SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Non-Domestic Energy Assessment Procedure (NEAP)

Guidance Document

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Sustainable Energy Authority of Ireland

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

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1. INTRODUCTION

The Non-Domestic Energy Assessment Procedure (NEAP) is the official procedure for the calculation of energy performance of non-domestic buildings in Ireland for the purposes of producing Building Energy Ratings (BER). It considers space heating, cooling, ventilation, water heating, and lighting in a building. The Sustainable Energy Authority of Ireland (SEAI) publishes NEAP and the associated guidance and procedural documents.

NEAP is used by registered BER assessors to calculate the BER of new and existing buildings and to demonstrate compliance with aspects of Part L of the Building Regulations.

1.1 Purpose of this document

The primary purpose of this document is to consolidate guidance from several previous* documents and resources, including:

- NEAP Technical Bulletins (some articles updated to match new software methodology).
- Guidance issued at previous technical workshops run for BER assessors, also updated.

Updated guidance: The material obtained from the above sources has been updated to match the updated iSBEMie software V5.5h. Subjects or examples where changes are significant, compared to previous guidance, are marked **Updated guidance.** It is recommended that assessors pay particular attention to these areas.

Sections in this document are organised based on different technical aspects of a NEAP assessment (i.e. general information, survey, project database, geometry, building services). This document is supplementary to the following core documents and tools, all of which are available here:

- NEAP Software (iSBEMie)
- NEAP Modelling Guide and Technical Manual (RoI)
- iSBEMie User Guide (three volumes)
- NEAP Survey Guide
- BER Non-Domestic Assessor Videos
- BER Assessor's Quality Assurance and Disciplinary Procedure here and Code of Practice here

This document generally does not duplicate guidance published in these core documents. However, some of the guidance in those documents is repeated here for emphasis. Obsolete guidance is not included in this document.

1.2 BER Programme contact details

All resources referenced in this document are available here. Assessors are advised to stay up to date with the latest publications at this link. If you need to contact SEAI's BER Helpdesk details are as follows:

Registered BER assessors	Non-registered assessors
☎ 01 808 2029	☎ 01 808 2029
registered@ber.seai.ie	info@ber.seai.ie

*The Technical Bulletins are being superseded and retired on publication of this guidance document, as this document incorporates the relevant guidance and examples from these resources.

2 GENERAL INFORMATION

This section covers high-level aspects of non-domestic BERs, such as the BER requirement, the Quality Assurance process, selection of the right building type and the NDNAS.

2.1 When is a BER required?

All new and existing buildings, as identified in Irish Regulations S.I. No. 243/2012 - European Union (Energy Performance of Buildings) Regulations 2012, for sale or rent require a BER. Additionally, new buildings require a BER before they are first occupied even if not being sold or rented. An existing building is a building which has previously been sold and/or occupied. Buildings which have not previously been sold or occupied are specified as new buildings in NEAP assessments.

New buildings sold off-plans and specifications, prior to construction, require a provisional BER. On completion, the new building will require a new final BER. New buildings which are built to "shell and core" stage and which are offered for sale or rent will require a provisional BER. In all cases, published BERs must adhere to the NEAP methodology and the guidance detailed in the core documents and supplementary guidance (including this guidance document) referenced in Section **1** above.

S.I. No 243/2012 lists types of buildings exempted from the BER requirements:

- national monuments
- protected structures
- places of worship or buildings used for the religious activities of any religion
- certain temporary buildings
- non-residential industrial or agricultural buildings with a low installed heating capacity (less than 10 W/m^2)
- standalone buildings with a small useful floor area (less than 50 m^2).

2.2 BER quality assurance

The quality-of-service delivery by BER assessors is central to the reputation and effectiveness of the BER scheme, both for the purposes of fulfilling legal obligations to building owners and in stimulating action to improve the energy performance of buildings. That quality of service has two key dimensions: competence and conduct.

As the issuing authority responsible for the BER scheme, and as part of an overall suite of provisions governing the registration and performance of BER assessors, SEAI has in place a quality assurance system for BER assessors, and a related disciplinary procedure. Through this system and procedure, SEAI maintains a strong focus on monitoring the technical performance and professional conduct of BER assessors and taking appropriate corrective action. This policy is designed to serve the interests of clients for BER services and of all reputable BER assessors along with the integrity of the BER scheme.

The Quality Assurance System and Disciplinary Procedure (QADP) outlines the key elements and processes for BER assessors. It applies equally to BER assessors operating in either the domestic or non-domestic buildings sector. Disciplinary sanction can arise from audits or complaints. Audits can be selected on either a random or targeted basis at SEAI's discretion. Section 15 of the BER Assessor's Code of Practice outlines the monitoring and compliance of BER assessments, with further detail in the QADP.

Audit findings: The primary objective of the BER Quality Assurance System is to monitor and ensure widespread operational compliance by BER assessors with the Code of Practice and the relevant technical methodology. The system helps to assist BER assessors in the effective discharge of their duties and to ensure the accuracy of assessments.

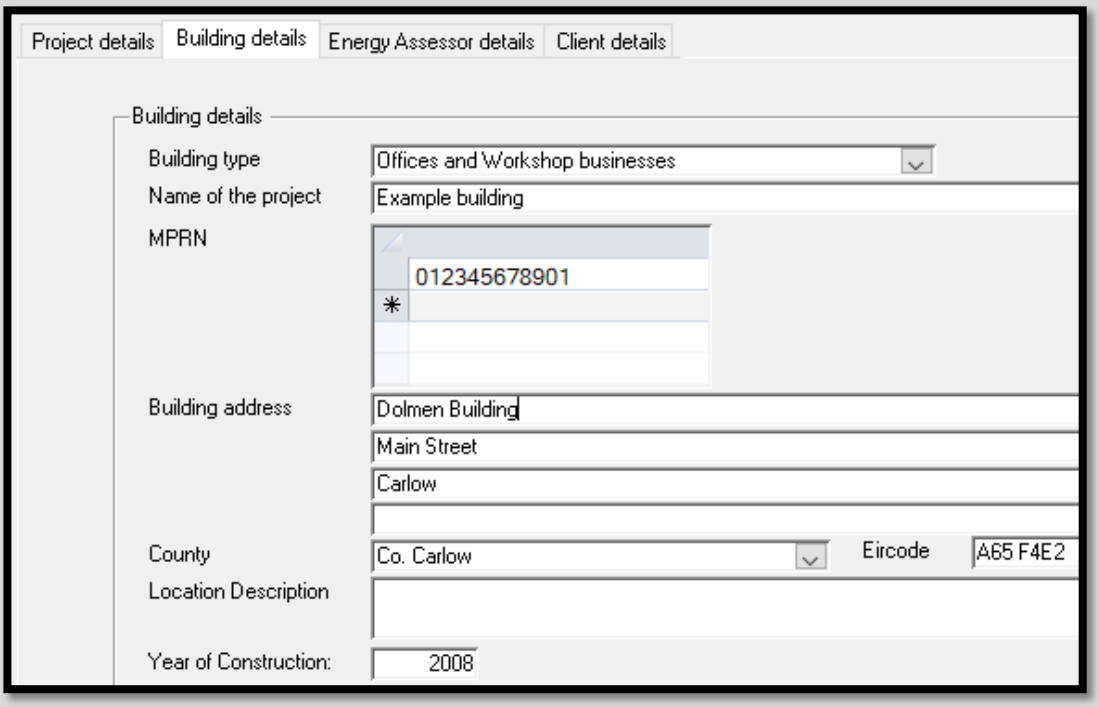
2.2.1 Data integrity

BER assessors are responsible for ensuring that the data file (XML file) submitted to the non-domestic National Administration System (NAS)database is accurate and correct. All documentation supporting a BER must be secured prior to the publication of a rating and must be maintained on file. Assessors should note that when changes are made in an assessment, Calculate BER on the Ratings screen is selected to update the results and XML file when using iSBEMie. An example is shown as follows:

Example:

(i) Administration details

Confirm that the administration details contained within the XML file match those recorded in the software. For example, the following is the input in iSBEMie:

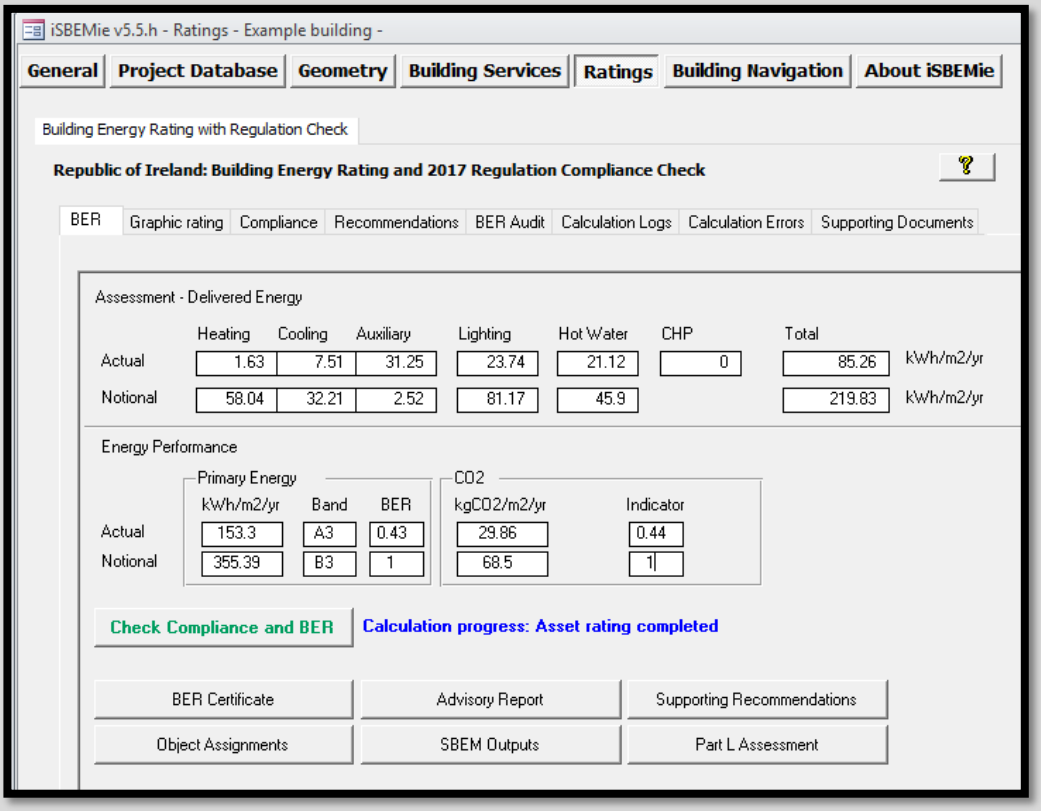


Which is shown under the Report Header, Property Details and Property Address in the XML file:

```
<!-- This XML message is for the Republic of Ireland BER. -->
- <Report>
  - <Report-Header>
      <Project-Name>Example building</Project-Name>
      <Issue-Date>2019-04-15</Issue-Date>
      <Report-Type>1</Report-Type>
      <Valid-Until>2029-04-14</Valid-Until>
      <Construction-Year>2008</Construction-Year>
      <Registration-Date>2019-04-15</Registration-Date>
      <Status>entered</Status>
    - <Energy-Assessor>
        <Assessor-Number>000000</Assessor-Number>
        <Name>A. Person</Name>
        <Telephone>99999999999</Telephone>
        <Address>The Non Domestic BER Company</Address>
        <County>Cork</County>
        <Eircode>P81 NY52</Eircode>
        <Accreditation-Scheme-Name>SEAI</Accreditation-Scheme-Name>
        <Trading-Address>The Non Domestic BER Company</Trading-Address>
        <Company-Name>12345</Company-Name>
        <Company-Number>111111</Company-Number>
        <Status>Registered</Status>
      </Energy-Assessor>
    - <Property-Details>
        <Location-Description/>
      - <MPRNs>
          <MPRN>012345678901</MPRN>
        </MPRNs>
      - <Property-Address>
          <Address-Line-1>Dolmen Building</Address-Line-1>
```

(ii) Results

Confirm that the results in the XML file are as detailed in the software. For example, the results of an assessment are as follows:



The energy details for the actual, reference and notional buildings can be verified under Global Performance under each building within the XML. The details for the actual building are shown below:

```
<Global-Performance>
    <KWH-M2-Heating>1.63321</KWH-M2-Heating>
    <KWH-M2-Cooling>7.51031</KWH-M2-Cooling>
    <KWH-M2-Auxiliary>31.2511</KWH-M2-Auxiliary>
    <KWH-M2-Lighting>23.7397</KWH-M2-Lighting>
    <KWH-M2-DHW>21.1217</KWH-M2-DHW>
    <KWH-M2-Equipment>45.1707</KWH-M2-Equipment>
    <KWH-M2-Natural-Gas>21.1217</KWH-M2-Natural-Gas>
    <KWH-M2-LPG>0</KWH-M2-LPG>
    <KWH-M2-Biogas>0</KWH-M2-Biogas>
    <KWH-M2-Oil>0</KWH-M2-Oil>
    <KWH-M2-Coal>0</KWH-M2-Coal>
    <KWH-M2-Anthracite>0</KWH-M2-Anthracite>
    <KWH-M2-Smokeless>0</KWH-M2-Smokeless>
    <KWH-M2-Dual-Fuel>0</KWH-M2-Dual-Fuel>
    <KWH-M2-Biomass>0</KWH-M2-Biomass>
    <KWH-M2-Supplied>64.1345</KWH-M2-Supplied>
    <KWH-M2-Waste-Heat>0</KWH-M2-Waste-Heat>
    <KWH-M2-District-Heating>0</KWH-M2-District-Heating>
    <KWH-M2-Displaced>0</KWH-M2-Displaced>
    <KWH-M2-PVS>0</KWH-M2-PVS>
    <KWH-M2-Wind>0</KWH-M2-Wind>
    <KWH-M2-CHP>0</KWH-M2-CHP>
    <KWH-M2-SES>0.800838</KWH-M2-SES>
</Global-Performance>
```


The BER Certificate details can be verified under Building Energy Rating Certificate in the XML:


```
- <Building-Energy-Rating-Certificate>
  - <Building-Energy-Rating>
      <BER>0.43</BER>
      <BER-Grade>A3</BER-Grade>
      <Primary-Energy>153.3</Primary-Energy>
      <CO2-Indicator>0.44</CO2-Indicator>
      <CO2-Emissions>29.86</CO2-Emissions>
      <EPC>0.99</EPC>
      <PartL-Primary-Energy-Pass>Yes</PartL-Primary-Energy-Pass>
      <CPC>1</CPC>
      <PartL-CO2-Pass>Yes</PartL-CO2-Pass>
      <RER>0.04</RER>
      <PartL-RER-Pass>No</PartL-RER-Pass>
      <Elec-CO2-Emission-Factor>0.409</Elec-CO2-Emission-Factor>
      <Elec-Primary-Energy-Factor>2.08</Elec-Primary-Energy-Factor>
  </Building-Energy-Rating>
```


Always ensure the correct version of the XML file is selected for upload if multiple XML files have been generated in the course of completing the assessment.

2.2.2 Building access for audits

SEAI carries out audits on an ongoing basis to maintain the integrity of the BER scheme. In the case of a documentation and practice audit, the BER assessor is required to arrange access to the building. Occasionally the BER assessor may not be able to arrange access. In such cases, the BER assessor is required to provide documentary evidence supporting the request to gain access and the response from the client to support failure to access this property.

2.3 Choosing the correct property address

It is critical that BER assessors ensure they have the correct postal address for the building being assessed and that they publish the rating under this address. The address should allow for unique identification of the property insofar as possible, and in such a way that prospective purchasers or renters (or their agents) can content themselves that the rating before them relates to the property in question. Any ambiguity in addresses must be eliminated or assessors run the risk of a rating being revoked and thereafter must be republished with a satisfactory address.

Assessors must confirm the postal address with the building owner. In addition, there are several tools available to assist assessors in verifying the postal address, as outlined below.

- **Eircode finder:** Source the Eircode of the property based on its location if unavailable from the client. This resource can be used to verify the address if the Eircode is available or to also obtain the Eircode if the remainder of the address is known.
- **Meter Point Reference Number (MPRN):** The MPRN is a unique reference allocated to the building by the utility supplier and can be found on the electricity bill. The Non-Domestic National Administration System (NDNAS) enables assessors to confirm the correct building address through the utility supplier's database of MPRNs. Occasionally there may be an issue with the address stored in the MPRN database. For example, in the case of new developments, the address given to the utility supplier may be the address used during the construction phase and may be out of date. The assessor must publish the rating under the most accurate address.
- **Other utility bills:** Other utility bills, such as gas bills, can be another useful reference point.
- **An Post:** An Post provides an address verification service. The maximum number of searches allowed is 15 per day.
- **GeoDirectory:** The GeoDirectory is a database (a joint An Post and Ordnance Survey initiative) containing the address and map coordinates of over 1.9 million addresses for every building in the Republic of Ireland. The database is updated by An Post workers, with official updates released on a quarterly basis. GeoDirectory offers services such as the GeoAddress Locator which can be used to confirm dwelling addresses.

2.4 NEAP Software

2.4.1 Use of alternatives to iSBEMie

The NEAP procedure allows for the use of approved software packages as an alternative to the default interface, iSBEMie. There are several approved software packages that provide a front-end interface for the Simplified Building Energy Model (SBEM). The current list of approved software can be obtained on the SEAI website.

Assessors accredited to use alternative software must note that:

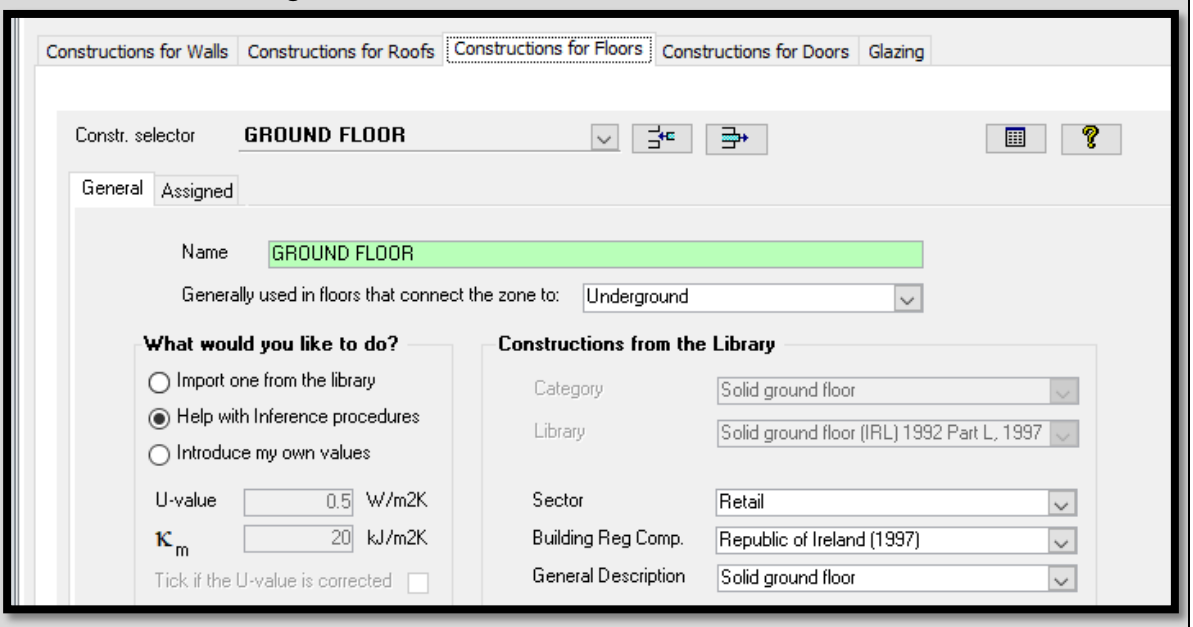
1) Non-defaults should be used where possible, however where these cannot be substantiated, default values must be used. The default values to be used are outlined in the iSBEMie User Guides (three volumes), iSBEMie software F1 help, and the NEAP Survey Guide. It is the responsibility of the assessor to ensure that any defaults used in alternative software comply with the iSBEMie software and guidance documents. Third party software does not necessarily use or provide the same defaults as iSBEMie.
2) In all cases, the methodology outlined in the iSBEMie User Guide and NEAP Survey Guide takes precedence over guidance from third-party software.

2.4.2 Updating project files

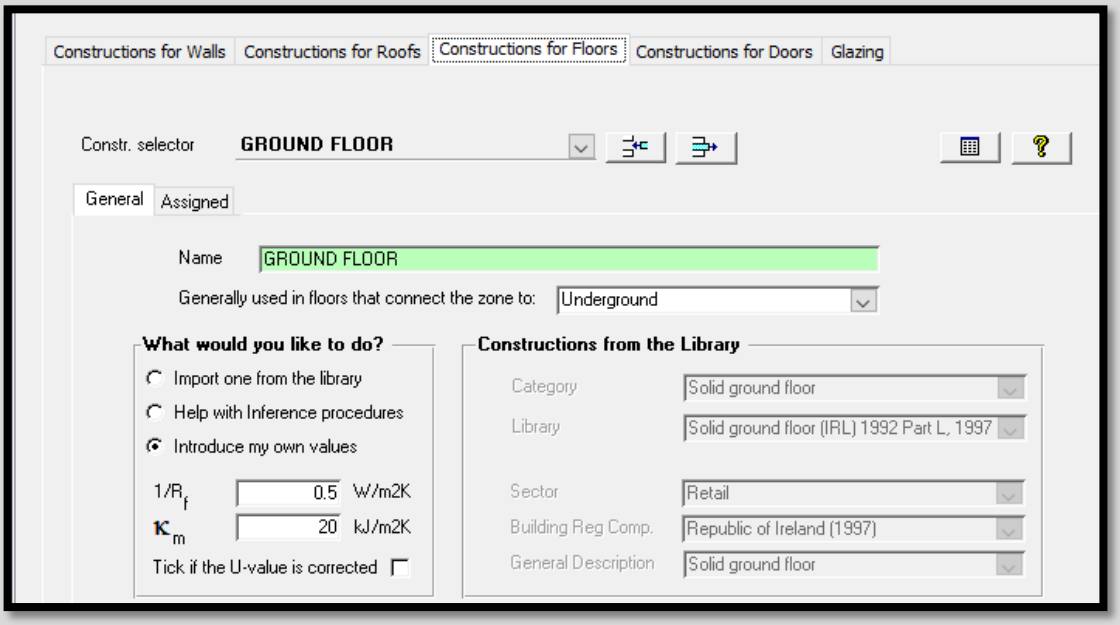
It is the responsibility of BER assessors to check that all input data is an accurate representation of the building when converting a project created in a previous version of the iSBEMie software, or other third-party NEAP software, to a current version of the software. Defaults may vary between software versions and the published assessment must be based on the defaults applicable at the time of BER publication. The following example for iSBEMie v3.5b/iSBEMie v5.5h illustrates this.

Example: updating project files

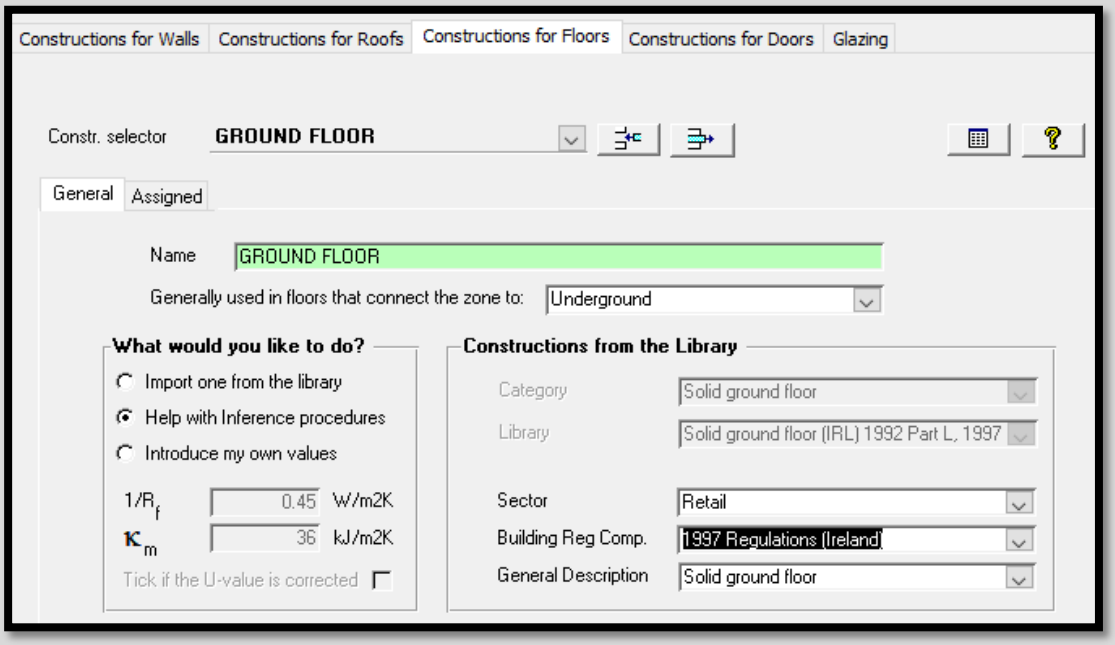
The following shows a default floor element created in Version 3.5b of the iSBEM software: the U-value is 0.5 for the solid ground floor from 1997.



