand alone utility block	Non-residential Institutions – Post-primary Education	Residential Institutions - Residential Post-primary schools
12hr Specialist Treatment Area							X																	
24 hrs Consulting/treatment areas							X																	
24x7 Bedroom Unit							X																	
24x7 Circulation area (corridors and stairways)																				X				
24x7 Generic Office Area					X															X				
24x7 Reception																				X				
24x7 Toilet																				X				
24x7 Warehouse storage					X																			
Assembly areas / halls						X	X																	
Auditoria																	X							
Bathroom						X	X	X	X	X									X					
Bedroom								X	X										X					
Bedroom Only						X																		
Bedroom Unit							X																	
Car Park	X		X																		X			
Cell (police/prison)										X						X			X					
Changing facilities with showers			X		X	X	X	X	X	X		X		X			X		X			X		
Circulation area (corridors and stairways)			X	X	X	X		X	X	X		X		X	X	X			X		X			
Circulation area (corridors and stairways) - non public	X	X											X				X	X						
Circulation area (corridors and stairways) - non-public/restricted							X																	
Classroom							X		X	X														
Common circulation areas											X													
Computer lab								X	X					X										
Data Centre																				X				

Dept Store Sales area - chilled	X																							
Dept Store Sales area - electrical	X																							
Dept Store Sales area - general	X																							
Diagnostic Imaging							X																	
Display and Public areas													X											
Display window	X																							
Domestic Bathroom											X													
Domestic Bedroom											X													
Domestic Circulation											X													
Domestic Dining room											X													
Domestic Kitchen											X													
Domestic Lounge											X													
Domestic Toilet											X													
Dry sports hall						X		X	X	X		X		X			X		X					
Eating/drinking area	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X					
En suite bedroom						X																		
Fitness Studio																	X							
Fitness suite/gym			X			X			X	X							X		X					
Food preparation area	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X					
Generic Checkin areas																		X						
Generic Office Area	X	X	X	X	X	X							X			X	X	X	X		X			
Generic Ward							X																	
Hall/lecture theatre/assembly area								X	X	X		X	X	X		X	X							
Heavy Plant Room																				X				
Hydrotherapy pool hall							X																	
Ice rink																	X							
Industrial process area				X			X																	
Laboratory				X			X	X	X				X	X										
Laundry	X					X	X	X	X	X							X							
Light plant room	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X			
Lounges																		X						
Office and consulting areas							X	X	X	X		X		X	X									
Operating theatre							X																	
Performance area (stage)		X															X							
Physiotherapy Studio							X																	
Post Mortem Facility							X																	
Public circulation areas							X										X							
Reception			X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X					
Residents common rooms								X	X															
Residents kitchen									X															
Retail Warehouse Sales area - chilled	X																							
Retail Warehouse Sales area - electrical	X																							

Retail Warehouse Sales area - general	X																							
Sales area - general																X								
Server Room																			X					
Small Shop Unit Sales area - chilled	X																							
Small Shop Unit Sales area - electrical	X																							
Small Shop Unit Sales area - general	X																							
Specialist Care Ward							X																	
Store Room	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X					
Swimming pool						X		X	X					X			X							
Teaching Areas								X						X									X	X
Teaching Areas DoES TGD033 2018								X						X									X	X
Toilet	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X			
Waiting Rooms																		X						
Warehouse storage				X	X																			
Workshop - small scale			X					X	X	X		X	X	X			X							