When this is converted into the current version of the iSBEMie software, Version 5.5h, the data is automatically entered in "Introduce my own values" with the same U-value and K_m value as the original software, as follows:



The U-value and K_m figures are copied to match the values that were obtained in iSBEM Version 3.5.b and appear in the "Introduce my own values section". However, when the default is selected for the 5.5h version of the iSBEMie software, the U-value changes to 0.45 and the K_m value also changes. This updated value, shown below, is what an assessor must use.



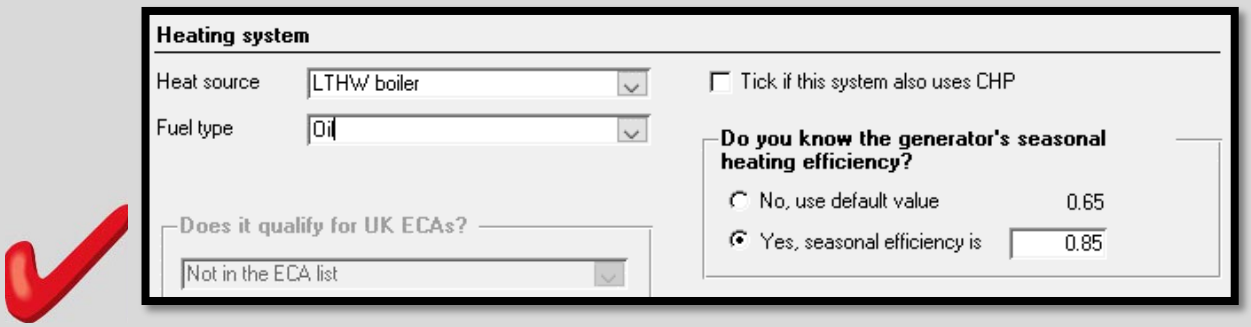
The 1997 regulation floor is reselected by the assessor. This guidance applies to default selections only. "Own values" previously entered in Version 3.5b will carry over to Version 5.5h.

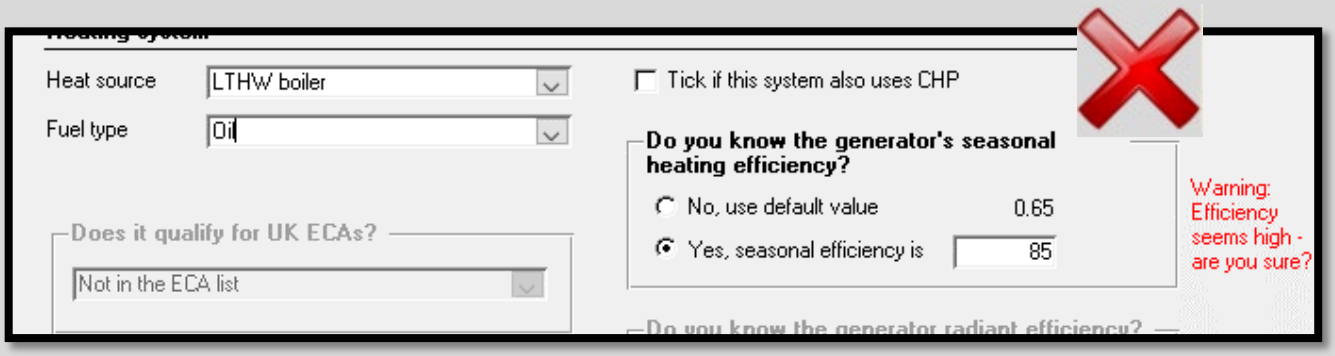
2.4.3 iSBEMie software: correct data entry

iSBEMie is a user interface for the SBEM, the default software for the NEAP. BER assessors are responsible for ensuring that the data entered is an accurate representation of all characteristics relevant to the energy performance of the building. It is not possible for the software to highlight all potential errors or omissions. The following are examples of typical errors.

Examples of iSBEMie data entry

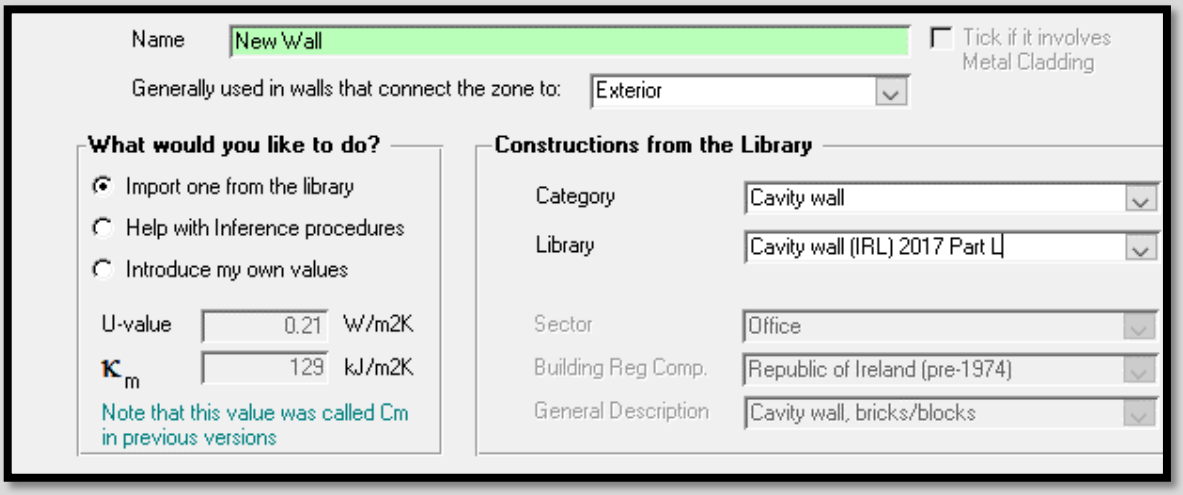
(i) The efficiency of the heating and cooling must be entered as a fraction and not a percentage.
A boiler with a heating seasonal efficiency of 85% is entered as 0.85:



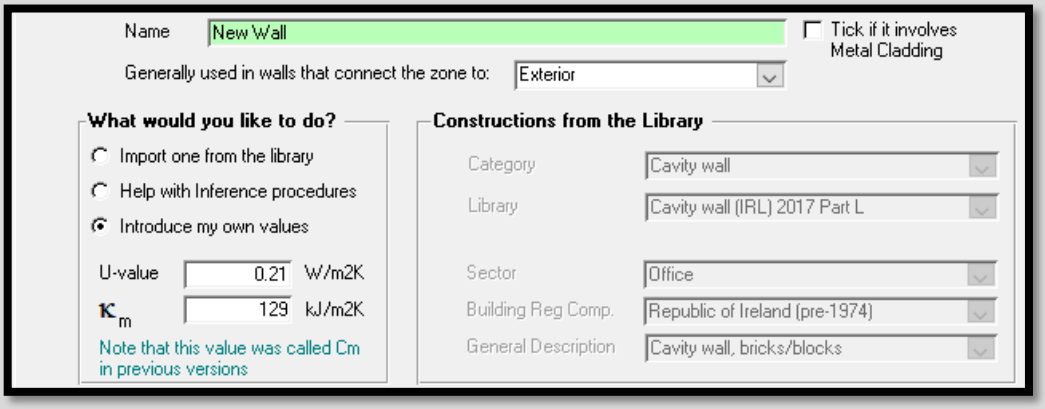


Updated guidance: Version 5.5h software will warn if values are entered incorrectly, but the warning will not appear until the user clicks out of the efficiency field. Always review each sub-tab/section of iSBEMie or other NEAP software prior to publication. Unfortunately, this particular warning is not included on the bi-valent tab.

(ii) Project Database: when a new construction is created, a U-value and K_m value are automatically applied based on the data selected in the iSBEMie library. When assessors select "Introduce my own values", these values are automatically applied. It is the responsibility of the assessor to ensure they update the values used under "Introduce my own values" where necessary and that the revised values are correct. Also, ensure that documentary evidence is available to support entries. Example of new wall construction being created, U-value and K_m value automatically applied:



Example showing selection of "Introduce my own values", which automatically applies the previously selected defaults, but requires proof of the non-default values subsequently entered:



2.5 The Non-Domestic National Administration System (NDNAS)

NDNAS ITEM	Information	Additional information
What is the MPRN utility in NAS?	The MPRN facility allows assessors to cross-check the MPRN and the building address.	
What is my Username?	Username is typically your assessor number.	
How do I get a new password to NAS?	Your password can be changed in the "My Account" section of NAS.	If at any stage you forget your NDNAS password, you can get it emailed to your assessor email address by using the "Forgot Password" option. Contact the Helpdesk if you become locked out of your account.
How do I change my BER assessor details on the National Register?	Contact the Helpdesk by email.	
As a BER assessor, how do I change my bank details?	Contact the Helpdesk by your registered email.	Bank details changes cannot be made over the phone.
Why does a rating go into Rejects in NAS?	Publication cannot proceed. An error has been found.	Fix the error. Review any notices and amend if appropriate. Send to NAS.
Why does a rating go into Repairable in NAS?	The BER and/or MPRN is incompatible with a record already held on the BER Register.	Discard the assessment in repair (in NAS) and fix the error in iSBEMie or other NEAP software. Also, review any notices and amend if appropriate. Send to NAS.
I've realised the non-domestic BER XML file I have published has an error. How do I correct this?	Correct the error in iSBEMie or other NEAP software. Publish the revised version of the XML to NAS. You must contact the Helpdesk detailing which XML is to be removed.	The Helpdesk can then refund your publication fee for the XML file that has been taken down.
How to I obtain a copy of my BER Assessor Certificate?	Your certificate can be downloaded in the "My Account" section of NAS	"My Account" can be found on the top right. It also contains information on insurances and expiry dates.

2.6 Selecting the correct building type

Selecting the correct building type is essential when carrying out a NEAP assessment. For example, for an estate agent, as detailed below, the correct building type would be "Retail and Financial/Professional Services". A BER assessor is responsible for ensuring that the correct building type is selected for the assessment. Refer to Appendix A of the iSBEMie User Guide volume 1, 'Basics', for a list of activities associated with the building types.

It is essential to input the correct building type because the calculated energy use and BER grade can differ significantly between different building types. Each building type has specific operating hours and temperature set points built into the SBEM activity database. These activity database parameters are not editable by the user. SBEM assigns different parameters to, for example, the zone type "Generic Office Area" in a hotel building will have different operating hours to a "Generic Office Area" in the "Law Courts" building type.

It is important to note that a BER is an asset rating of a building, or part of a building, and not a measure of the efficiency of the actual activity taking place in the building. This means that the building is assessed on building type. The current occupant's equipment or property not forming part of the lease/sale is omitted from the BER.

The building type selected under General Information – Building Details is the building type that defines most of the building and is displayed on the BER Certificate. Table 1 below is the list of building types available in the NEAP software.

Updated guidance: This list has been updated to match the "Building type" lists in iSBEMie Version 5.5h. It can be found in the iSBEMie Technical Manual Section 3.3.1 and is reproduced here.

	Building Type	Description
1	General Assembly and Leisure, plus Night Clubs and Theatres	Cinemas, music and concert halls, bingo and dance halls, swimming baths, skating rinks, gymnasiums or sports arenas (except for motorsports or where firearms are used). This type also includes nightclubs and theatres.
2	General Industrial and Special Industrial Groups	Heavier industrial process, it excludes light industry appropriate in a residential area. Use "industrial process building" where the building has specific infrastructure to support the process taking place. "Industrial process area" zone type includes a large amount of process heat being given off by the activity.
3	Hotels	Hotels, boarding and guest houses where no significant element of care is provided.
4	Non-residential Institutions – Community/Day Centre	Crèches, day nurseries and day centres.
5	Non-residential Institutions – Law Courts	Law courts.
6	Non-residential Institutions – Libraries Museums and Galleries	Art galleries, museums, and libraries.
7	Non-residential Institutions – Post Primary Education	Non-residential post primary education and training centres.
8	Non-residential Institutions – Primary Education	Non-residential primary education and training centres.
9	Non-residential Institutions – Primary Health Care Building	Non-residential clinics and health centres. Possibly includes veterinary clinics if purpose built (otherwise the vets would be an office). Similarly, a dentist/physiotherapist unit could be "Primary Health

		Care" if purpose built. Otherwise, the dentist/physio unit would be "Retail and Financial/Professional services".
10	Offices and Workshop businesses	General office type buildings. Workshop small scale defined as: Research and development of products, light industry appropriate carried out in any residential area without detriment to the amenity of that area by reason of noise, vibration, smell, fumes, soot, ash, dust or grit.
11	Others – Car Parks 24 hrs	Car parks enclosed or underground.
12	Others – Emergency services	Emergency services include fire stations.
13	Others – Miscellaneous 24hr activities	Data centres, server rooms, heavy plant rooms, 24x7 office activities.
14	Others – Passenger Terminals	Airports, bus/train and seaport terminals.
15	Others – Stand-alone utility block	Modular building that just provides showers/toilet facilities.
16	Residential Institutions – Hospitals and Care Homes	Residential care homes, hospitals and nursing homes.
17	Residential Institutions – Residential Post-primary schools	Residential post-primary boarding schools.
18	Residential Institutions – Residential primary schools	Residential primary boarding schools.
19	Residential Institutions – Universities and colleges	Universities and other residential campuses. These follow a schedule of work similar to the university's schedule (with similar working days, breaks and holiday periods).
20	Residential spaces	Residential spaces within non-domestic buildings not designed or altered for use as a separate dwelling. (Without an independent entrance.)
21	Restaurant and Cafes/Drinking Establishments and Hot Food	For the sale of food and drink for consumption on the premises – restaurants, snack bars, cafés, public houses and wine bars, (but NOT nightclubs). Also premises for the sale of hot food for consumption off the premises.
22	Retail and Financial/Professional services	Shops, retail warehouses, hairdressers, undertakers, travel and ticket agencies, post offices, pet shops, sandwich bars, showrooms, domestic hire shops, dry cleaners, funeral directors. Banks, building societies, estate and employment agencies, professional and financial services and betting offices. It also includes laundrettes.
23	Secure Residential Institutions	Use for a provision of secure residential accommodation, including use as a prison, young offenders' institution, detention centre, secure hospital, secure local authority accommodation or use as a military barracks.
24	Storage and Distribution	Use as a storage or distribution centre.

Table 1: Building types

2.6.1 Activity database

Each zone within a building has defined operating hours, temperatures, hot water requirements, lighting levels and other factors built into the activity database. The databases are available on the SEAI website should assessors wish to find out more detailed information. Please note, the database content is also integrated into the SBEM software and cannot be modified by the user.

2.6.2 Building type examples

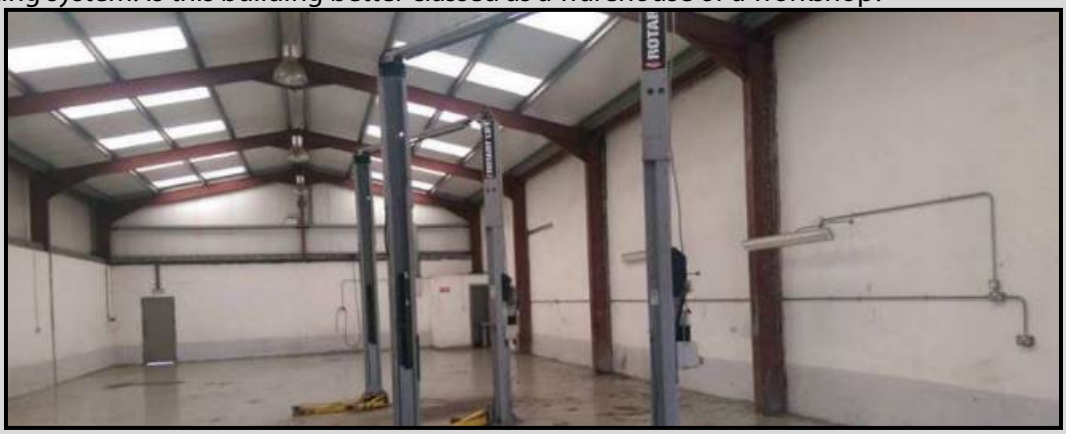
Several indicators are key to identifying the building type, such as:

- Are there fixed mechanical/electric services suited to a particular building type?
- What is the location of the building/unit? Is it at street level or on the first floor?
- What are the surrounding buildings used for?
- Location of the building – urban, rural, etc.
- Speak to operators in the building/unit(s) if possible.
- Information from planning permission if available.
- Information on sale/rent advertising for the building. What is it being sold/rented as?

Updated guidance: All of the examples below have been updated to match the new "Building Type" and zone "Activity" lists in iSBEMie Version 5.5h. The following examples illustrate several building types:

Example 1: Is this a warehouse or workshop?

This building is a large open--plan type structure with a toilet towards the end. It has no installed heating system. Is this building better classed as a warehouse or a workshop?



In this case, the assessor is told the vehicle mechanical lifts are the property of the previous tenant and are not part of the building. Ignoring the mechanical lifts, the building has task lighting and power points fitted to the walls. Due to the extra electrical fit-out, the building type is a "Offices and Workshop businesses" building type rather than a "Storage or Distribution" building type.
There is another building type available called "General Industrial and Special Industrial Groups", but this building type is best suited for larger industry.
However, if a smaller scale industrial development had zones, such as a laboratory or a clean room, "Laboratory" is selected from the "General Industrial and Special Industrial Groups" type to represent zones of this type.
Updated guidance: SOME small-scale workshops do not require heating. Where a red "!" appears when "Zones without HVAC" is applied, a default heating system is required. Otherwise apply "Zones without HVAC".

Example 2: Is this a retail or primary healthcare building?

Exterior view

Interior view

There are a few pointers indicating that this is a retail building rather than primary healthcare:

- It is in a retail area.
- The activity "hairdressers" is classified as "Retail and Financial/Professional services" as per Table 1 above.
- There are no Primary Health Care specific zones in the building.

Example 3: Children's indoor play areas

Children's indoor play areas are often located in business parks and the building type "Retail and Financial/Professional services" is usually the most appropriate. If this building type is appropriate, then the large play areas can be entered as zone type "Retail Warehouse Sales area – general". The best way to assess these types of businesses is to assess as if the play equipment were no longer present and then take a view on what type of building it might be.

Play area

Snack area

For the above building, the type "Retail and Financial/Professional services" is the correct choice. Unlike a warehouse, the building is conditioned, and its lighting levels are higher than those for warehouses. Its relatively large size means that "Retail Warehouse" type zones are selected for the large zones.

Example 4: Crèches

Crèches and childcare: use the building type "Non-residential Institutions – Community/Day Centre". The childcare rooms themselves are best represented by the zone type "Workshop small scale", as found in the "Non-residential Institutions – Community/Day Centre" building type. The reason the building type "Primary School" is not used for a crèche is because the SBEM database of activities includes school holidays while crèches generally stay open through the school holidays. "Non-residential Institutions – Community/Day Centre" building types in SBEM do not use extended holidays.

Example 5: Is this an office, retail or primary healthcare building?

This building was in use as offices, but then a dentist leased the building. Apart from installing the specialist equipment, such as the dentist's chair, little material alteration has been made to convert the building from offices to use by the dentist.

If the dentist were to leave, this building would be suitable for retail or office use without substantial work having to take place. For this building "Retail and Financial/Professional services" is the closest match.

Do not enter a dental practice as "Non-residential Institutions – Primary Health Care Building" unless the dentist surgery forms part of a primary healthcare complex and therefore has been specifically built for healthcare or has specific medical fit-out requiring substantial alterations to class it as "Retail and Financial/Professional services" or other building type.

Example 6: Buildings with cooling only

Food processing factories may have large work areas with cooling only. Since SBEM HVAC systems all have a heating aspect to them, what sort of a system should be selected for this zone?

Factory floor of food processing plant

This type of zone has no installed heating system, but is cooled for the purposes of the process taking place in it. With reference to *Table A7* of the NEAP Survey Guide, "Zones without HVAC" may be selected if it can be justified that a HVAC system is not required. This type of zone is entered as an "Industrial process area" and this zone definition will not produce a red "!" when "Zones without HVAC" is applied. Since the space is being deliberately cooled for the purposes of the process, there is no justification to apply a default heating system. The heating system for this zone is "Zones without HVAC".

Updated guidance: The zone types of cold or chilled stores are not included as zone types in SBEM. To enter a cold or a chilled store, the most appropriate activity type is "Warehouse storage" or "24x7 Warehouse storage" under the building type "Storage or Distribution".

Refer to NEAP Survey Guide, Appendix A2.2, for more information on Cold Stores in SBEM.

2.6.3 Mixed use building and multiple units in a single building

In some cases, the assessor is asked to carry out a BER on a large building consisting of several units – for example, a shopping centre with multiple retail units. The assessor must determine if a single BER can represent the entire building or if multiple BERs are required for the various units. The BER Certificate should reflect the building or part of a building being offered for sale or lease. A building typically refers to the whole of a building or part of a building with the following options needing consideration:

- **Option 1:** a single BER to be produced for the entire building. In the event of leasing of the individual units, this BER can be used to represent these units as the BER is calculated on a per m^2 basis and the energy use is uniform.
- **Option 2:** a BER for each smaller unit. This will result in a number of BERs being produced to cover the entire building.

Both **Option 1 and Option 2** are suitable for a sale or rent of the building in one lot.

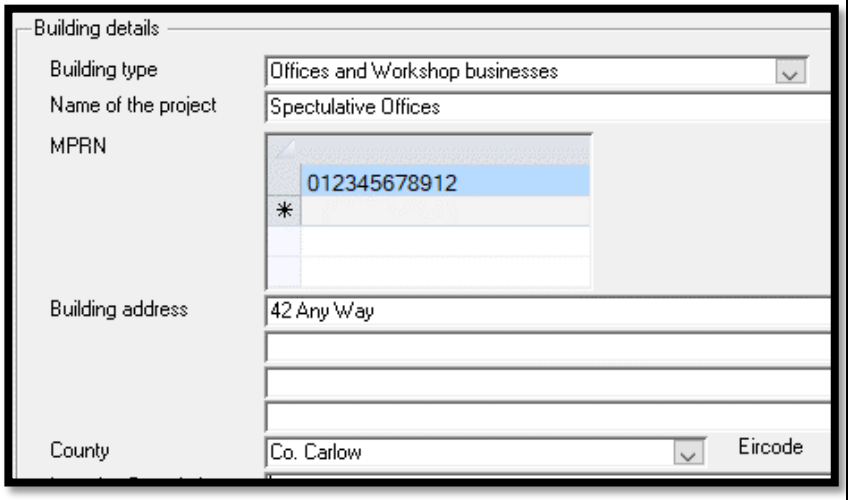
Option 1 can be suitable for sale or rent of parts of a building if the BER represents the building average and the BER's kWh/m^2/yr can be effectively applied to the individual lettings/sales.

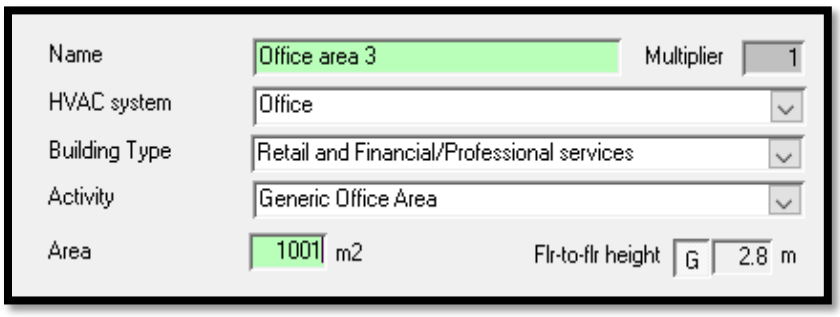
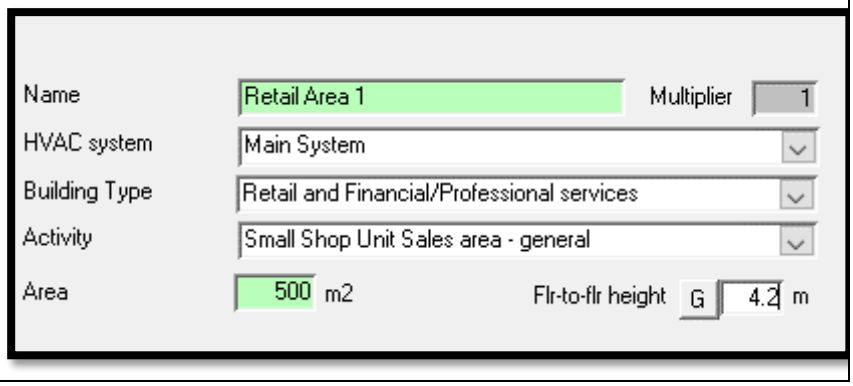
Option 2 is generally what is used for individual sales or lettings.

The BER assessor should consult with the client with reference to their BER requirement for the building. Notwithstanding the above, the Building Control Authority (BCA) is responsible for ensuring that the BER is provided by building owners to prospective buyers and tenants. If in any doubt, the BER assessor/client should consult with the BCA to confirm the number of BERs required for the building being assessed. The following examples show mixed-use buildings.

Updated guidance: All of the examples below have been updated to match the new "Building Type" and zone "Activity" lists in iSBEMie, Version 5.5h.

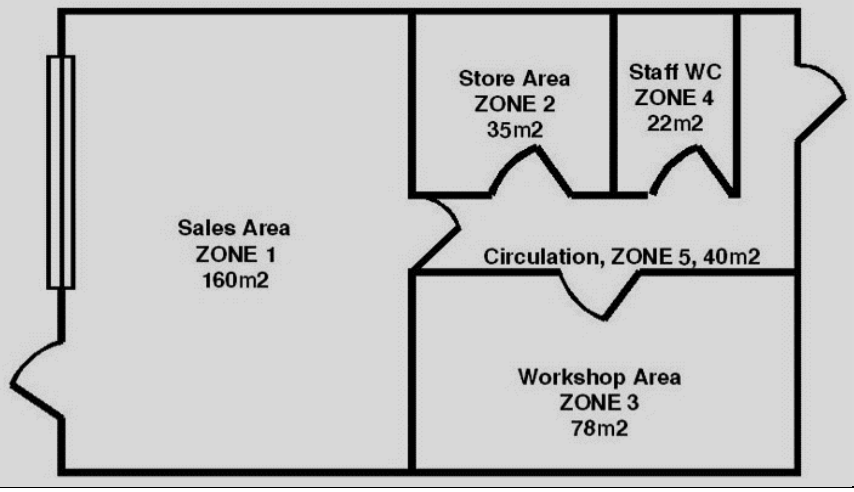
Mixed Use Building Type Example 1: Offices and retail	
This example shows a new building with shell and core office space on levels one to four, totalling an area of 4,000 m^2, and shell and core retail space contained on the ground floor totalling 1,000 m^2.	

In this case, the Main Building Type is "Offices and Workshop businesses" as it defines most of the building. The BER Certificate shall show the building type as "Offices and Workshop businesses".	

For the office zones, Z1/01, Z2/01, Z3/01 and Z4/01 the building type remains as "Offices and Workshop businesses" and the activity is selected based on activities associated with that building type. In this zone, the activity chosen is "Generic Office Area". (Speculative Office Space is no longer available.)	
For the retail type zones, Z0/01 and Z0/02, the activities associated with the building type "Offices and Workshop businesses" are not appropriate. Therefore, the building type for these zones is changed to "Retail and Financial/Professional services" and appropriate activity selected. In this space, the activity chosen is "Small Shop Unit Sales area – general". (Speculative Retail Space is no longer available.)	

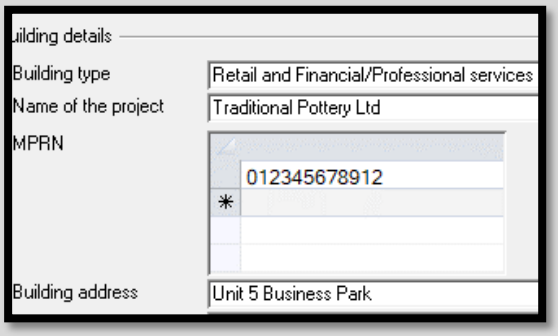
Mixed Use Building Type Example 2: Retail & Workshop

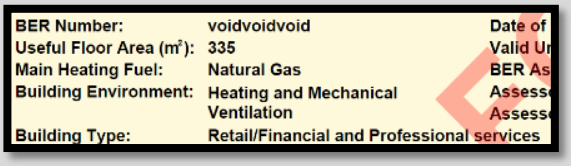
Should the building be classified as "Retail and Financial/Professional services" or "Offices and Workshop businesses"?



Activity	Area	Comments
Retail	160 m²	
Store	35 m²	Shared between Retail and Workshop
Toilets	22 m²	Shared between Retail and Workshop
Corridor	40 m²	Shared between Retail and Workshop
Workshop	78 m²	

Since some zones are shared, they can be in either building type. Listing of the zones shows that the retail activity area is greater than the workshop activity area, therefore the building type is classified as "Retail and Financial/Professional services". Always enter the building type with the largest area in the Building Type field in the General Information tab. The entry in Building Type entered in the General Tab appears on the BER Certificate.





"Workshop – small scale" is available as a zone type in the "Offices and Workshop businesses" Building Type.

Appendix A of the iSBEMie User Guide, Volume 1, lists available zone types within each building type.

Mixed-use building, example 3: zone type not listed under building type being assessed

If a suitable zone cannot be found in the list associated with the assigned building type, a suitable zone may be selected from another building type. For example, if a retail building has a server room, then how is the server room handled?

The server equipment runs 24x7. There is no zone in the "retail" building type representing a server room. Choose the missing zone from the most suitable "other" building type:

- Refer to iSBEMie User Guide, Volume 1, 'Basics', Appendix A, and read the full description in the zone description window within iSBEMie. Or refer to table 1 and table 2 found in Section 3.3.1 of the iSBEMie Technical Manual.
- Select Building Type "Others – Miscellaneous 24hr activities" and Zone Type "Server Room".
- If in doubt, consult the helpdesk, providing as much information as possible.

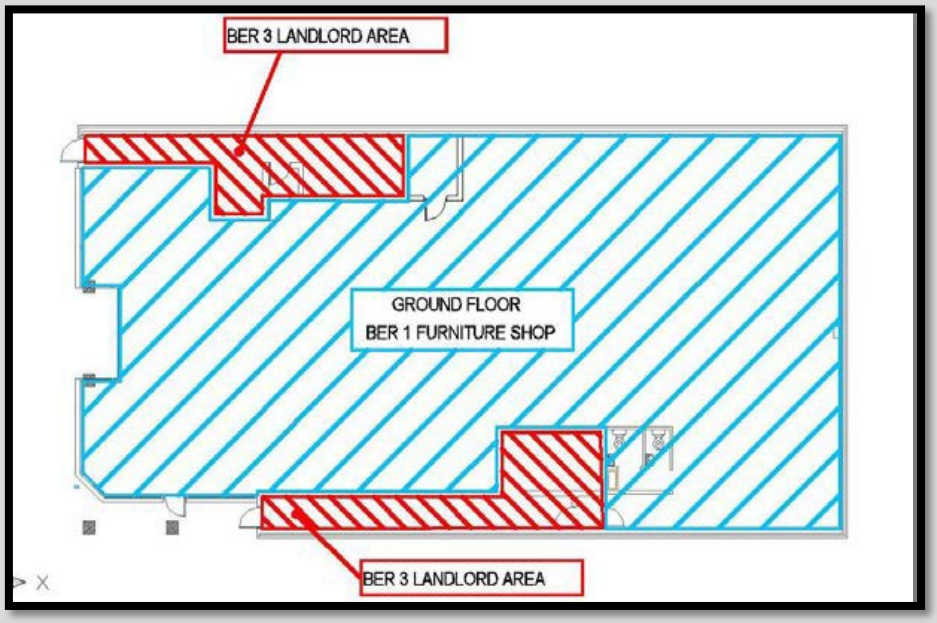
Described as:
For areas such as computer server spaces with 24hr low-medium internal gains from equipment and transient occupancy. For an area with 24hr high gains from equipment, use the "Data Centre" activity.

2.7 Common areas in buildings and number of BERs required

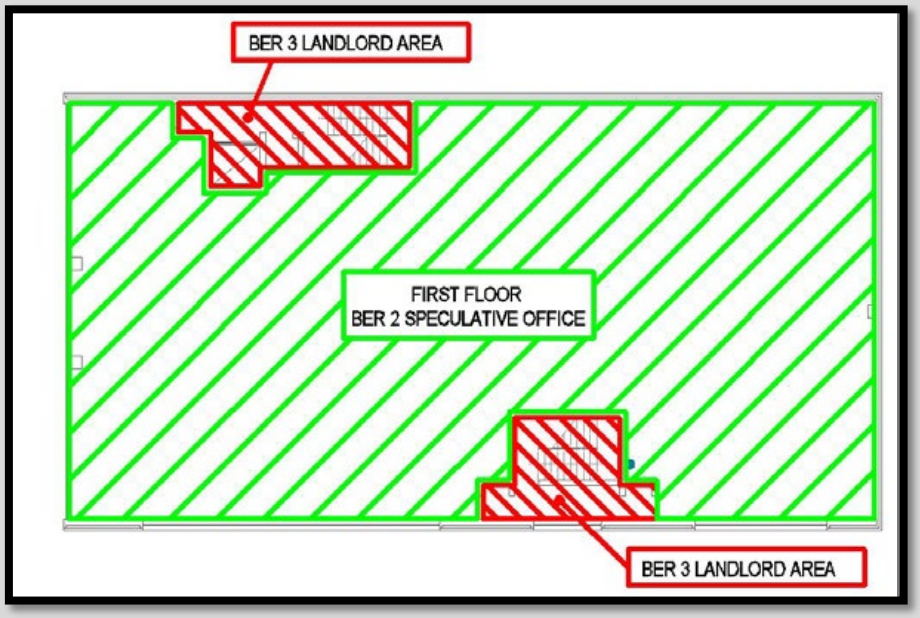
When assessing common or shared areas in larger buildings such as apartment blocks, the BER(s) should reflect the building(s) or parts of the building(s) offered for sale or rent.

Example of a building with common areas:

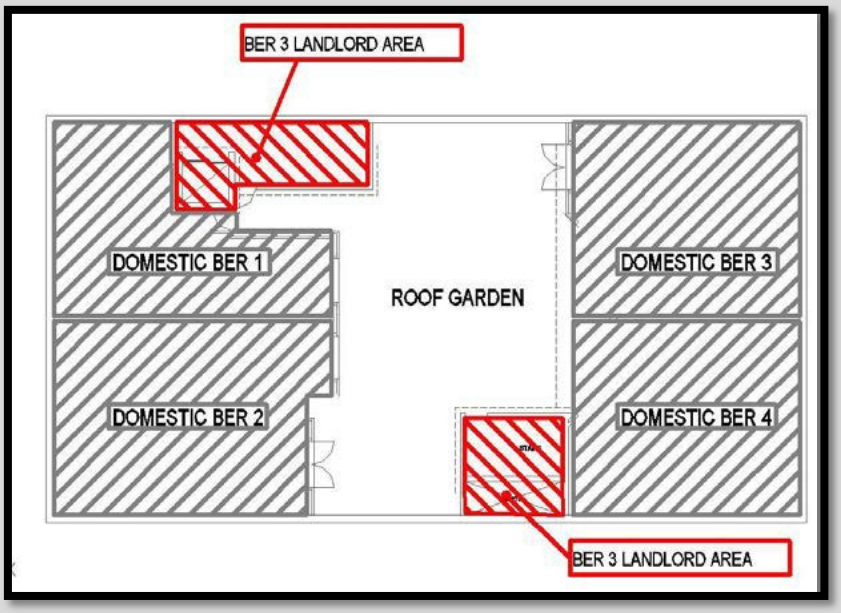
The following sketches show a newly constructed building comprising of a ground-floor shop, first-floor office and second-floor apartments, all being rented separately. Individual BERs are produced for each of the shop, office and dwelling areas. The common or landlord areas (stairwells, corridors, etc.) also require a BER in this newly constructed building.



Ground floor



First floor



Second floor

The ground-floor furniture shop and office BERs are assessed using SBEM in the usual way. The domestic BERs on the second floor are carried out using the Dwelling Energy Assessment Procedure (DEAP) methodology.

BER 3, covering the landlord areas, consisting only of unheated spaces, in this case, common circulation areas, stairways and a lift, is assessed using SBEM.

None of the areas under BER 3 have any HVAC equipment, although the common circulation areas are flagged in iSBEMie as requiring heating by a red "**!**". Since these areas are transient, like toilets, a HVAC system is not assigned unless there is one present.

Updated guidance: Version 5.5h of the iSBEMie software allows production of an XML without the need to have a HVAC system in a model. The model is completed with all of zones' HVAC set to "Zones without HVAC".
Note: If this building were for sale a one lot it would require either:

- Four domestic BERs AND a single non-domestic BER; or
- Four domestic BERs AND three non-domestic BERs.

For sale/rental of parts of the non-domestic sections of building, it will require BERs to represent the areas offered for sale or rent.

Note: For this building, the domestic BERs will be assessed using DEAP since the domestic areas can be accessed from the street without having to go into either of the shop or office units to gain access.

Refer to the end of Section 2.3 of the iSBEM User Guide, Volume 1, 'Basics', for guidance on use of domestic zone types in iSBEMie.

3 GENERAL GUIDANCE ON ACCEPTABLE EVIDENCE AND SURVEYS

This section outlines and supplements the NEAP Survey Guide, discussing key points such as year of construction, provisional BERs, shell and core buildings, common areas in buildings and acceptable evidence when information is not accessible on site.

3.1 NEAP Survey Guide outline

BER assessments for existing, new-final, and shell and core buildings require that BER assessors carry out a full building survey before the BER is published. The assessor must visit the premises to collect the data for the assessment. The BER assessor may also review plans and specifications for new or existing buildings. Plans and specifications are particularly useful in providing supplementary information not available from site survey.

Provisional ratings are carried out based on plans and specifications rather than using a site survey, although site surveys must be carried out on shell and core buildings on the already constructed items.

The NEAP Survey Guide provides extensive detail on the approach to non-domestic BER surveys, and, along with the iSBEMie User Guides, is the first port of call for technical guidance on the NEAP methodology. The following are among the key content in the NEAP Survey Guide and are not repeated in detail in this NEAP Guidance Document:

- A site visit is mandatory for new-final, existing building and shell and core building assessments.
- Contact the client prior to the site visit. Formally request information such as building age details, drawings/spec, building type information, etc. Also advise the client in writing that access to all areas in the building, including boiler rooms, any hatches which provide access to insulation, controls and pipework, is required to carry out the survey.
- Collect as much evidence/photos/documentation/plans as possible.
- Always complete a survey form when carrying out the survey and ensure that it includes the BER assessor's name and/or BER assessor's registration number.
- The NEAP Survey Guide outlines equipment, documentation, approach to sketches/drawings, data gathering.
- The NEAP Survey Guide includes step-by-step guide for internal, external, plant room and floor- by-floor surveys.
- NEAP Survey Guide's sections Guidance on Supporting Evidence and Information regarding Individual iSBEMie Inputs give extensive detail on the evidence required for NEAP assessment entries.

3.1.1 Survey form contents

- Always include the SEAI survey form or a custom version with at least the same fields*. Combine with other evidence, sketches, documentation, etc.
- The Survey Form is designed to capture information towards every SBEM entry.

* It is acceptable for Assessors to use their own Survey Form provided it captures at least the same data as the SEAI Survey Form.

- Assessors may create their own version of the survey form if they find it easier.

3.1.2 Architectural/mechanical drawings, specifications and reports of works

The NEAP Survey Guide, Section 6, details that, "Reports of works carried out in the building from a suitably qualified engineer or architect are acceptable as supporting documentary evidence."

The NEAP Survey Guide also refers to drawings/sketches signed by the developer/builder, site engineer or architect.

Where signed specifications/reports/drawings are required, as outlined in the NEAP Survey Guide, SEAI will also accept these documents with the signature of the assigned certifier for the building in question (as defined by the Department of Housing, Planning and Local Government) as being acceptable for the purposes of NEAP assessments.

3.1.3 Survey order of priority

The NEAP Survey Guide, Section 6, details that data from the site survey takes precedence. If site evidence isn't available, evidence can be sourced from documentation. If site and documentary evidence are not available, then rely on NEAP defaults as the last option, bearing the following in mind:

- Defaults are usually, but not always, the most pessimistic (resulting in higher energy usage) option. Only very occasionally do non-default results in higher energy usage.
- Non-defaults are always used if supporting evidence that meets requirements in the NEAP Methodology is available.
- Keep a record of all evidence used.
- Invoices/receipts must have sufficient detail and must identify the building on which the work was carried out.
- If using defaults, keep on record the reasoning for using those defaults.

3.1.4 Quality of survey photographs

NEAP Survey Guide, Section 4, outlines the need for clear photographs as part of supporting evidence for BERs. BER assessors should endeavour to gather as much data, photographs and supporting evidence as possible to increase the likelihood of an accurate survey and assessment which will stand up to auditing by SEAI.

In some cases, photographs are not of a high enough standard to be usable for BERs, such as:

- Blurred photographs – due to camera movement;
- Underexposed photographs – particularly photos in poorly lit areas, such as boiler rooms, when the flash has either not been used or used incorrectly;
- Poorly focused photographs – caused by not giving the camera time to focus, not having enough distance between camera and object, or, misuse of the camera's macro function. This applies particularly to pictures of nameplates on boilers, heating systems, etc.

If an auditor cannot make a clear appraisal of a photograph for reasons such as the issues mentioned above, or for any other reason, then the assessor may be liable to disciplinary sanction under the BER Quality Assurance scheme. To minimise the likelihood of any problems occurring, the assessor is encouraged to read the camera's manual to gain a full understanding of how the camera works, paying attention to the use of flash, macro and focus.

Always adhere to the following:

- Hold the camera steady.
- Give the camera time to focus – e.g. for close-up shots, the camera's macro function may take several seconds to gain the correct focus.
- Further information and tips can be found in Section 4 of the NEAP Survey Guide.

3.2 Year of construction

Guidance on determining the Year of Construction of a building can be found in NEAP Survey Guide.

Two pieces of evidence are required. If evidence conflicts, err on the side of caution by choosing the older option.

The year of construction must be that of the original year of construction. Further information on the date of renovations and extensions can be provided in the location description in iSBEMie. For example, where an office building was originally constructed in 1930, with an extension added in 2007:

- The year of construction in SBEM is 1930.
- Location description entry in SBEM is "Extension added in 2007".

3.3 New provisional BERs

1. A new Provisional BER is the type of BER required for a new shell and core building. Refer to specific shell and core building guidance in Appendix A4.7 of the NEAP Survey Guide and the next section of this document.

2. A new Provisional BER is the type of BER required for a building that is being sold/rented off the plans.

Section 5 of the BER Assessor's Code of Practice states that, "a new Provisional BER assessment can be carried out by BER assessors based on design drawings and specifications of an uncompleted building provided that, on completion of the building in question, a new Final BER assessment is carried out on the completed building."

The provisional BER must represent the specification and drawings of the building. The assessor must verify each item entered in the provisional BER and in a comparable manner to the final or existing BER, and must have documentary evidence to support all entries, such as signed off specifications, U-value calculations and so on. Descriptions of acceptable documentary evidence are detailed in the NEAP Survey Guide.

The specification and drawings must be provided by the client or their representatives, however where as part of their role within a project a BER assessor has developed the specification or drawing, they must be signed off by the client confirming that the uncompleted building shall be built to the specifications and drawings produced by the assessor.

The specification and drawings must provide adequate information to support an entry. Please refer to examples below. In exceptional cases, there may be insufficient documentary evidence to support an entry. The assessor may then use the default values. The default must be based on the relevant guidance documents and iSBEMie defaults. The assessor should keep a record, with the assessment detailing the reason for the default chosen. The following table provides guidance on the documentation required for several items.

Data entry	Acceptable supporting documentation	Unacceptable supporting documentation
U-value of opaque elements	• Specification/drawing detailing materials used in element construction and • U-value calculation to correct standards and • Appropriate references to thermal conductivities used in U-value calculation (conductivity from agrément, CE marked, certified data, etc).	• Specification/drawing stating U-value of the element is X.XX
Pressure test results	• Specification/drawing stating pressure test shall achieve X $m^3/hr/m^2$ and • Drawings showing details of the air barrier and addressing penetrations and junctions Or • Use expected values from ATTMA TSL2 Table under Section 2.1: **n**ormal air permeability values (e.g. for a naturally ventilated office, assume 7.0 $m^3/hr/m^2$ @50Pa). A permeability test must be carried out on the final building once construction is complete. This measured value is used in the final BER. If test not carried out on the final building, then SBEM defaults apply.	• Specification/drawing stating pressure test shall achieve X $m^3/m^2/hr$ with no other supporting detail.
Thermal bridging factor	• Specification/drawing stating the building will conform with "Limiting thermal bridging and air infiltration – acceptable construction details" and • For a provisional BER for a building that proposes to conform with "Limiting thermal bridging and air infiltration – acceptable construction details". Assessor must provide the relevant drawings clearly showing the relevant details. These drawings must be signed off by the developer/builder, site engineer or architect, confirming that the uncompleted building shall be built to these details. Or Certified PSI values and associated drawings, etc.	• Specification/drawing stating the building will conform with "Limiting thermal bridging and air infiltration – acceptable construction details" with no details provided. • Thermal bridging PSI values based on uncertified calculations.
Heating system efficiency	• Specification/drawing detailing proposed heating system and • Efficiency of heating system based on relevant standards and • Calculation of seasonal efficiency.	• Specification/drawing stating that the boiler efficiency shall be X%.

3.4 Shell and core buildings

Appendix A4.7 of the NEAP Survey Guide details the approach to shell and core buildings (building in which not all of the services are installed) at the point where the building is being sold or let. Buildings (or parts thereof) being sold or let as bare structures, still require a BER as there is an expectation that energy is used to condition the indoor climate. The NEAP Survey Guide details scenarios where there is a proposed design available or where there is no design available (with or without electrical supply to the unit and with/without other fuels supplied to the unit).

In some cases, it may be difficult to decide if a building should be classified as a shell and core building, for example, when the building has a basic fit-out such as for unconditioned storage or is unfinished due to lack of funding.

The following examples illustrate several scenarios:

Example 1: Shell and core, no HVAC or lighting

There are no mechanical and electrical services except for drainage and a fire alarm. For this building, zones are retail or office-type zones. The guidance in Appendix A4.7 of the NEAP Survey Guide applies to shell and core buildings.

Example 2: Completed warehouse zone, no HVAC, full lighting

This building has been completed. It is not shell and core. Final lighting is installed. There is no heating, nor is there a requirement for heating, as it is a warehouse store. Lighting is entered as found. The heating to this zone is entered as "Zones without HVAC".

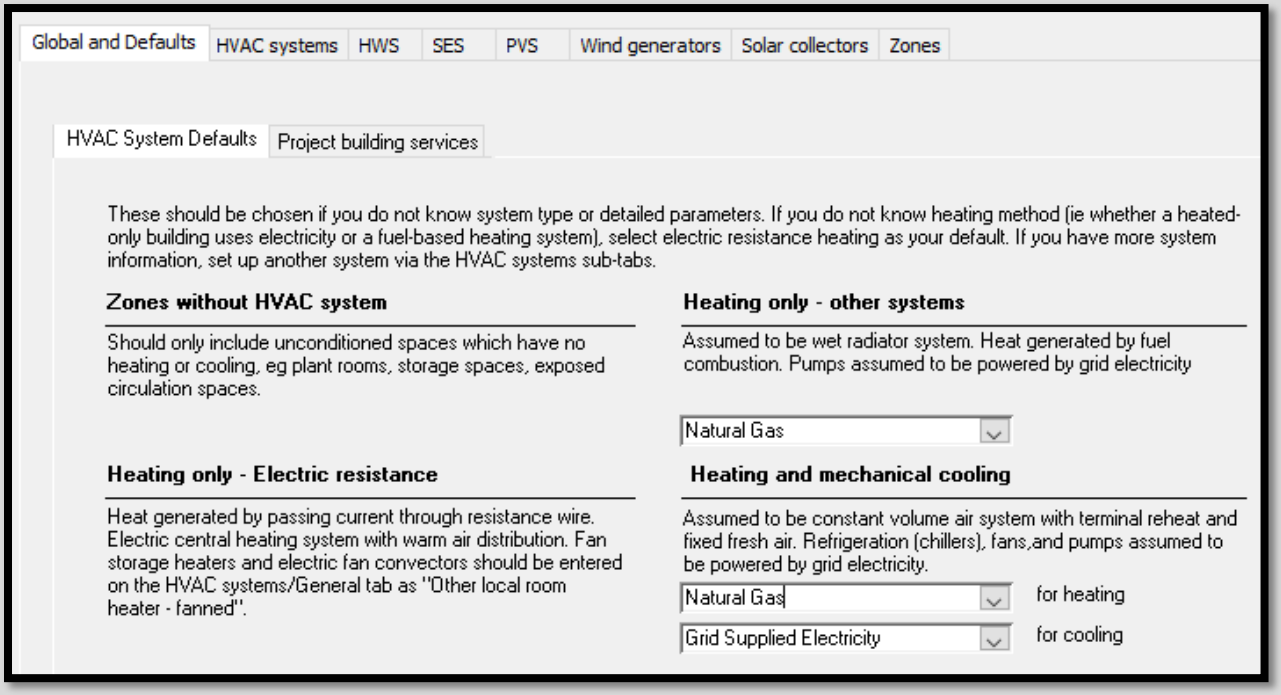
Updated guidance: Version 5.5h of the iSBEMie software allows production of an XML without the need to have a HVAC system in a model. The model can be completed with all of the zones' HVAC set to "Zones without HVAC" and it will produce an XML.

Example 3: Not fully completed, no HVAC, but full lighting installed

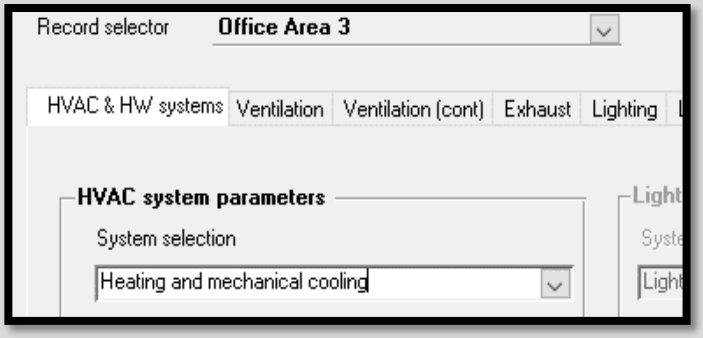
This building has been completed to the extent that it is not a shell. Zone types can be identified. Final lighting is installed. There is no heating or hot water installed. Some zone activities require heating, so assign appropriate HVAC default(s) based on NEAP Survey Guide, Section A4.3.
The hot water system will be "Instantaneous hot water only" with fuel type to match fuel available on site.

Shell and core HVAC example:

A building is constructed to a shell and core standard. There are capped floor drains, a fire alarm and a single halogen lamp for safe access with no other services installed. The only fuel on site is mains electricity. The building requires a BER. There is no Mechanical and Electrical (M&E) design at this stage.

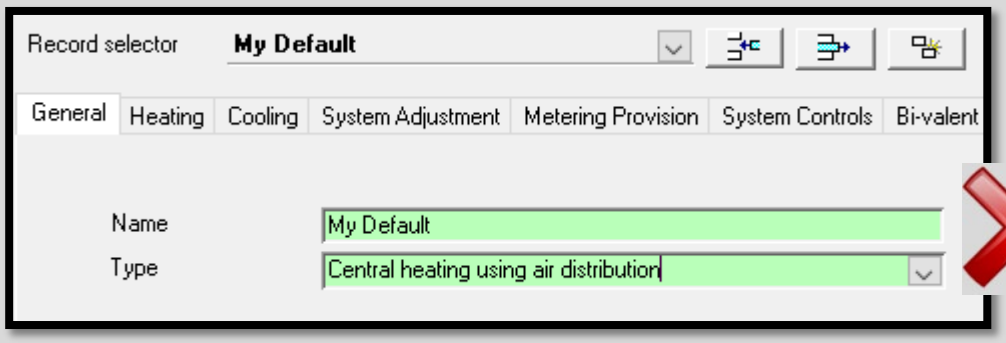


The HVAC system default used is “Heating and mechanical cooling”. Go to the Global and Defaults – HVAC



System Defaults tab. In this example, there is only electricity on site. There is no alternative fuel supply site. Natural gas is selected as the fuel type even if there is no natural gas available. This is because there is no option to select electricity as the fuel type for heating, and natural gas is the heating fuel used in the notional building.

Assign “Heating and mechanical cooling” to the relevant zone or zones. “Heating and mechanical cooling” is a system built into the software. It cannot be modified or deleted.



Do NOT define your own Default HVAC using the sub-tabs.

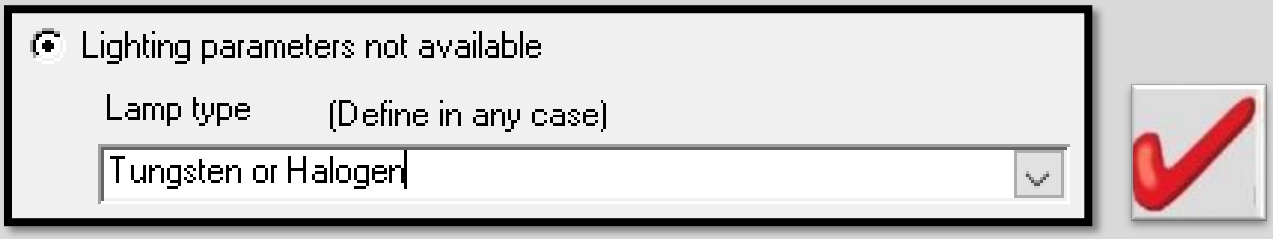
Shell and core hot water system example:

For the same building as described above, there are no water services in the building.

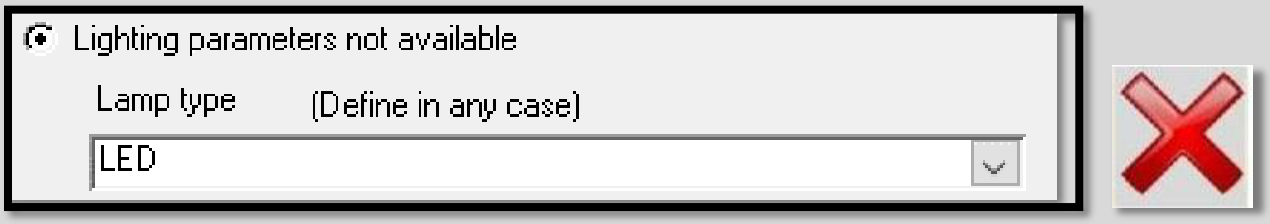
Define the hot water as "Instantaneous hot water only" with fuel type grid supplied electricity as there is no other fuel available in this building. Do not enter anything in the Storage and Secondary Circulation Tabs. Assign this HWS to all the zones in this shell and core assessment.

Shell and core lighting example:

For the same building as described above, there is no permanent lighting and there is no design documentation available, although it is likely that, when this building is fitted out, it will have similar fittings to the building next door which has LEDs.



Updated guidance: The correct choice is Tungsten or Halogen" as there is no documentation to show what is proposed. The option "Don't know" is no longer available.



The presence of LED lighting next door must NOT be viewed as enough evidence to show that this building will also have LED lighting. When no design is available the most conservative option is selected.

3.5 Acceptable evidence when information isn't accessible on site

The following table details the documentation required for different fabric parameters for new-final, new-provisional and existing building BERs, where those parameters are not accessible during the site survey. Full detail of acceptable evidence for different parameters is shown in the NEAP Survey Guide, Section 7.2: "Information Regarding Individual Inputs".

	New-final	New-provisional	Retrofit to existing
Insulation thickness	Invoices/statements/as-built drawings, report of works detailing type/thickness of insulation.	Drawings or specifications.	Invoices/statements/as-built drawings, report of works detailing type/thickness of insulation.
Conductivity of insulation	Agrément Certificate or other certified sources.	Agrément Certificate or other certified sources preferable. CIBSE Guide A or acceptable otherwise.	Agrément Certificate or other certified sources preferable. CIBSE Guide A acceptable otherwise.
Construction of element	Invoices/statements/as-built drawings, report of works detailing layers and thicknesses.	Drawings or specifications.	Invoices/statements/as-built drawings, report of works detailing layers and thicknesses.
Conductivity of element (e.g. concrete, timber, etc.)	CIBSE Guide A / TGD L Table A1 or certified sources if available.	CIBSE Guide A/ TGD L Table A1 or certified sources if available.	CIBSE Guide A / TGD L Table A1 or certified sources if available.
Area of element meeting non-default	Survey used to verify as-built drawings or specification/invoices/receipts/ report of works.	Drawings or specifications.	Survey used to verify as-built drawings or specification/invoices/receipts/ report of works.

Table 2: Supporting non-defaults using documentation

3.5.1 Summary of required documentary evidence for fabric

The following summary outlines documentary evidence required when assessing building fabric for different assessment types.

New-final, existing building assessments or shell and core (provisional) assessments

- U-value calculation to relevant standards:
  - NEAP Survey Guide's Section 6 details relevant standards.
  - BRE 443 gives concise information on each standard. Available online.
  - Non-default U-value entry means a non-default K_M value must be entered. NEAP Survey Guide's Section A4.12 details derivation of K_M
- Acceptable evidence for fabric in new-final/existing BERs:
  - On-site evidence takes precedence.
  - Support with as-built drawings/specs detailing materials and thicknesses.
  - Report of works from supervising engineer/architect or assigned certifier also acceptable.
  - Photographs from the construction phase of the building being assessed are useful.
  - NSAI Agrément Certificates for insulation conductivity or other certified sources such as accredited test data or CE marked data. Must reference relevant standards.
    - For existing buildings, can also take insulation l from CIBSE in the absence of agrément/certified data.
  - Conductivity for materials other than insulation (e.g. plaster, brickwork, render, etc) from TGD L Table A1/CIBSE or certified data if available.

New-provisional building assessments

- U-value calculation to relevant standards (see examples above):
  - NEAP Survey Guide's Section 6 details relevant standards.
  - BRE 443 gives concise information on each standard.
  - Non-default U-value entry means a non-default K_M value must be entered. NEAP Survey Guide's Section A4.12 details derivation of K_M
- Acceptable evidence for fabric in new-provisional BERs
  - Specifications/drawings from developer/engineer/architect detailing materials and thicknesses to be used in element construction.
  - NSAI Agrément Certificates for insulation conductivity or other certified sources such as accredited test data or CE marked data are preferable. Must reference relevant standards.
  - Conductivity for materials other than insulation (e.g. plaster, brickwork, render, etc) from TGD L Table A1 or CIBSE or use certified data if available.

4 PROJECT DATABASE

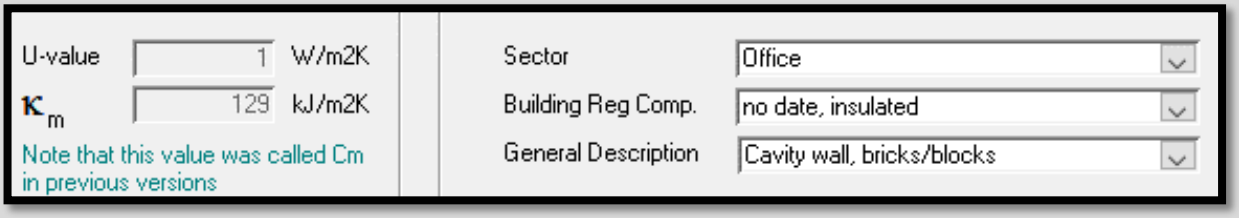
This section focusses on the project database in SBEM as well as building fabric assessment. It provides examples and discussion on construction types, U-values, adjoining spaces, windows and voids to supplement the guidance in the NEAP Survey Guide and iSBEMie User Guide.

4.1 Construction types

The NEAP Survey Guide, Section A4.2, provides guidance on entering some common construction types. Further examples are shown below. In cases where it is not clear which default applies or there is more than one applicable option, the most conservative applicable option (resulting in higher energy usage) is chosen unless proven otherwise.

Example 1: External wall constructed pre-1994

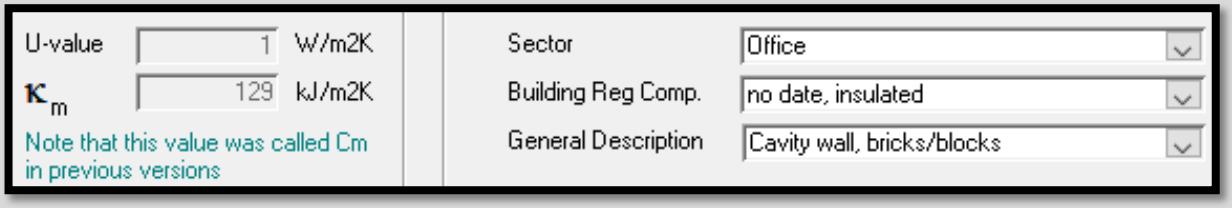
The building was constructed in 1986 with a brick-wall type construction. The walls are known to be cavity walls, but there are no details on insulation. External walls constructed pre-1994 are assumed to be uninsulated unless proven otherwise as detailed in NEAP Survey Guide A4.1. Following the guidance in NEAP Survey Guide, Section A4.2, the assessor uses "Help with inference procedures" to select the following uninsulated wall:



"No date, uninsulated" is chosen. It is assumed that no insulation is present.

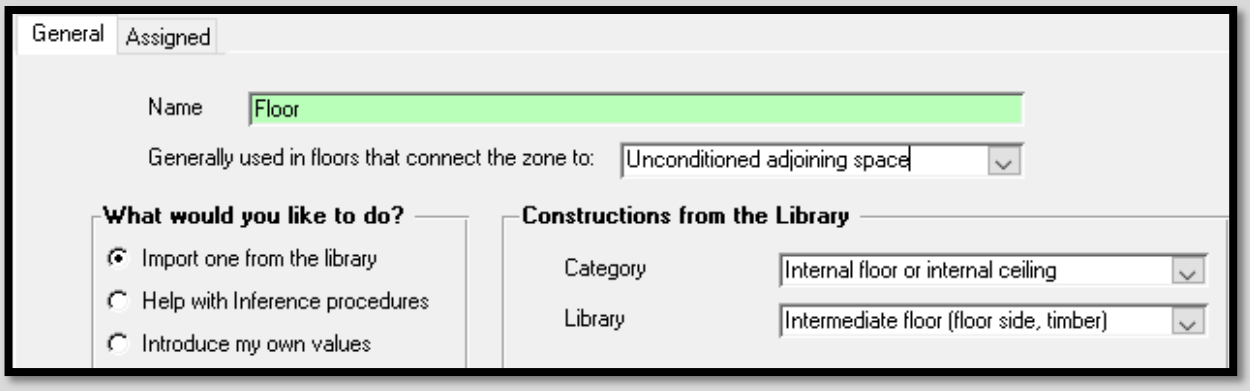
Example 2: External wall constructed pre-1994

The building was constructed in 1989 with a brick-wall type construction. The walls are proven to be cavity walls with insulation, although exact insulation details are not available.



"No date, insulated" is chosen as it is known the walls have some insulation but no specific details.

Example 3: Internal floor connected to unheated adjoining space of a storeroom below.



Floor connects to unheated space rather than external ground (basement, store room, etc).
Note that using the library, the choices for the internal floor are "Intermediate floor (floor side, timber)" and "Internal concrete floor (with conditioned space below)". Select the element that best matches the construction type observed on site. Review Section 8 of the NEAP Survey Guide to confirm which of "Unconditioned adjoining space" or "UAS – partially conditioned by surrounding spaces" best matches the store room conditions.

NB Internal floors/internal ceilings are dealt with under the "Constructions for floors tab" as detailed in the iSBEMie User Guide, Volume 2, 'Compliance', Section 3.3.

4.2 U-values

4.2.1 Age-based U-values

Section A4.1 of the NEAP Survey Guide details the derivation of U-values based on the age of the building element. A4.2 provides examples, with further examples shown below.

Example 1: Internal elements – "No date, uninsulated"

The internal wall shown below may or may not be insulated. It cannot be determined on site if it is insulated and no relevant documentary evidence is available.

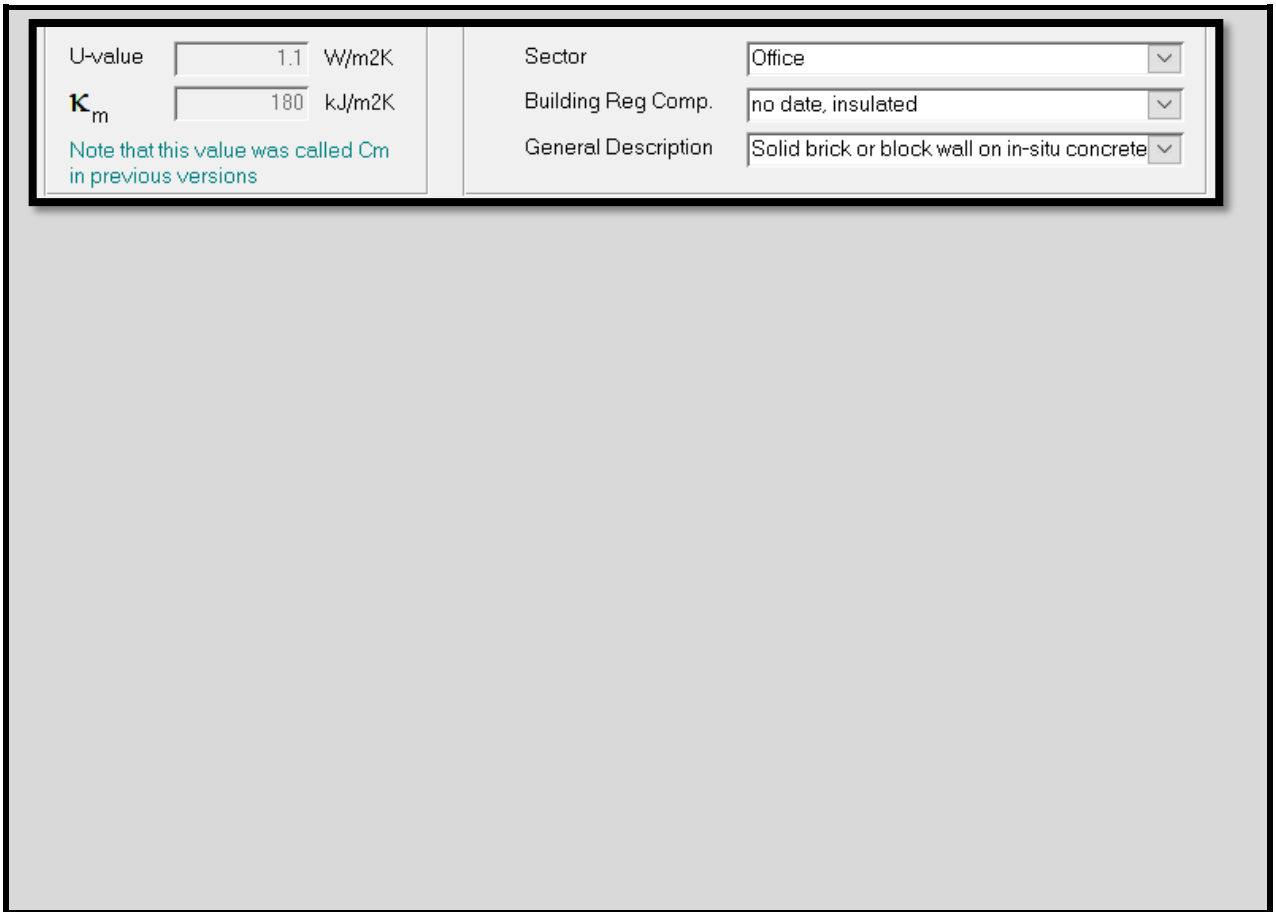
Internal wall in a modern office, construction details unknown

In the absence of information available on site, or any supporting documentation, it must be assumed that insulation is not present. Appendix 4.1 of the NEAP Survey Guide advises: "For internal elements, irrespective of the adjoining condition, select 'No date – Uninsulated' irrespective of the age of the building, unless able to demonstrate that insulation is present."

The internal walls for *Example 1* are entered as shown below. Note that the selection shown for Library will produce the same values.

This guidance applies to all internal elements and not just wall elements. If the element is connecting to an unheated space, review Section 8 of the NEAP Survey Guide to confirm which of "Unconditioned adjoining space" or "UAS – partially conditioned by surrounding spaces" best matches the adjoining conditions.

Note: The example above shows the entries for lightweight walls. If the walls were determined to be of block construction the entries below will apply. A BER assessment often requires both types.



Example 2: External elements – "No date, uninsulated"

The building shown below was built in 1974. The owner said that the roof was insulated in 1995 during renovation works and can remember that 25 mm thick of polystyrene was added. The owner has no documents related to the roof's renewal works.

The Assessor has adhered to Section 2 of the NEAP Survey Guide and requested information from the client prior to carrying out the BER assessment**.** In addition, following a site inspection, the BER assessor still cannot source documentary evidence to prove that insulation was added to the roof and, as it is hidden within the construction, it cannot be verified on site either.

1974-built retail unit

With reference to the table in Appendix A4.1 of the NEAP Survey Guide, the entry "No date, uninsulated" is chosen for the roof. This is because there is no visible or documentary evidence to allow the inclusion of insulation to the roof element. The roof is entered as shown below.

U-value	2.3	W/m2K	Sector	Retail
κ_m	12	kJ/m2K	Building Reg Comp.	no date, uninsulated
Note that this value was called Cm in previous versions			General Description	Flat roofs Asphalt (or chippings on asphalt

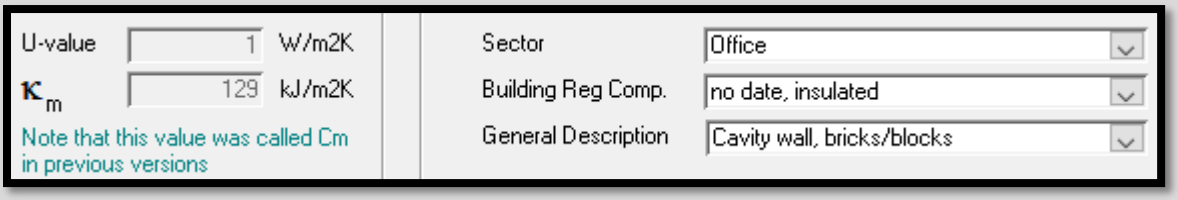
"No date, uninsulated" also applies to the original walls, floor and door elements as there is no evidence to support the presence of insulation. Glazing is assessed as seen and/or measured on site.

Example 3: External elements – "Pre-1991" age band

The building shown below was built in the 1980s and renovated in the 2000s. However, there is no documentary evidence to support the actual year of the 2000s' renovation. It is immediately apparent from the drill holes that all cavity walls of the building were filled at some point. The client does not know what sort of insulation was added to the cavities or the width of the cavity. Refer to the Section 3.2 above for guidance on the documentary evidence required to determine the age of a building.

1980s-built offices

With reference to the table in Appendix A4.1 of the NEAP Survey Guide, the entry "No date, insulated" is chosen for the exterior walls. Although the building was built before 1994, there is visible evidence to support the inclusion of insulation in the external wall elements. The walls are entered as shown below.



Even though the assessor does not know the quality or quantity of insulation in the walls, "No date, insulated" walls are selected since this option assumes that some insulation is present.

If the attic is found to be insulated, but insulation details cannot be determined, then "No date, insulated" is used for the roof element as well.

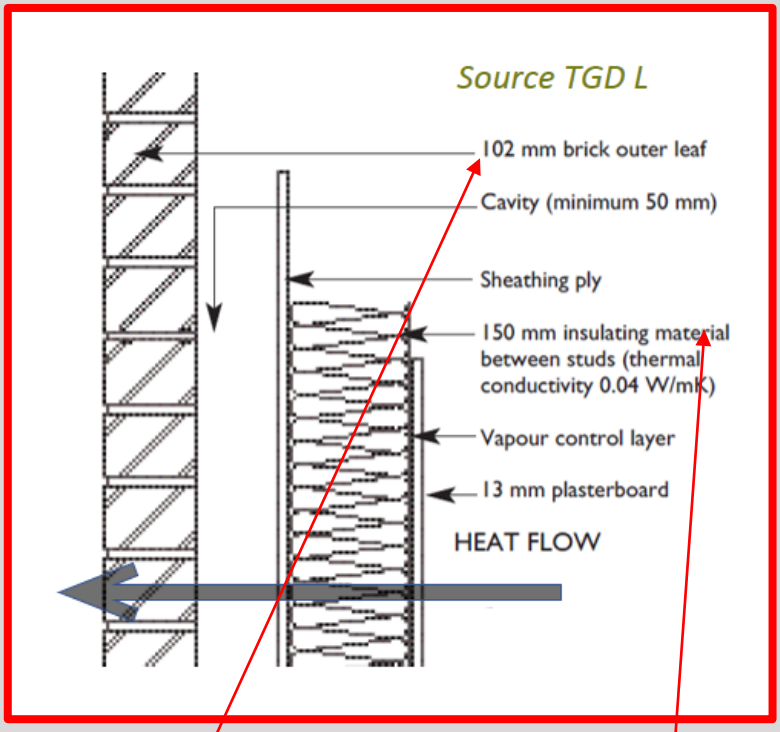
In this particular example, the BER assessor cannot determine if the ground floors were ever insulated during renovations. The ground floor is therefore entered as "No date uninsulated" like *Example 2* above. The internal elements are entered as "No date uninsulated" unless site inspection or documentary evidence proves otherwise.

4.2.2 U-value calculations and sourcing thermal conductivity (l)

This section demonstrates U-value calculations, focusing on sources used for thermal conductivity values in each case. Material types/thicknesses are shown as well as the U-value calculation entries in each case. The relevant U-value calculation standards are also displayed in each calculation.

Where there is adequate documentary evidence to support a non-default U-value, a non-default K_m value must also be used based on the make-up of the construction. The K_m value is calculated in compliance with CEN standard: EN 13790 using the method in Section 3.3.1 of How To Use iSBEMie (Volume 2).

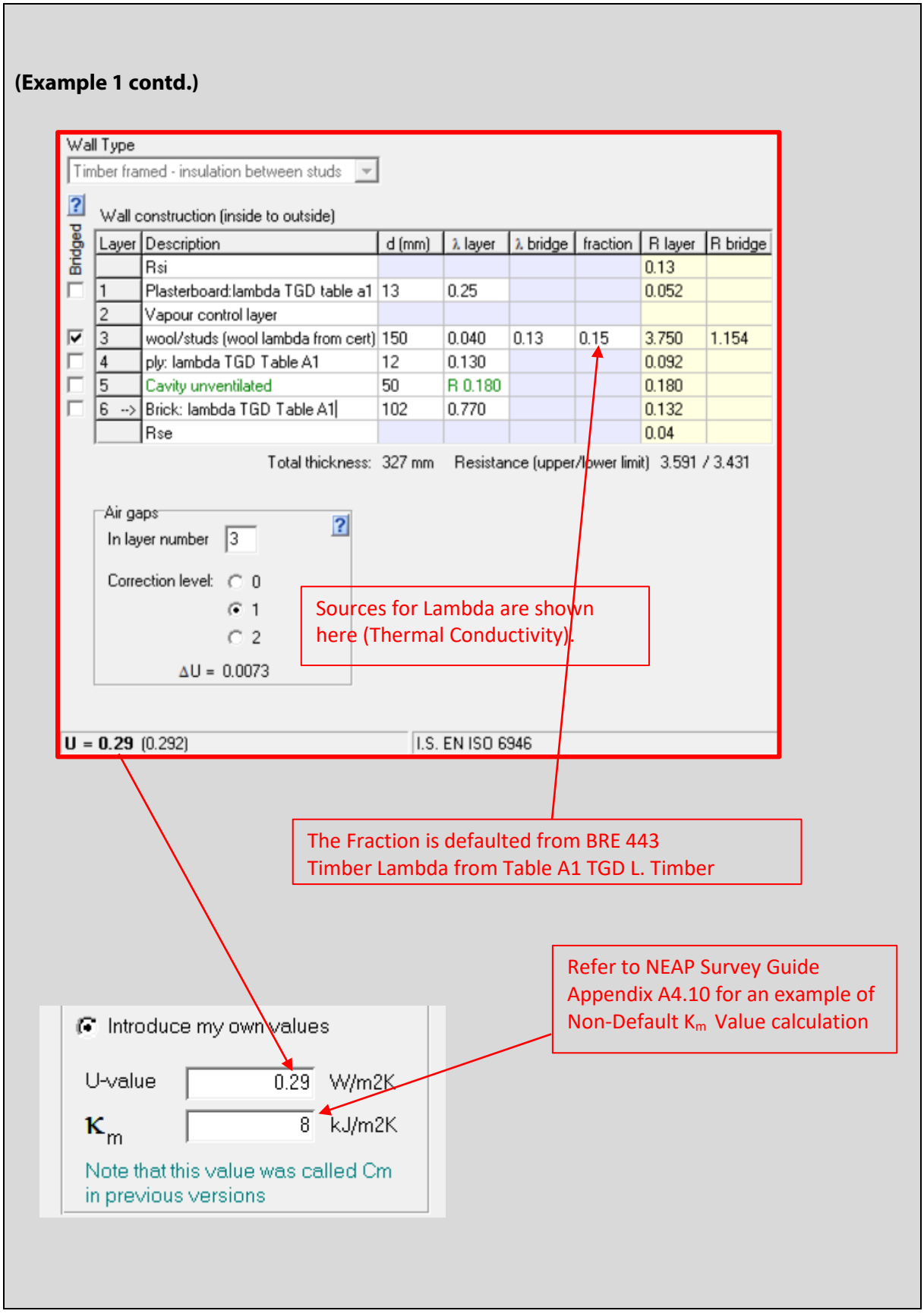
Example 1: Timber frame wall U-value calculation



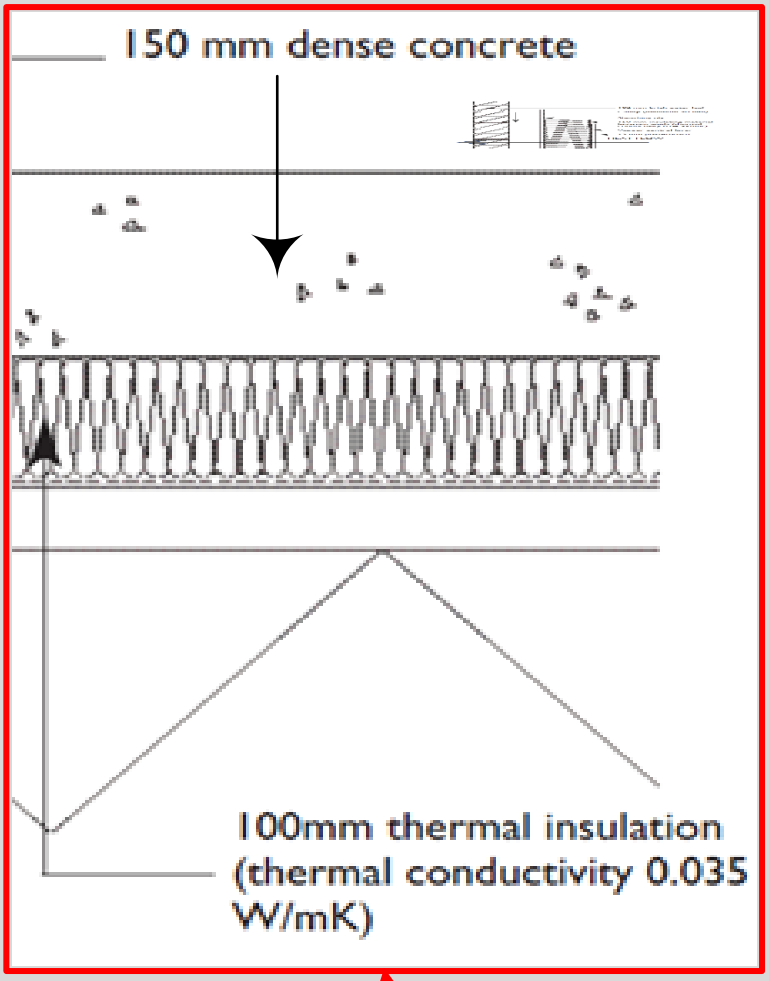
Insulation product name anonymised in this example

Material thicknesses from as-built drawings

(Example 1 contd.)



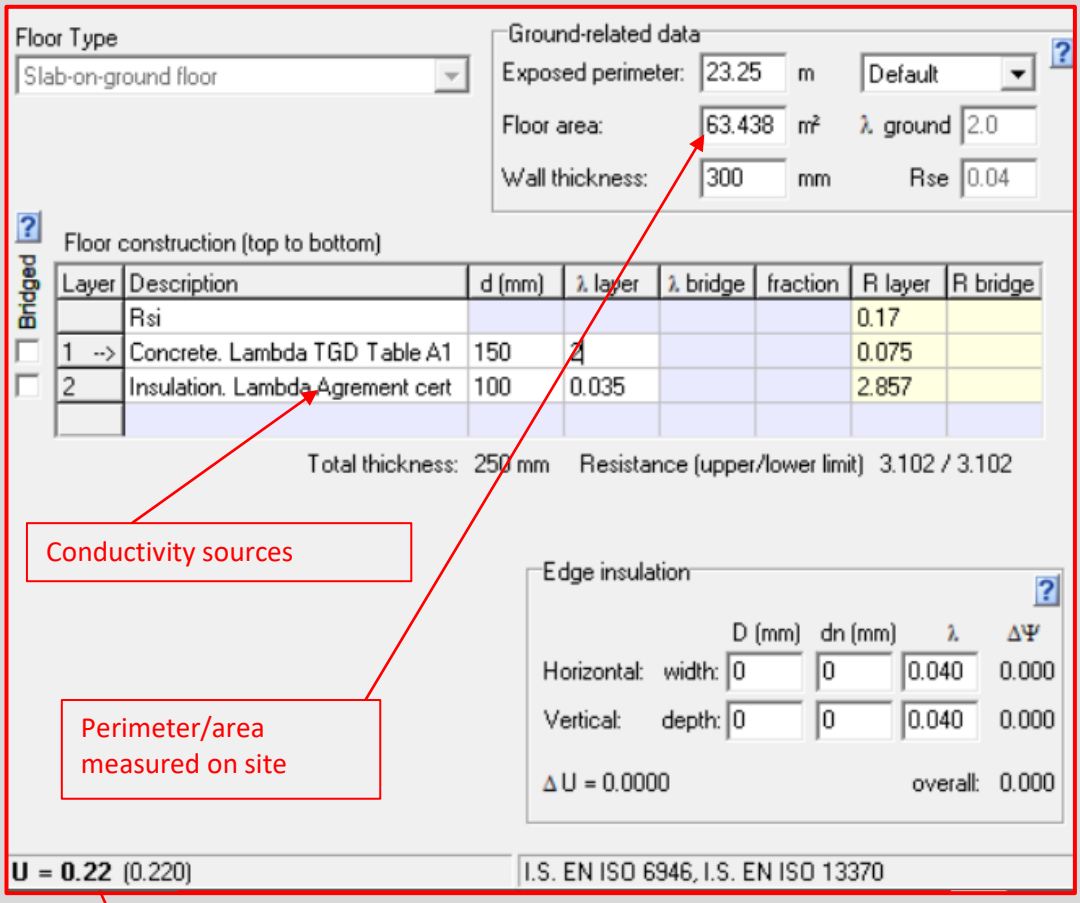
Example 2: Floor U-value calculation: concrete over insulation



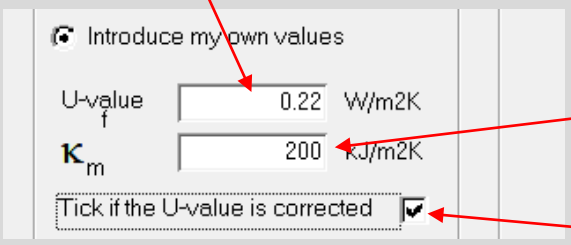
Material thicknesses from as-built drawings.

Insulation product name anonymised in this example

(Example 2 contd.)



NB Retain evidence supporting calculation (e.g. thickness, type, conductivity, calculation)



Refer to NEAP Survey Guide Appendix A4.10 for an example of Non-Default K_m Value calculation

Perimeter/area included in ISO 13370 compliant calculation means that the U value has been corrected, tick the box.

4.3 Adjoining buildings

In all cases, adjoining buildings are assessed in accordance with the guidance in Appendix 8 of the NEAP Survey Guide.

The examples below show a retail outlet with apartments overhead, followed by a gym adjoining a warehouse/storage building.

Example 1: Retail with apartments overhead

The building below consists of a retail unit with apartments overhead. The apartments are assessed using the DEAP Methodology while the retail section is assessed using iSBEMie.

Retail unit with apartments overhead

The ceiling of the retail unit is entered as connecting to a conditioned adjoining space. The matrix below from the NEAP Survey Guide shows that domestic accommodation is considered conditioned.

Matrix from NEAP Survey Guide

CAS - Conditioned Adjoining Space

Unconditioned Adjoining Space/ Strongly Ventilated Space

Building in BER Assessment \ Adjoining Building	Others – Passenger Terminals	Community/Daycare Centre	Primary Health Care Building	Residential Institutions	Restaurant and Cafes/Drinking Establishments and Hot Food	Libraries Museums and Galleries	Offices and Workshop businesses	Residential spaces	Education	Retail and Financial/Professional services	General Assembly and Leisure plus Night Clubs and Theatres	Storage and Distribution	Others - Car Parks 24 hrs.
Others – Passenger Terminals													
Community/Daycare Centre													
Primary Health Care Building													
Residential Institutions													
Restaurant and Cafes/Drinking Establishments and Hot Food													
Libraries Museums and Galleries													
Offices and Workshop businesses													
Residential spaces													
Education													
Retail and Financial/Professional services													
General Assembly and Leisure plus Night Clubs and Theatres													
Storage and Distribution													
Others - Car Parks 24 hrs													

Example 2: Gym/fitness centre adjoining a warehouse/store

The BER is to be carried out on the gym/fitness centre

The main activity in the left-hand building is a gym; the main activity of the right-hand building is storage. Access to the storage building was not possible.
The two building types under consideration are "Offices and Workshop Businesses" (the gym) and "Storage and Distribution" (the warehouse).
Using the matrix in *Example 1* above, the storage building is defined as an "Unheated adjoining space" with respect to the gym.

4.4 Windows

This section discusses the approach to windows and the associated use of defaults and non-defaults. iSBEMie User Guide (Volume 2), Section 3.3, and TGD L outline relevant standards to be detailed in certified, CE marked or manufacturer's performance data for windows when using non-defaults.

Refer to the NEAP Survey Guide, Section 7.2, for guidance on what is required for both non-default and default window entry.

Refer to NEAP Survey Guide, Appendix A4.2, for some examples.

There are several key parameters to be considered for windows in SBEM Project Database entries:

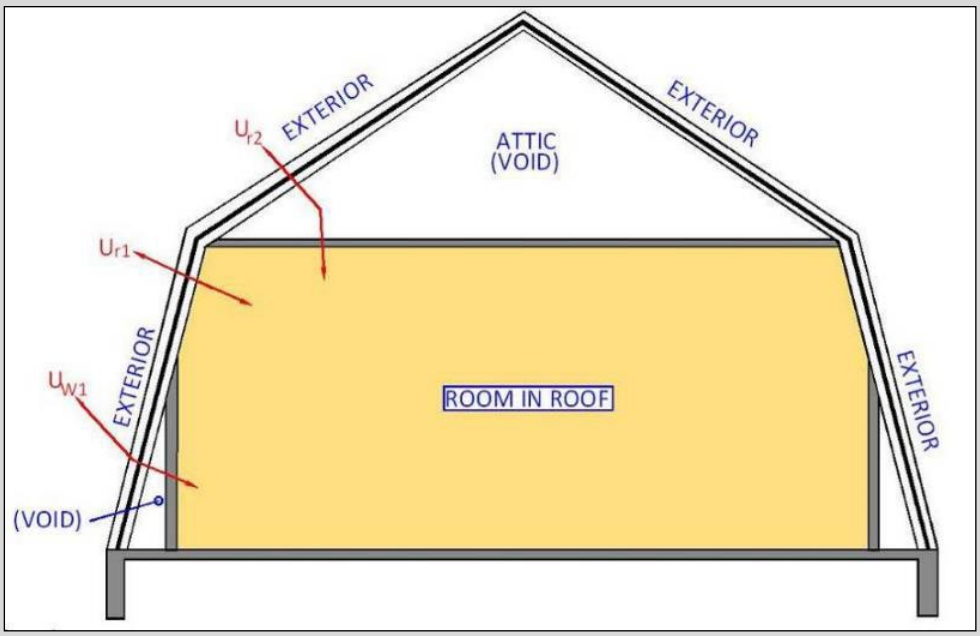
- For the U-value, solar transmittance and light transmittance, either use all as non-defaults or all as defaults for a window. Do not mix defaults and non-defaults for a window.
    - U-value is the heat loss of the window.
    - Solar transmittance (T-Solar) is the solar energy transmittance at normal incidence "g^". This parameter influences heat gains through the window in SBEM.
    - Window light transmittance (L-Solar) is the visible solar energy passing through glazing at normal incidence and is used in daylighting calculations in SBEM.
- Window make and model can be taken from the following to help source non-default data:
    - As-built drawings/specifications
    - receipts/invoices from the installer clearly applicable to the building being assessed
    - Glazing stamp (e.g. between panes).
- The approach to choosing the correct default is detailed in NEAP Survey Guide A4.2 and requires at least:
    - Glazing type
    - Glazing age
    - Frame type.

4.5 Elements containing voids

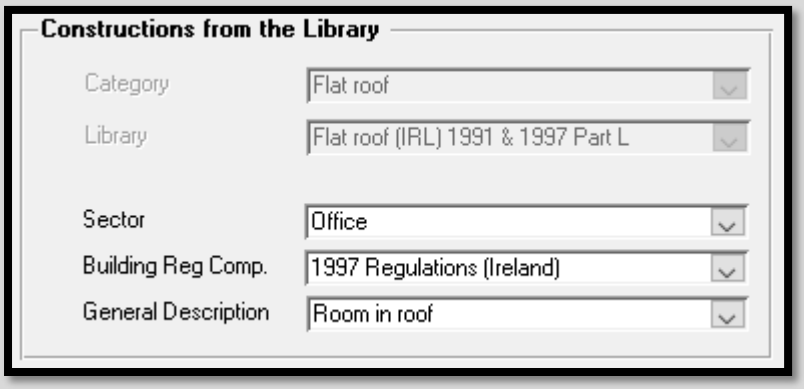
In some cases, building elements in the project database contain a void or air space. The following example illustrates how this is treated in SBEM assessments.

Example

The sketch below shows a top floor zone. The attic space above is not a zone included in the assessment floor area, it is a void. The spaces either side are not accessible. What "connects to" is assigned in iSBEMie to the ceiling and the walls adjoining these voids?



The "connects to" is to exterior as indicated by the red arrows. The construction of the wall or the ceiling with the void includes the airspace as part of the construction. The U-values for these constructions, Ur2 and Uw1, are calculated including the void and exterior façade.



A "Room in roof" element is available in the iSBEMie database for roof elements.

5 GEOMETRY

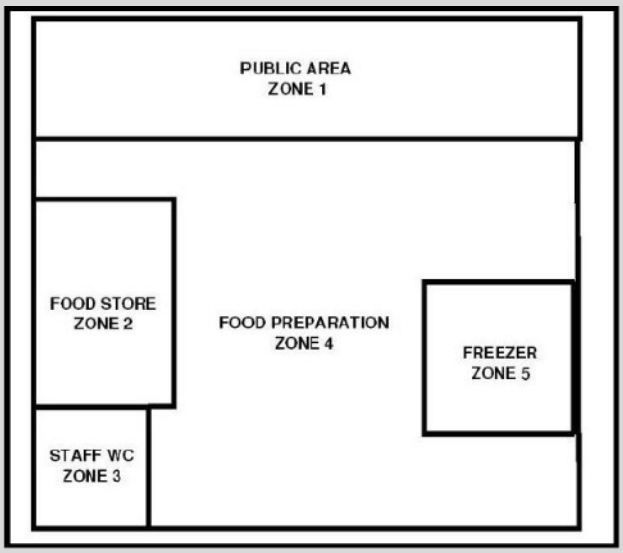
This section discusses the Geometry entries in SBEM, supplementing the guidance in the NEAP Survey Guide and iSBEMie User Guide. It focuses on measurements, merging and defining zones, zone height, roofs, walls and openings.

5.1 Defining zones: examples

This section provides examples of zone definition in NEAP assessments. When zoning a building, follow iSBEMie User Guide (Volume 1), Section 3.3, "How to zone your building" .

Example 1: Cold room

The following photograph and sketch show part of a fast-food outlet. The food preparation area behind the counter has a free-standing walk-in cold room forming part of the sale. The cold room (zone 5) sits in a larger room – the food preparation area (zone 4). In this example, the top outer surface of the cold room does not touch the ceiling of the food preparation room. The food preparation room has a heating system.



The cold room is zoned separately from the surrounding areas since it has a different zone activity associated with it, namely cold/chilled storage (zone 5) and food preparation zone 4).

Updated guidance: The zone types of cold or chilled stores are not specifically included as zone types in the current version of the SBEM. To enter a cold or a chilled store the most appropriate activity type is "Warehouse storage" or "24x7 Warehouse storage" under the building type "Storage or Distribution". Refer to Appendix A2.2 of the NEAP Survey Guide for details on this item.
The refrigeration aspect for this space is a process load since it is designed/provided for the goods and not for the thermal comfort of the occupants in the space, and is therefore outside the scope of the energy uses which can be accessed via iSBEMie. As such, this zone should be defined as a "Zones without HVAC system" in the iSBEMie model.

Zone 4 contains some elements adjoining the cold room, namely the insulated walls and the top outer surface (entered as an internal floor in zone 4).

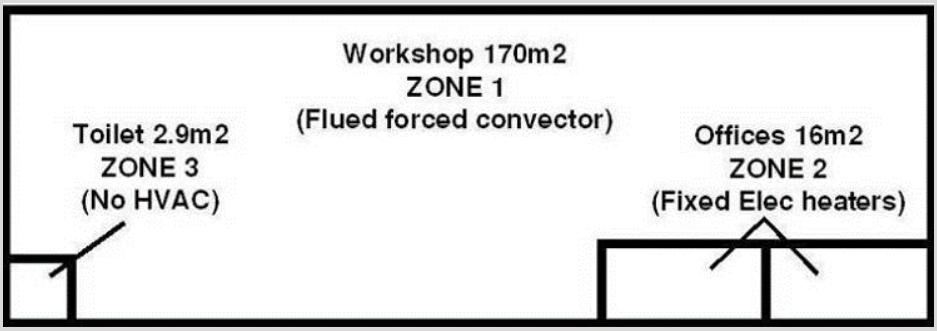
From the viewpoint of the zones that surround this zone, the envelopes, which are adjacent to this zone, should be defined as adjacent to a "conditioned adjoining space", so that no heat loss is calculated by

the software from the surrounding zones through them since the envelopes of walk-in fridges are usually very well insulated.

The height of zone 4 is the height of the zone measured like the convention in the NEAP Survey Guide, Appendix 6: "Warehouses with unusable space above adjoining zone". The unusable space between the top of the cold room and the underside of the ceiling is part of zone 4. All elements of this unusable space are assigned to zone 4. For example, the short section of wall visible above the cold room is assigned to zone 4. The plaster ceiling in the space above the cold room is included in zone 4's full ceiling element. The high-level floor made by the cold room's top outer surface is assigned to zone 4.

Example 2: Small zones

The drawing below shows a workshop with a small toilet in the corner. The toilet is 2.9 m^2, so when entered in iSBEMie the following warning appears: "Warning: area seems small – are you sure?"



A separate zone must still be created to represent the differing activity of the toilet compared to the surrounding workshop zone. The message "Warning: area seems small – are you sure?" flags to the iSBEMie user that the entered zone area is small in case the user has made an error during the area input. Since the toilet is unheated, the walls to the toilet, as seen from the workshop, are subject to the guidance in Appendix 8 of the NEAP Survey Guide.

5.2 Merging zones

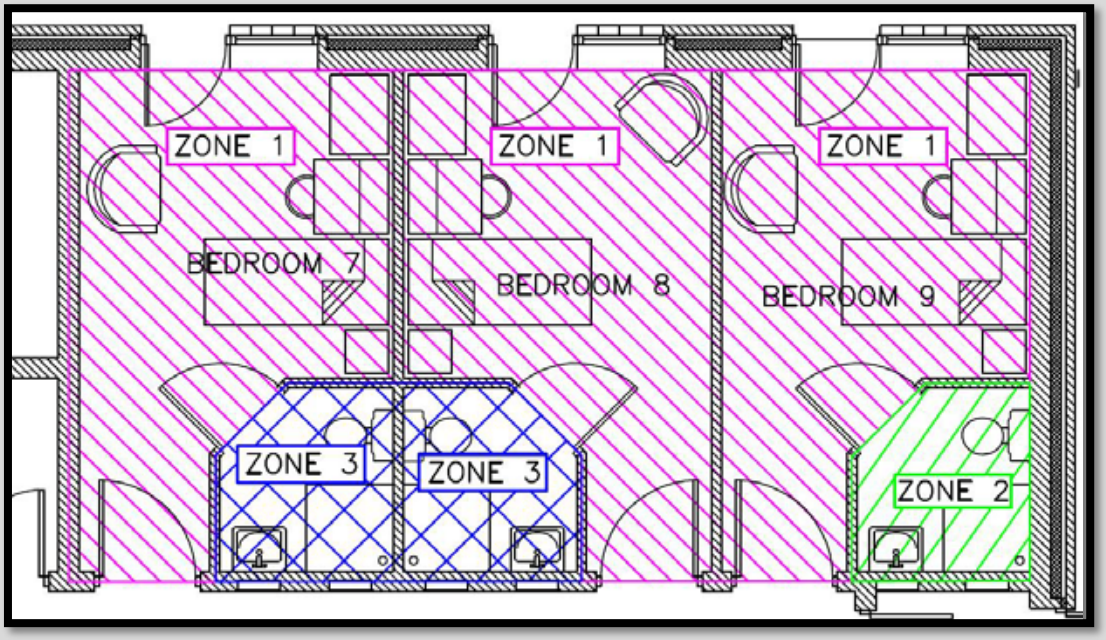
The examples in this section are based on hotels with many rooms and zones. Hotels tend to have large numbers of similar-sized and shaped zones, so there is potential to merge zones. As detailed in iSBEMie User Guide (Volume 1), Section 3.3: "Merge any contiguous areas that are served by the same HVAC and lighting systems have the same activity within them (e.g. adjacent hotel rooms, offices, etc.), and have similar access to daylight, unless there is a good reason not to."

The following sketches are from a hotel assessment. As is common in hotels, there is a repetition of the room layouts. Some layouts allow scope for more merging of zones than other layouts. In the examples below, some of the zones have the same lighting and HVAC, while others don't. For these examples, the allocation of zones is determined by following the zoning rules. Roof lighting arrays affect zone allocation, but there are none in these examples.

Updated guidance: Version 5.5h of iSBEMie includes a new zone type called en-suite bedroom. This can allow an en-suite room be entered as a single zone if the zoning rules allow.

Example 1a: Merging zones

- The lighting is NOT the same between the bedrooms and the toilets.
- The bedrooms and the toilets have the same underfloor heating system.
- The en-suite rooms have supply air into the bedroom and extract in the toilet (ventilation).



The three bedrooms can be merged into one zone as they are touching (contiguous), have identical HVAC, lighting, activity, and their daylight aspect is also identical. The bathrooms cannot be merged into the bedroom zones as they have a different lighting to the bedrooms. Two bathrooms have been merged as they are contiguous. The third bathroom is not contiguous to another bathroom, so it must be defined as its own zone.

Zone 1: three bedrooms defined as zone type – en-suite bedroom.

Zone 2: one bathroom defined as zone type – en-suite bedroom.

Zone 3: two bathrooms defined as zone type – en-suite bedroom.

Updated guidance: Using the new zone type, situations like those found in *Example 1a* above now have the potential to be entered as one zone as long as the HVAC and lighting are common to the bedroom area and the toilet area. The inclusion of this zone type in the software does not override the necessity to follow the zoning rules that are described in iSBEMie User Guide (Volume 1), Section 3.3.

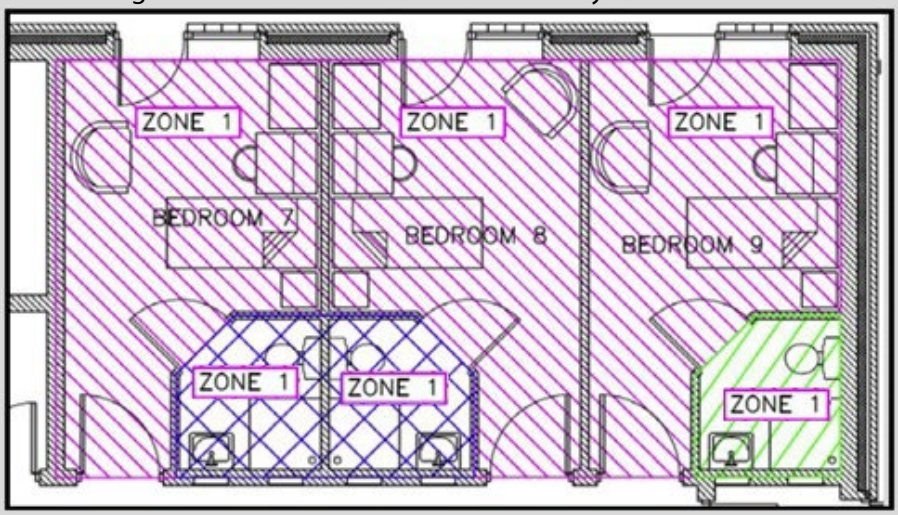
An *Example 1b* has been included below to show how the new zone type might be used.

Refer also to Appendix 8 of the NEAP Survey Guide for guidance on how to treat the adjacent conditions of the bedrooms and the en-suite rooms.

Updated guidance:

Example 1b: Merging zones

- The lighting is the same LED lighting in the bedrooms and the toilets.
- Each en-suite room is 17 m^2.
- The bedrooms and the toilets have radiators.
- The toilets are fitted with exhaust fans, but fan power and flow rate are unknown.
- The bedrooms are ventilated by openable windows.
- The connecting walls between bedrooms are a heavy construction.



If we were to combine the en-suites and the toilets, one exhaust flow rate would be applied to the combined space. The exhaust flow rates would represent the entire room, so would result in an incorrect result.

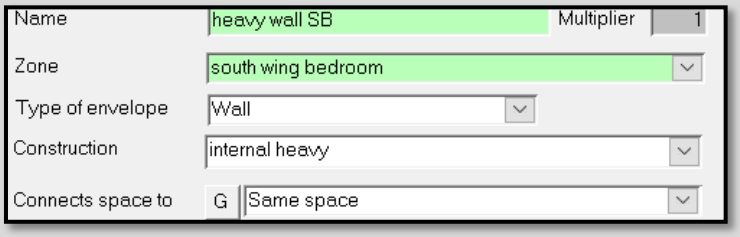
For this example, no details are known about the fans, but Appendix A4.8 of the revised NEAP Survey Guide gives default exhaust flow rates. The flow rate of 15 l/s is given for showers.

The three showers' exhaust flow rates are added to give 45 l/s and are then divided by the whole area of the hatched view above (e.g. 68 m^2). This gives a whole room flow rate of 0.66 l/s/m^2 and this can be applied to one merged zone.

The three bedrooms and their en-suite bathrooms can be merged into one zone as they are touching (contiguous), have identical HVAC, lighting, activity, and their access to daylight is also identical.

The zone type "en-suite bedroom" is applied to the single merged zone 1.

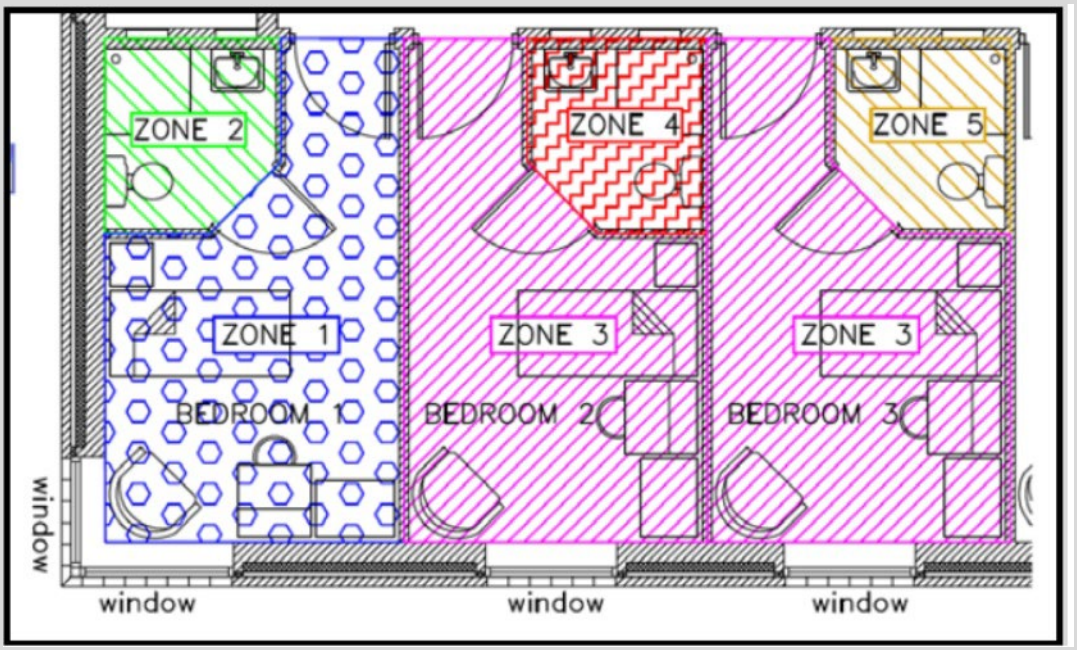
Note: Since the connecting walls between rooms are of heavy construction an additional wall element should be defined. The area is calculated by adding up the length of wall missing in each room as if the zones weren't being merged. If the rooms measure 5.6 m top to bottom, there will be 4 x 5.6 m of wall length to be multiplied by the height to calculate the missing wall area of heavy wall. The entered orientation of an internal wall doesn't matter, but use "same space" as the connects to. (Refer to Section 3.3.7 of iSBEMie User Guide (Volume 2), 'Compliance', for details.)



Example 2 and *3* below are left mostly unchanged from the previous publication as they contain useful information on zoning rules and the multiplier function.

Example 2: Merging zones

There are a total of six rooms. All have the same lighting, but the toilets use electric fan heaters, whereas the bedrooms use a boiler and radiators system. This example shows a more limited scope for merging, and it is only possible to reduce six zones down to five zones by merging two bedrooms. It is not possible to merge the zones any further.



The bathrooms have a different HVAC to the bedrooms and cannot be merged with bedrooms by use of the new "en-suite bedroom" zone type. The bathrooms are not contiguous to neighbouring bathrooms and cannot be merged, so they must be defined separately. Bedroom 1 cannot be merged with bedrooms 2 and 3, as it has different access to daylight. Bedroom 1 has daylight from two sides, while the other bedrooms have daylight from one side only.

The zone type "en-suite bedroom" is applied to all five defined zones.

Please note that the following apply in any case:

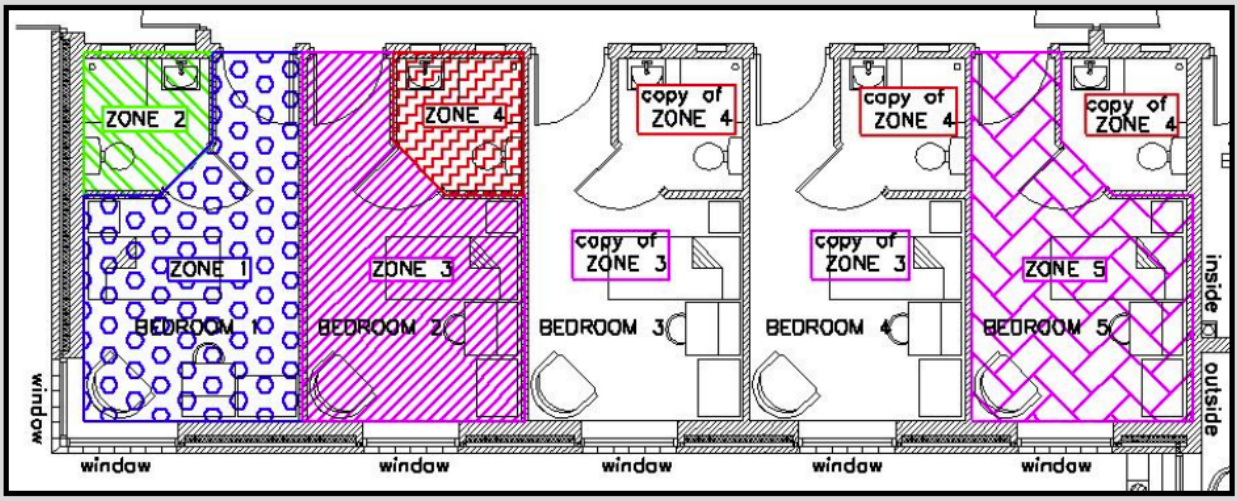
Thermal mass

Be aware of the need to account for the thermal mass of the boundary walls between merged zones. If the walls are of a heavy construction, they must be included as an additional element, or elements, assigned to the merged zone(s). If the walls are of lightweight construction (e.g. plaster stud), they may be ignored, subject iSBEMie User Guide (Volume 1), Section 3.3, item 7.

Vertical merging

The question may arise in some cases if merging of vertically stacked zones is an option where identical layouts exist from floor to floor. Can a stack of three bedrooms, each 3.0 m high be merged into a single zone circa 9.0 m high? It is not possible to merge zones in this fashion as the zone area is incorrect and lighting allocation is to a single tall zone rather than to the equivalent three 3.0 m high zones.

Example 3: Zone multiplier function

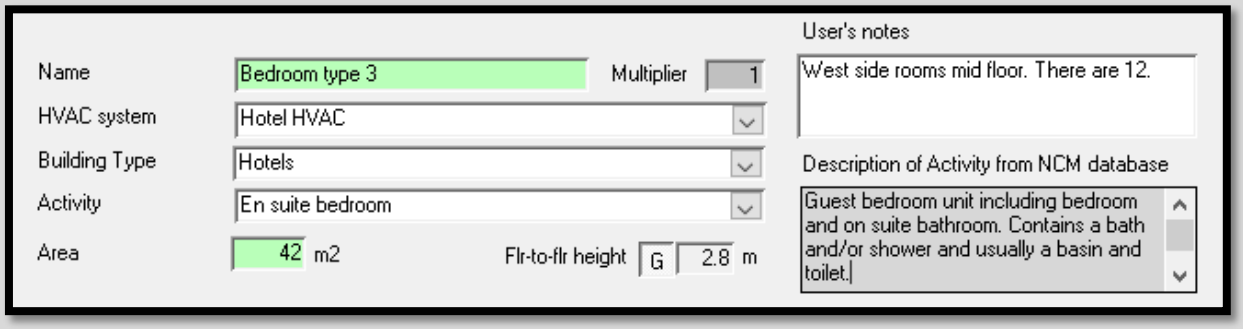


In situations like *Example 2* above, there is another option to reduce the number of zones in iSBEMie by using the multiplier function. The multiplier function, when applied to a whole zone, multiplies envelope elements, energy uses, etc, within the zone. Use the zone multiplier with caution to avoid errors. The zones being copied must be fully identical. The zone multiplier value field is found in the zone definition tab for each zone. This method helps where zone quantity is reaching the limit of iSBEMie capabilities, as it does not create copies of zone elements.

In *Example 3*, zone 3 has been multiplied by three, while zone 4 has been multiplied by four. Zone 5 cannot be included as a copy of zone 3 due to the right-hand wall of zone 5 having both inner and outer elements. In effect, five zones have been entered instead of up to 10.

You may find that choosing to use the methods employed in *Example 1* and *Example 3* to reduce the zone quantity will depend largely upon the layout being a mirror image type layout or an identical type layout. It is permissible to use a combination of the two methods. Always document merging and zone multiplication clearly, so that, in the event of an audit, the assessor's methods can be understood by the auditor and assessor.

In the user's notes text box the assessor can clarify the method employed as well as helping themselves understand inputs, particularly in a larger project.



The screenshot above shows the location of the zone multiplier field and the “User’s notes” text box.

5.3 Zone height

Appendix 6 of the NEAP Survey Guide provides several examples of zone height conventions for different buildings and roof types. The following examples supplement those given in the NEAP Survey Guide.

Example 1: Pitched roof buildings, multiple zones, full height boundaries

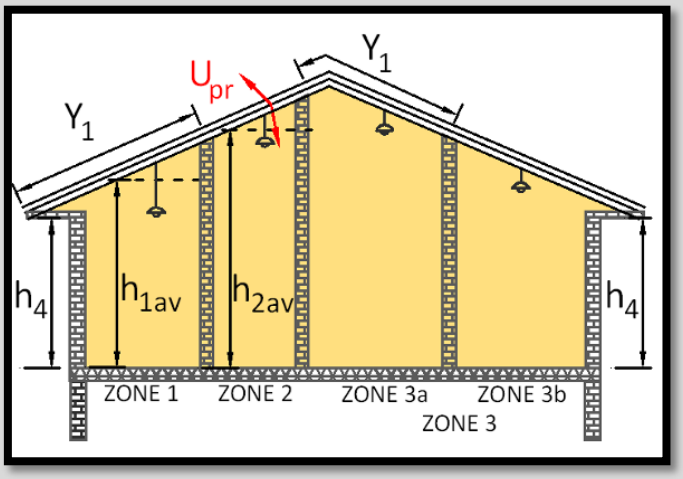
These are a combination of some of the examples in the NEAP Survey Guide.

Zone 1

- Zone 1's height is top of floor to weighted average height of all walls – h1av. It has a mono-pitched ceiling.
- Area of each zone's gable wall is the zone's shaded area.
- Area of outer wall to zone 1 and zone 3b is h4 x wall length.
- Area of any inner wall is inner wall height x wall length.
- U-value of pitched roof (Upr) is from underside of ceiling to outside roof.
- Zone 1's roof area is the roof width dimension Y1 x building length.

Zones 2, 3a and 3b

- Zone 2's height is top of floor to weighted average height of all walls – h2av.
- Zone 3a's height is h4 because the zone does not have a mono-pitched roof.
- Note: If zone 3a & 3b were a single zone 3, that is if the dividing wall did not exist, then the zone height is h4 because the zone does not have a mono-pitched roof.



Example 1

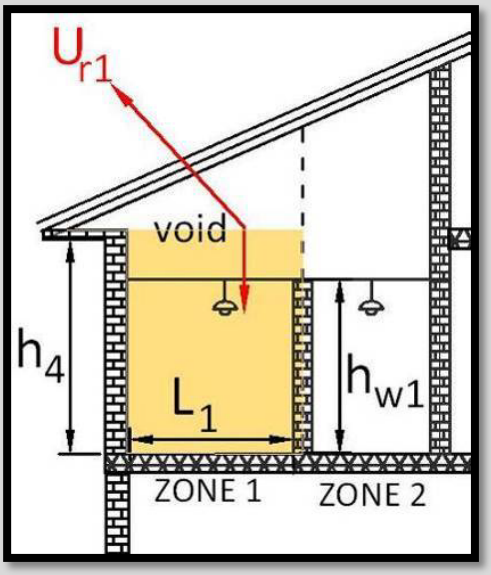
Example 2: Pitched roof type buildings, multiple zones, partial height boundaries, suspended ceilings

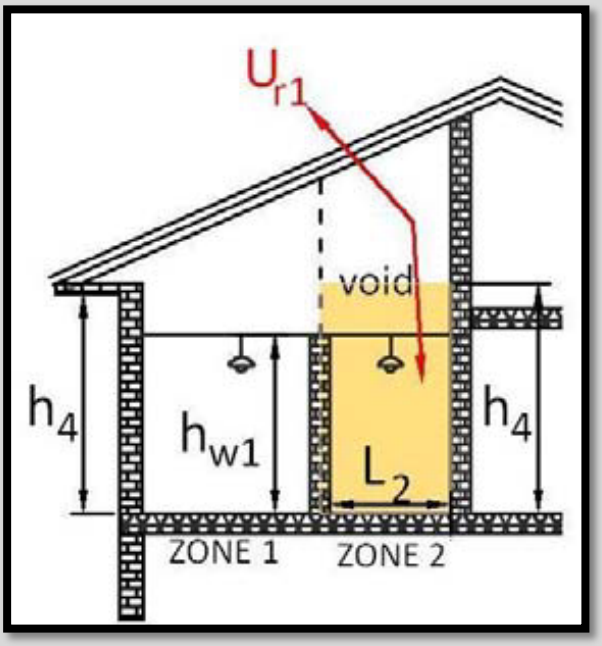
Zones 1 and 2 are like the top floor with pitched roof and dropped ceiling example in the NEAP Survey Guide.

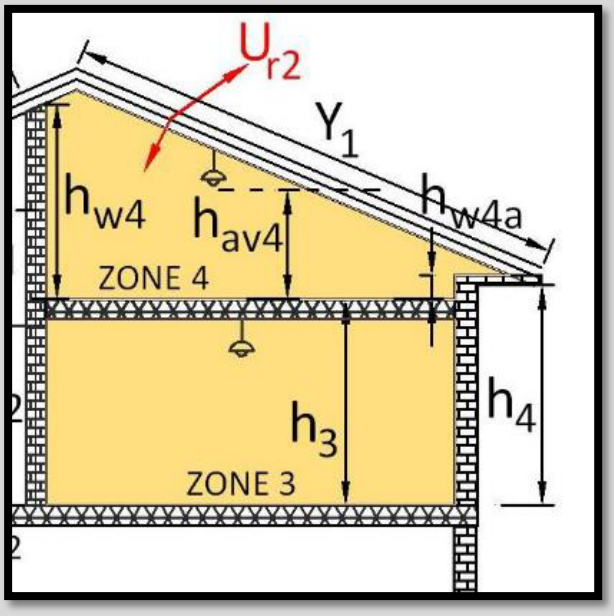
Suspended ceiling with or without insulation. Void above the zones not a usable space.

Zone 1

- Zone 1's height is top of floor to underside of soffit/eaves level h4.
- Area of gable wall is the zone's shaded area L1 x h4.
- Area of outer wall is h4 x wall length.
- Area of zone 1's inner wall is hw1 x wall length.
- U-value of pitched roof (Ur1) is from underside of ceiling to outside roof.
- The roof area is the ceiling width L1 x building length.



	Example 2: Zone 1
Zone 2 • Zone 2's height is top of floor to underside of soffit/eaves level h4. • Area of inner wall to zone 1 is hw1 x wall length. • Area of inner wall to remainder of building is h4 x wall length. • Area of gable wall is the zone's shaded area. • U-value of pitched roof (Ur1) is from underside of ceiling to outside roof. • The roof area is the ceiling width dimension L2 x building length.	 **Example 2: Zone 2**

Example 3: Pitched roof type buildings, multiple zones, with horizontal boundaries	
Zone 3 • Zone 3's height h3 is top of floor to top of floor slab. • Zone 3's area of inner wall is h3 x wall length. • Zone 3's area of outer wall is h3 x wall length. **Zone 4** • Zone 4's height is the top floor soffit height – hw(b). It is not mono-pitched. • Zone 4's area of inner wall is hw(a) x wall length. • Zone 4's area of outer wall is hw(b) x wall length. • Area of zone's gable wall is the zone's shaded area. • U-value of pitched roof (Ur) is from underside of ceiling to outside roof. • The roof area is the roof sloping width dimension Y1 x building length. Note: If zone 4 had a mono-pitched roof, the zone height would be the weighted average height.	 **Example 3**

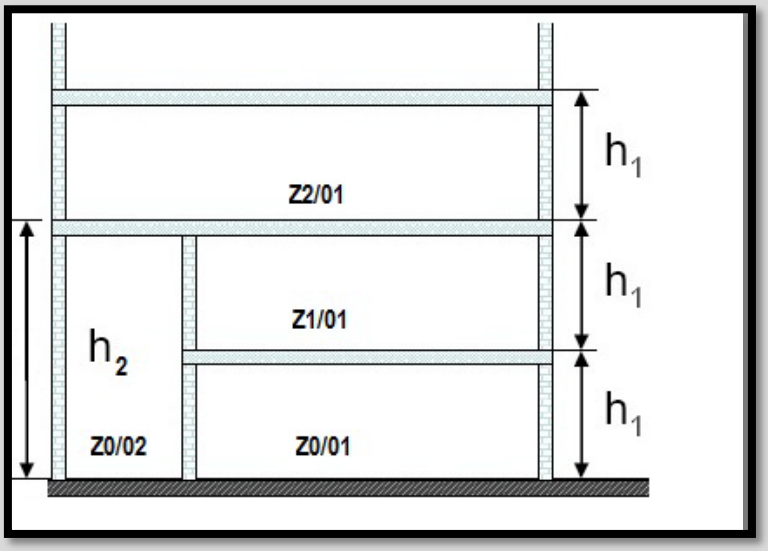
5.3.1 Global zone height examples

As outlined in the NEAP Survey Guide, a global zone height can be set in iSBEMie under General and Geometry -> Building Details. The value entered is given as the global or default zone height in each of the zones. The zone height can be altered, or the global height can be used for respective zones.

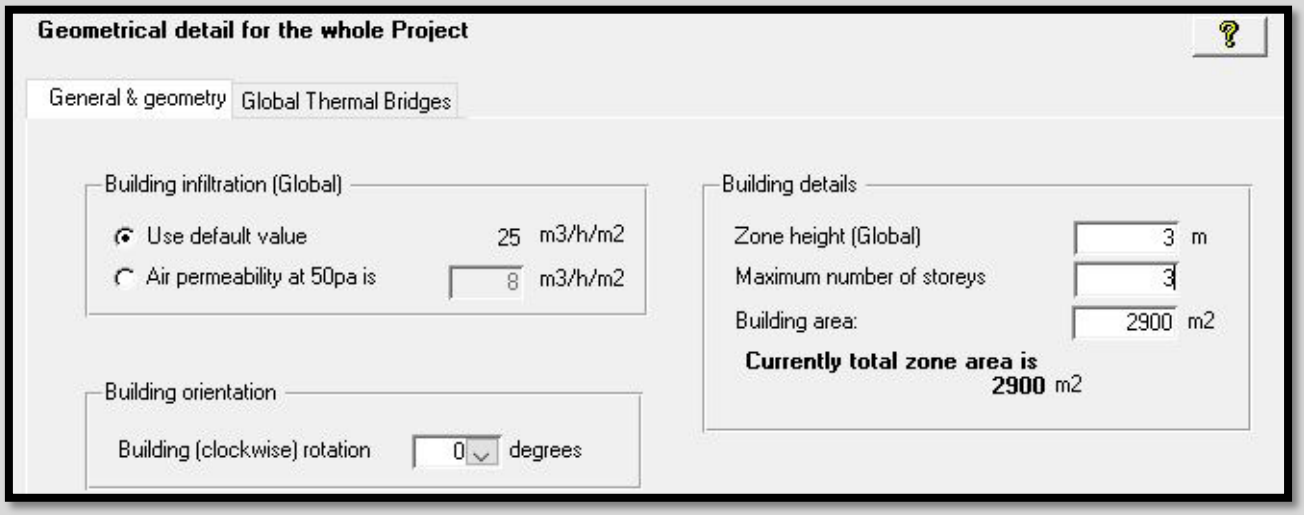
Where a zone height differs from the global/default height, select the global button G and enter the actual zone height.

Example: Global zone height

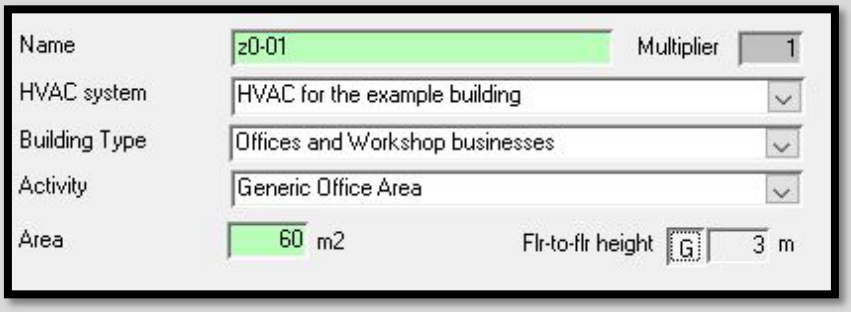
In the building shown below, Z0/01, Z1/01 and Z2/01 have the same height – h1 = 3 m.
Z0/02 has a different height – h2 = 6 m.



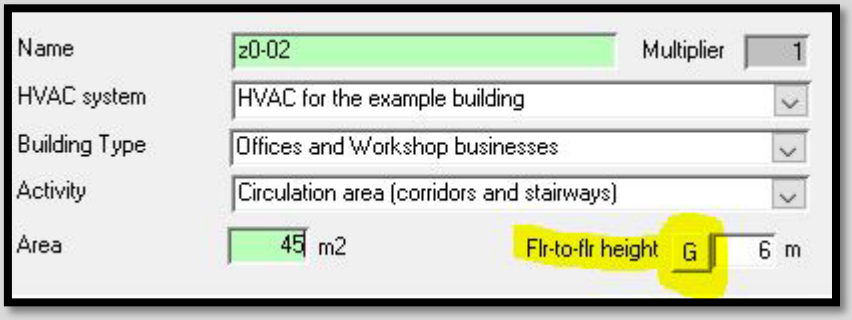
The Global zone height is set at h1 = 3 m:



For each of the zones the global/default height is then h1, as evident in Z0/01:



Where a zone height differs from the global/default height, the BER assessor selects the global button G and enters the actual zone height. In this case, Z0/02 has a height of 6 m, therefore, the zone is updated accordingly:



5.3.2 Global air permeability

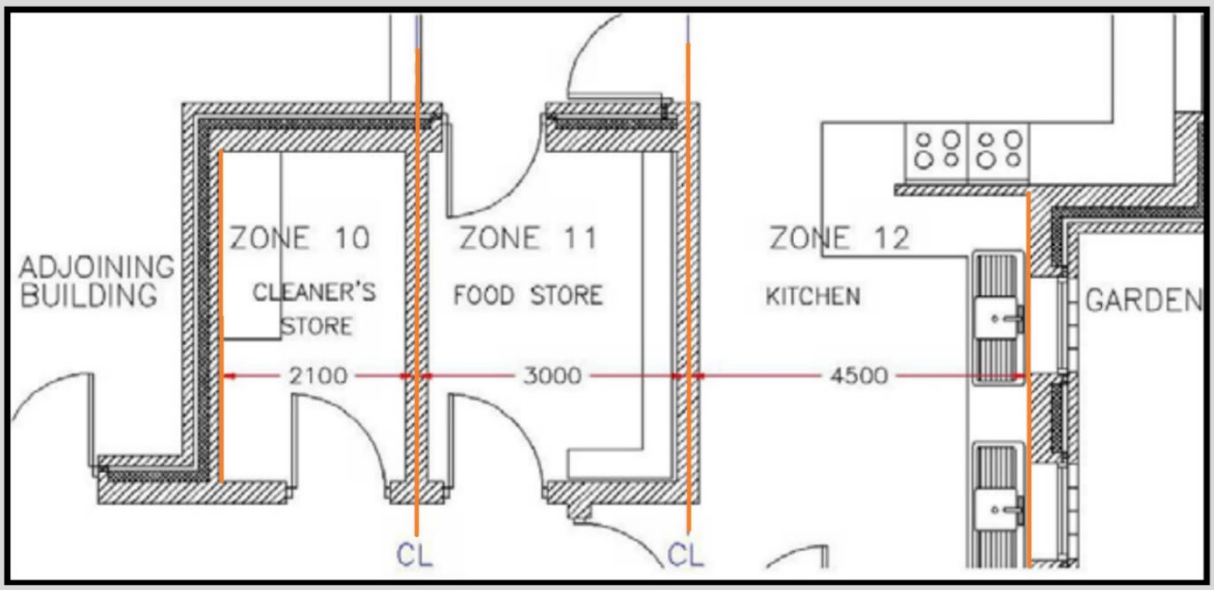
Like the global zone height above, iSBEMie allows for a global airtightness figure under General and Geometry -> Building Infiltration (Global). The value entered is given as the global or default permeability in each of the zones. The permeability can be altered for a zone or the global figure can be used for respective zones. Where permeability differs from the global/default figure, select the global button G under Geometry -> Zones, and enter the permeability for that zone.

5.4 Roofs and walls

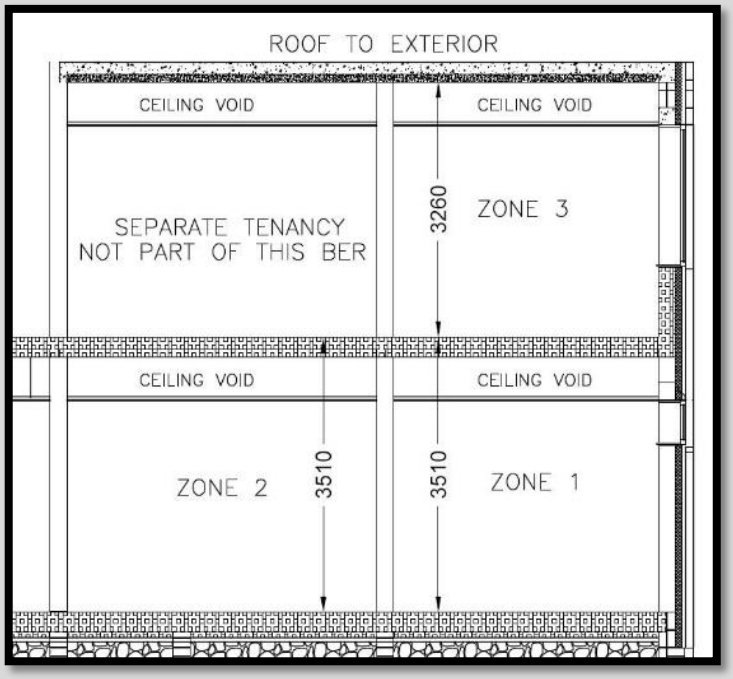
5.4.1 Wall area measurement

For walls, measurement is taken from the inner face of the exterior wall or party wall to the centre of an internal wall forming the boundary to another zone within the assessment. Refer to iSBEMie User Guide (Volume 1), Section 3.4, 'Measurement and Other Conventions'.

Example 1



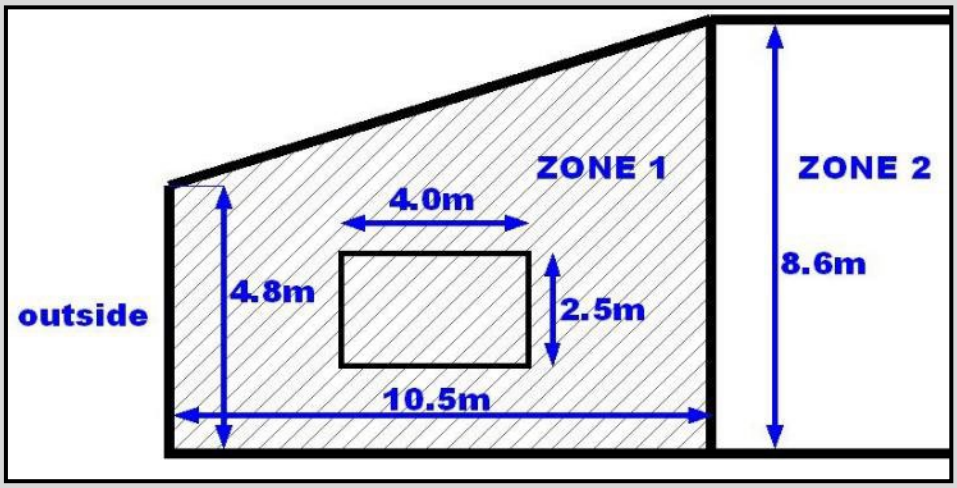
External or party walls bounding adjoining buildings are measured from their inner face. For internal walls representing zone boundaries, measure to the centre of the wall, shown as CL in the above sketch. Subsequent element area calculations are the basis for the element area entries in iSBEMie.



Sectional view of a building

Vertical measurements in zones not on the top floor require the inclusion of the floor slab thickness to the floor above to be included, as shown in zone 1 and 2 above. For top floor zones, where the ceiling is defined as a roof to the outside, the measurement is taken to the underside of the slab, as shown in zone 3 above. When there is insufficient proof of the actual slab thickness (not detailed in drawings for example), a default of 250 mm is used.

Example 2: Wall area calculation



Zone with non-rectangular wall and a window

The zone is bounded on the left by the exterior and on the right by the adjoining zone. The length of the wall is measured from the internal face of the outside wall to the centre of the internal wall separating the adjoining zone.

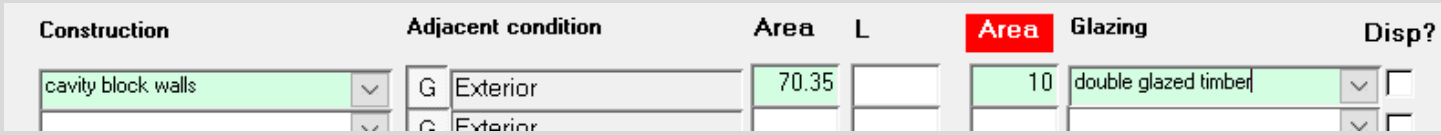
The window area is NOT subtracted from the wall area calculation as iSBEMie does this automatically.

The wall area entered in iSBEMie is calculated as follows:

(4.8 m x 10.5 m) + ((0.5 x 10.5) x (8.6-4.8)) = 70.35 m²

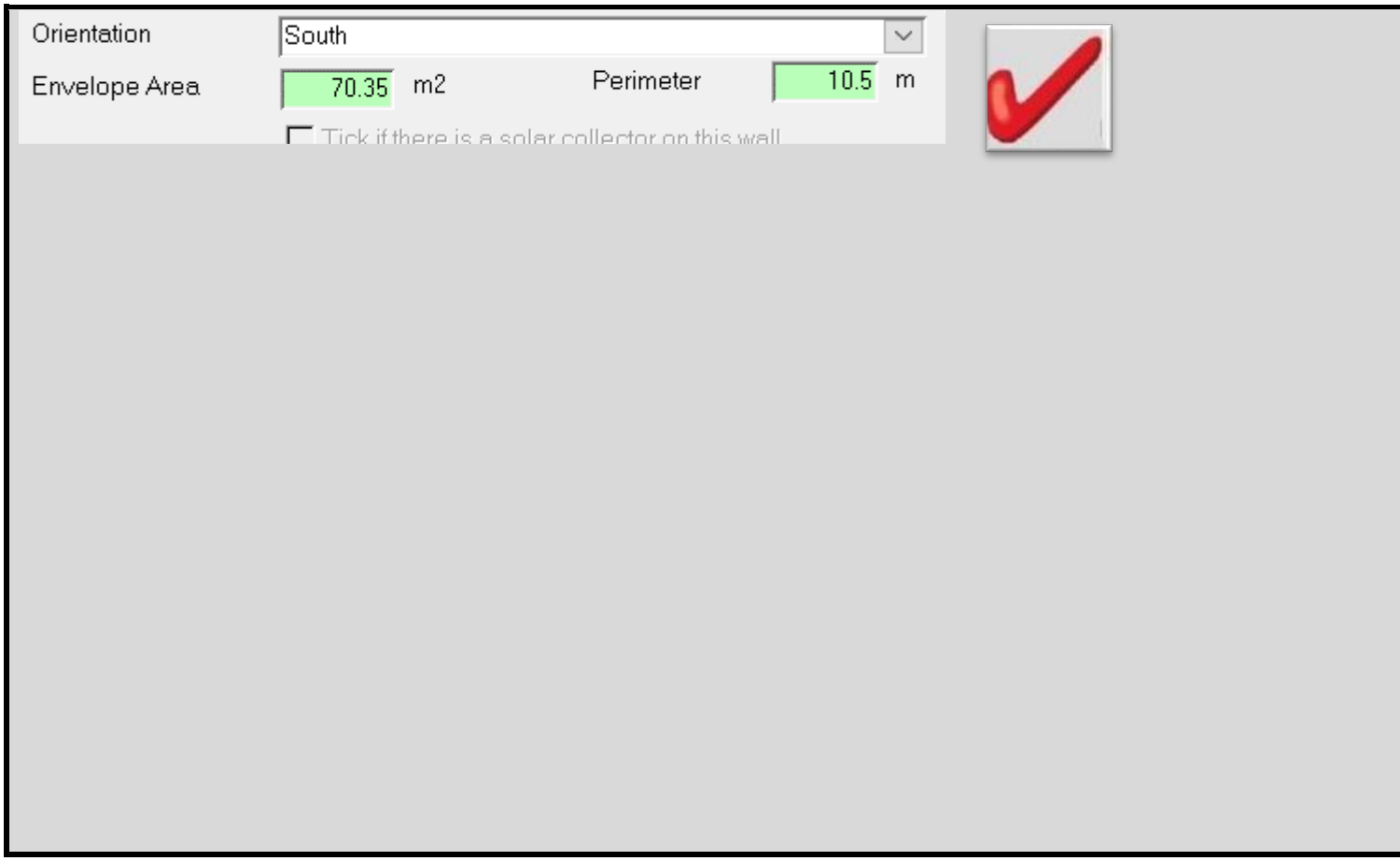
The hatching in the diagram above represents the entered wall area.

Updated guidance: Version 5.5h of iSBEMie has a data entry field for perimeter. Where a wall is rectangular iSBEMie can calculate the correct value for the horizontal wall length. This length is used in thermal bridging heat loss calculations. However, for a non-rectangular wall, such as that shown above, the perimeter value assumed by iSBEMie will need to be entered manually in the L box, as shown in quick envelope.



The quick envelope data entry method is being used for the above example wall. If L is not filled in, iSBEMie assumes a rectangle and calculates a value based on the wall area (70.35 m²) divided by the zone height (4.8 m)

The calculated value of 14.66 m is visible in the envelope tab. The BER assessor can enter the correct value for L (10.5 m) in the L field in the quick envelope tab either while inputting the data in the first instance or by overwriting the value in the envelope tab after the element has been created.

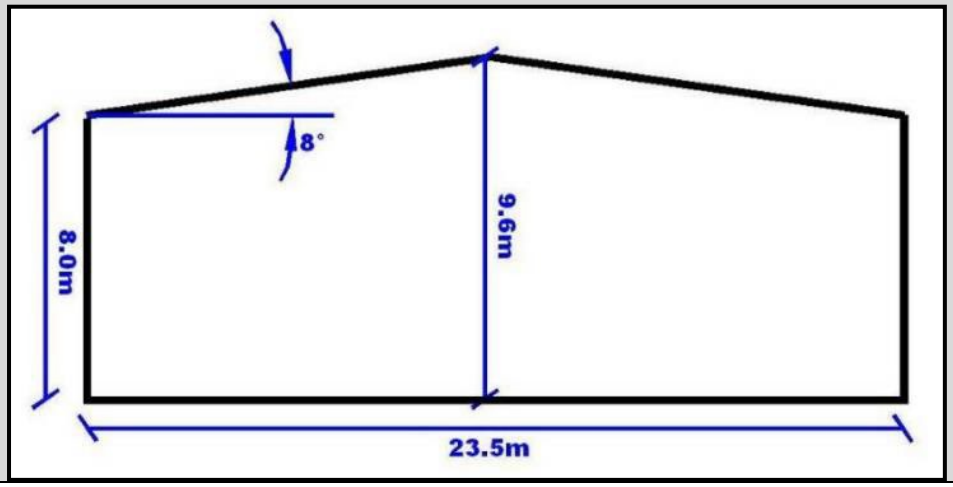


5.4.2 Roof area measurement

iSBEMie User Guide (Volume 1), Section 3.4, states: "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."

Example: A zone with a sloped roof

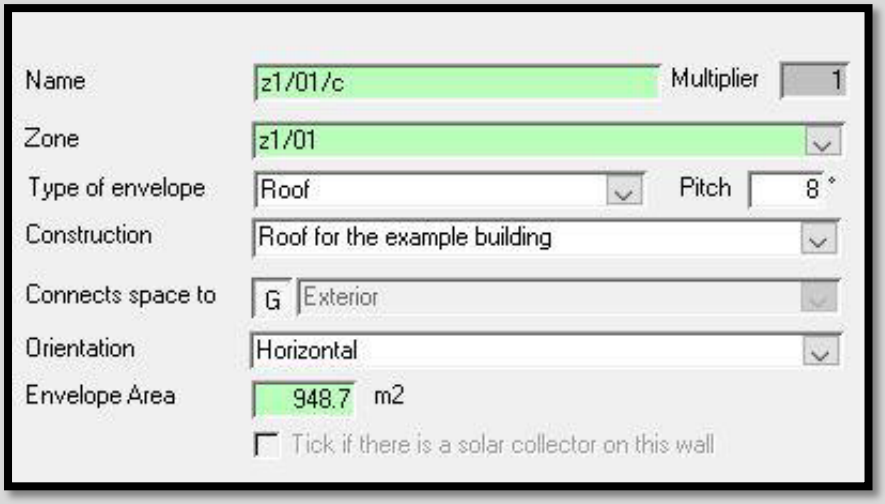
The sketch below shows a cross-section of a building. The width of the building is 23.5 m, as shown, and the depth is 40 m. The heights of the building are also shown. The roof pitch is eight degrees.



Sketch of warehouse building – 23.5 m wide and 40 m long

The roof inner surface area is calculated as 948.7 m^2 (based on the hypotenuse as the sloping roof x 40 m depth. Multiply this by two to account for both sloping sections).

The floor area is 940 m^2. The area of 948.7 m^2 is entered in the roof area field as shown below:



Updated guidance: In Version 5.5h of iSBEMie the actual pitch angle is entered where previously there was a tick box for flat roofs. The previous guidance where a roof element with a pitch greater than 70 degrees is entered as a wall remains unchanged. Refer to Table 4 in iSBEMie User Guide (Volume 1), Section 3.3, for further information.

5.5 Windows and doors

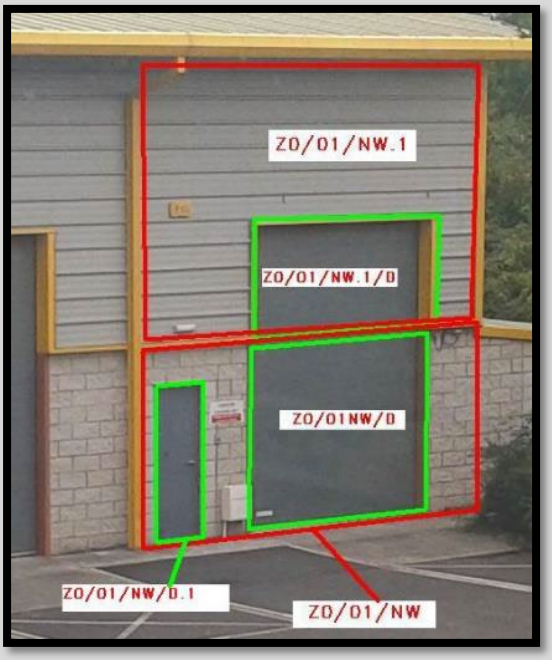
5.5.1 Window areas and door areas

The area of an external window or a door is not subtracted from the wall element in NEAP assessments. iSBEMie automatically subtracts the window or door area from the wall area. As per iSBEMie User Guide (Volume 2), Section 3.4.5.5, if an entered window or door area exceeds the area of the wall element to which it is applied, SBEM automatically increases the wall area to match that of the window/door areas. This leads to an inaccurate rating as the next example illustrates.

Example: Opening area relative to wall area

Many industrial and commercial units have block wall at lower level and prefabricated panel walls above this. Each side with this construction type has two wall elements.

Where a large vehicle-access door is present in such a building the correct way to enter the door is as two doors, each representing the area occupied by the section of door in each section of wall. If the whole vehicle-access door was applied to wall Z0/01/NW, its area might exceed the area of the wall itself. iSBEMie would then increase the wall area to that of the door. This results in this zone having more external element area than it actually exists. This increases heat loss from the zone, resulting in a poorer BER.



5.5.2 Rooflight areas

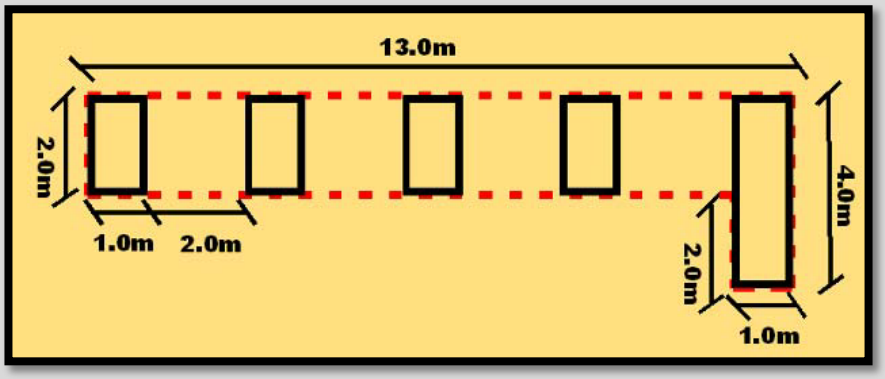
In some cases, the area ratio for rooflights is erroneously omitted. From iSBEMie User Guide (Volume 2), Section 3.4.5.7: "Area ratio covered is the ratio of the roof area covered by an array of rooflights to the total area of the rooflight glazing. This parameter is active only if the envelope to which this window belongs has been defined as a roof, i.e. the window is in fact a rooflight."

The area ratio is used to define an area of roof considered to be covered by rooflights and so it assists SBEM with automatic zoning according to daylight levels.

Example 1: Rooflight area ratio

A modern warehouse sales building with T-5 lighting and dimming achieves a BER of B1 = 0.64 with an area ratio left as the default value of 1.0.

The roof area covered by the rooflights shown in broken line is 28 m^2. The rooflight area is 12 m^2. The area ratio is 2.33. When this is entered, the rating changes to B1 = 0.6 as the lighting load is reduced. This is because an area of the warehouse is well lit by incoming light from the roof lights array rather than the area lit by the rooflights localised in one smaller area.



Example 2: Rooflight area calculation

Occasionally rooflights or skylights are omitted in error. Always remember to look for rooflights during BER assessments. Where elements are inaccessible due to height, use other measurable features on site to determine their areas. Document the methodology in case of a future audit.

5.5.3 Blocked up windows

In some cases, windows may be blocked up on site. There can be several reasons for this, as illustrated in the following examples. If assessors encounter a situation for which they are unsure of the correct approach, contact the BER Helpdesk for assistance.

Example 1: Advertising adhesive film on windows

The windows of this unit have had an adhesive film attached to advertise its potential for lease/sale. With reference to Window U-value, T-Solar and L-Solar in Section 7.2 of the NEAP Survey Guide, such films are ignored. The windows are entered in SBEM as if the film were not present.

Example 2: Windows boarded up

The windows of this building have been blocked up to prevent unauthorised access. In this situation, the window is entered as found and the plywood ignored. The reasoning is that this is a temporary measure and not part of the building fabric.

Example 3: Windows slabbed over with plasterboard

The windows of this building have been covered over with plasterboard. In this situation, the windows are ignored since substantial work is required to reinstate them. The plasterboard construction is included in the assessment as another type of wall element.

5.5.4 Window orientation

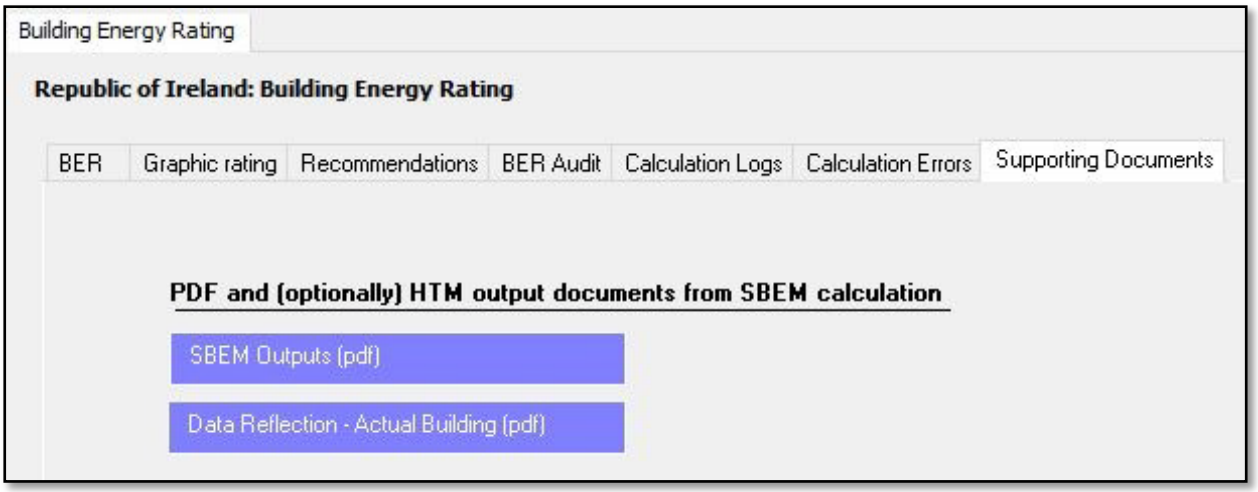
For some buildings, particularly buildings with a large amount of glazing, the orientation can result in a significant change to the BER. Always recheck the building's orientation before commencing entering the building into the software. Always double-check site notes against maps or other independent information sources.

It is possible to amend an incorrectly orientated building without having to re-enter all the geometry. iSBEMie User Guide (Volume 2), Section 3.4.2, describes this procedure. It is, however, better to enter the correct orientation from the start since altering the orientation in iSBEMie can be confusing.

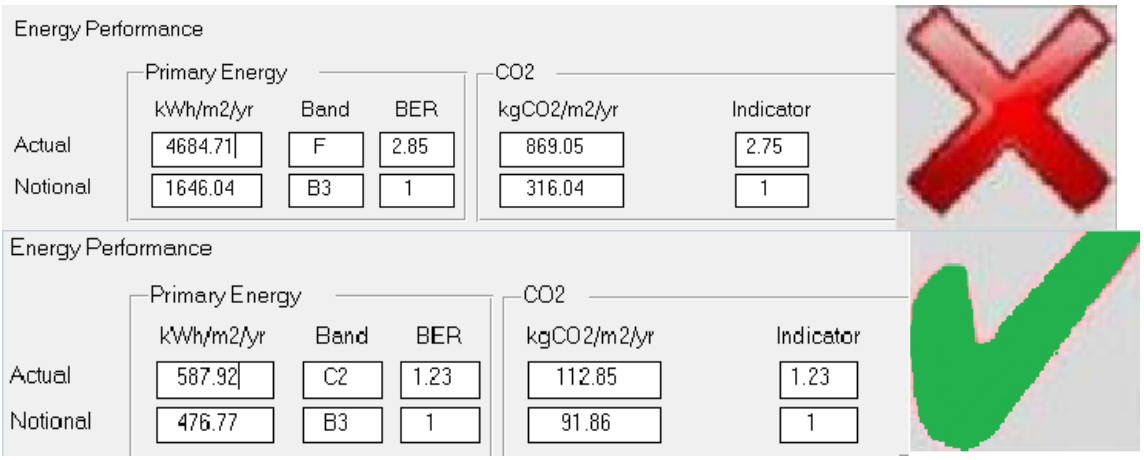
5.6 Checking inputs

Assessors may wish to gain a quick overview of wall areas, U-values and orientations entered in SBEM. The data reflection report produced by SBEM is useful for checking the geometry entries.

The data reflection report can be accessed from the ratings page in iSBEMie on the rightmost sub-tab, supporting documents or in the project file folder for all other approved software. The file name will be projectname_dr.pdf.

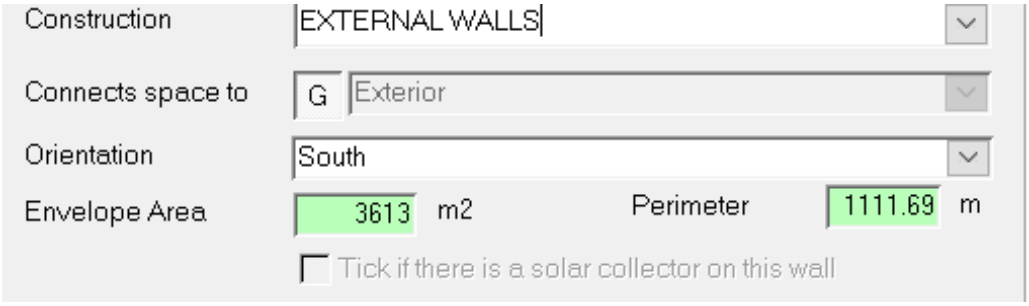


In some cases, the zero key is pressed instead of the decimal point key. The example below shows the difference for a wall element changed from the correct value of 36.13 m^2 to 3613 m^2.



Errors of this magnitude are spotted on the ratings page where the building's energy consumption in kWh/m^2/yr and the kCO2/m^2/yr figure become unusually large. The change to the BER is unpredictable and depends on whether the relevant element is a wall, floor, roof, ceiling, etc. It is good practice to also check inputs, using the record button at the bottom of the screen prior to publishing. The missing decimal point is spotted as the records are scrolled using the arrows.

It can also be spotted on a data reflection report.



The above screenshot from part of a data reflection report shows a correct zone area of 162.25 m^2 at the top of the page. The element areas appear below. The floor element entered incorrectly can be spotted.

Envelopes				
(Multiplier) Name	(1) Z1/01 SHOP/s	(1) Z1/01 SHOP/e	(1) Z1/01 SHOP/n	(1) Z1/01 SHOP/c
Type	Wall	Wall	Wall	Flat roof
Area [m2]	3613	26.9	36	58
Orientation	South	East	North	Horizontal
Adjacent space	Exterior	Exterior	Exterior	Exterior
Construction name	EXTERNAL WALLS	EXTERNAL WALLS	EXTERNAL WALLS	HORIZONTAL CEILING

6 BUILDING SERVICES

When identifying HVAC systems, the following flow chart is useful to identify the system type.

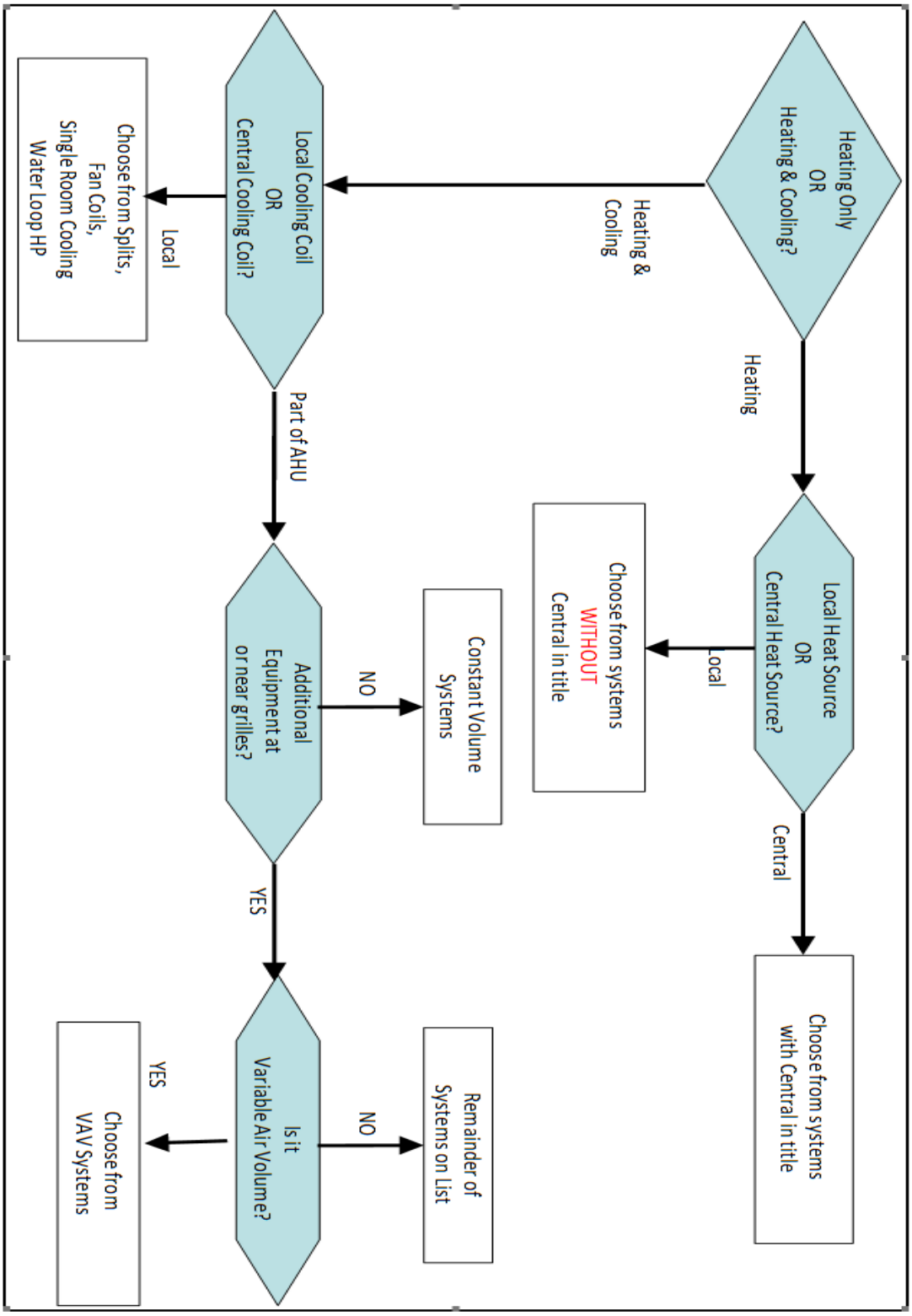


Figure 1: Flow chart to identify HVAC system type

6.1 Identifying HVAC systems: heating only

SBEM provides a wide range of HVAC system types to choose from. Some provide heating only, some provide cooling also, some are centralised, some are room heaters, etc. This section shows a range of heating-only systems, including photographs and common characteristics.

Central heating using water: radiators	Heating
Central heating using water: convectors	Heating
Central heating using water: floor heating	Heating
Central heating using air distribution	Heating
Other local room heater - fanned	Heating
Other local room heater - unfanned	Heating
Unflued radiant heater	Heating
Flued radiant heater	Heating
Multiburner radiant heaters	Heating
Flued forced-convection air heaters	Heating
Unflued forced-convection air heaters	Heating

Figure 2: List of HVAC system types – heating only

After the system is identified, the assessor must select the correct heat source and cooling sources. Heat sources are shown as follows:

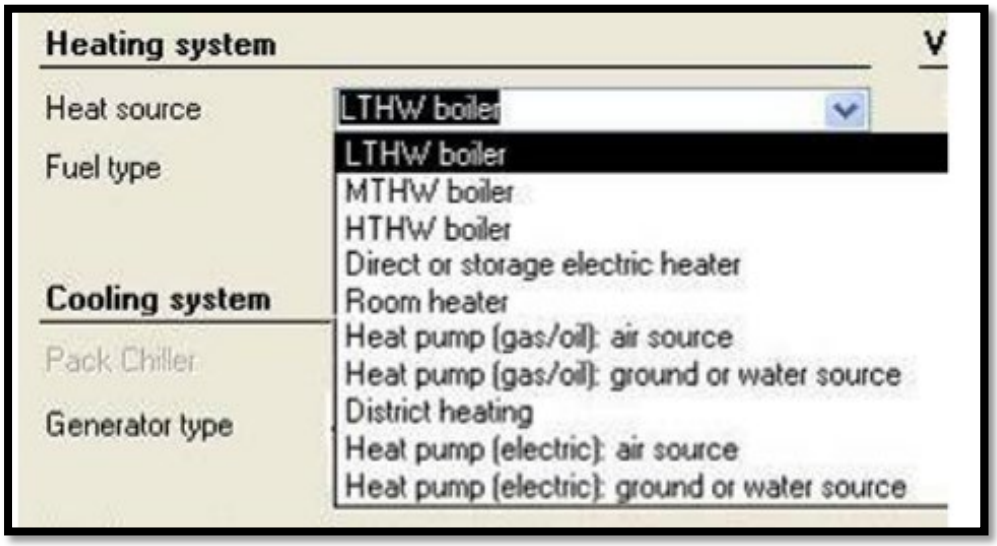


Figure 3: Heat sources

Heat source options vary depending on system choice. Some systems have fewer choices than others. All choices are shown above.

6.1.1 Central heating using water radiators

Central heating indicates a central heat source (e.g. boiler, heat pump) as opposed to a local heat source (e.g. room heaters). Examples are shown below.

Example: Water-fed radiant panels

- Enter as "central heating using water radiators"

Example: Radiators with fan assistance

- Enter as "central heating using water convectors"

Example: Convector

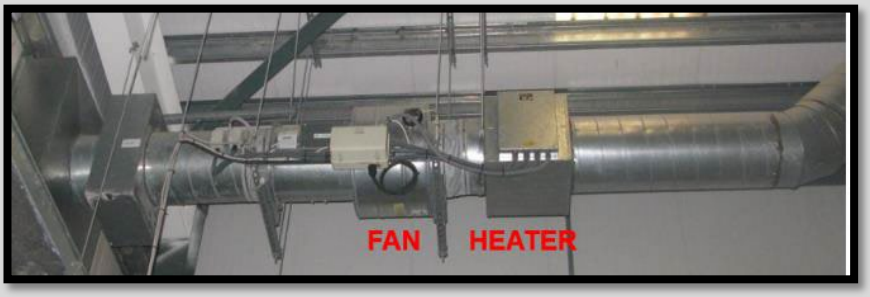
- Hot water fed to a coil, and heat is blown into the space by a fan.
- Typically found in high-roofed buildings.
- There may also be destratification fans in the space to help distribute heat.
- Enter as "central heating using water convectors".

Destratification fans do **NOT** provide heating and are not entered under HVAC systems. However, destratification fans are included under Zones/HVAC, HWS and Lighting Systems/HVAC system parameters where "Are there destratification fans in the zone?" is to be ticked.

6.1.2 Central heating using air distribution

Central heating using air distribution has, as a minimum, a heat source and ductwork with outlets to distribute air around the building. Examples are shown below.

Example 1: Central heating using air distribution

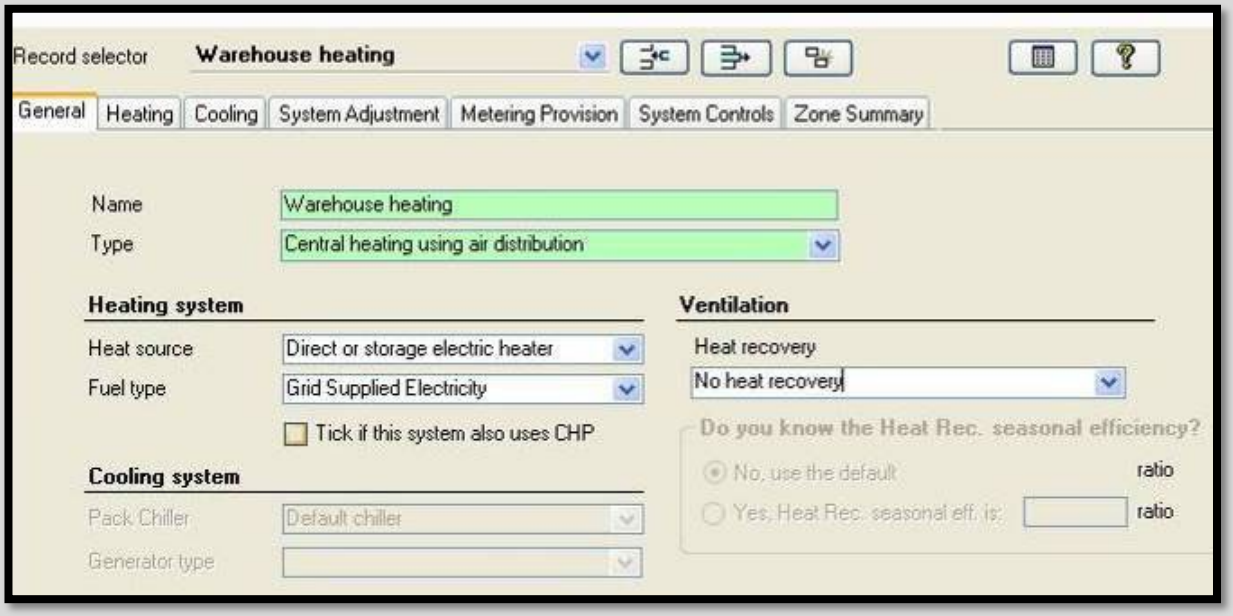


In this case:

- This building had two main ducts for supply (shown) and return air (not shown).
- Air flows from outside left to right.
- There is no pipework, but there are electric cables.
- The supply air is heated by an electric heating element.

To enter in iSBEMie:

- Select "Central heating using air distribution" with the heat source as "Direct or storage electric heater".
- The return air duct, not shown, is accounted for already in this type of system and so is not entered separately.
- There is no heat recovery in this example.
- Note: Cooling system fields are not accessible as this selection is a heating-only system.
- If the fan could run with the heater off with the building cooled by the outside air temperature, this is not classified as mechanical cooling.

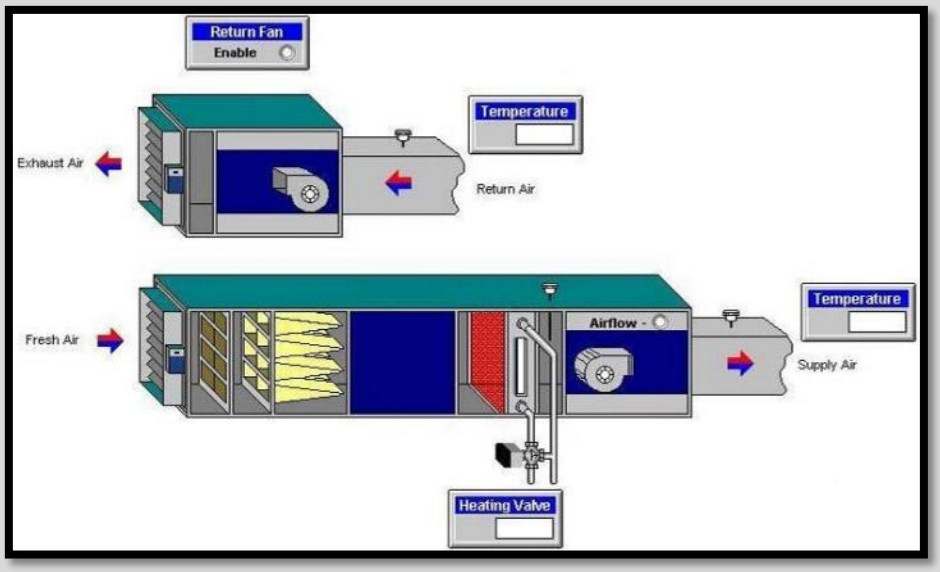


Example 2: Central heating using air distribution

In this case:

- The unit shown is an Air Handling Unit (AHU) supplying warm air.
- From left to right, air enters from outside and passes through some filters to remove airborne particulates.
- The air is heated and discharged to the duct.
- The insulated pipes contain hot water from boilers.
- The water flow rate is varied by a motorised control valve to regulate the temperature to which the air is heated.
- Since the unit is a single storey unit it is immediately apparent that there is no extract function built into this unit.
- In this installation, there are separate extract fans to the space. Therefore, there is no heat recovery.

The Building Management System (BMS) image for this system is as follows. The remote extract section (shown at the top of the BMS image, but not in the photograph above) has no connection to the supply section, thereby demonstrating there is no heat recovery in this installation.



To enter in iSBEMie:

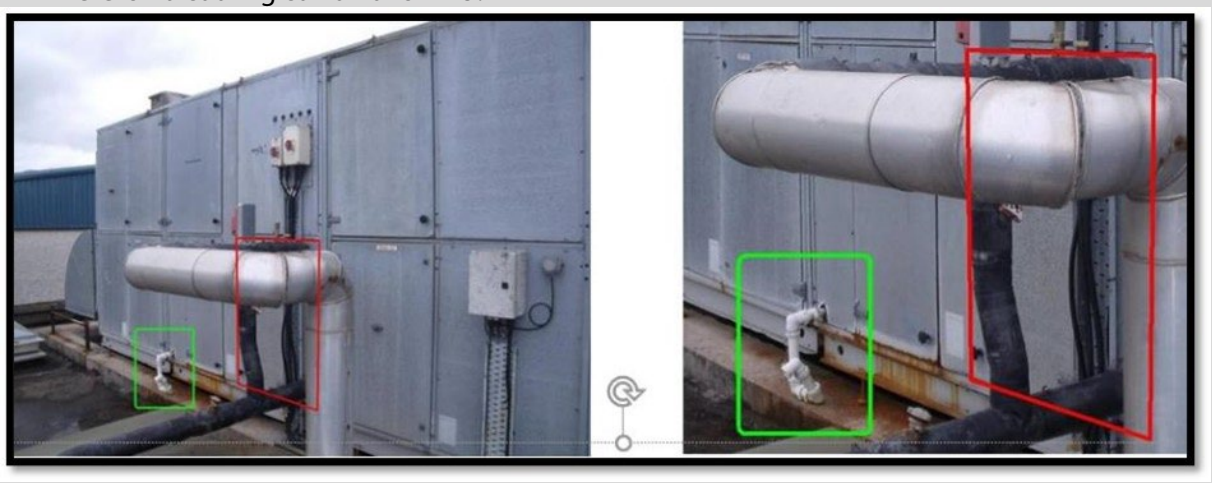
- Select "Central heating using air distribution". The heat source, in this case, is an LTHW boiler.

- There is no heat recovery
- The System Adjustments sub-tab allows entry of non-default values for specific fan power and duct leakage if these can be obtained.
- The remote extract fan is accounted for already in this type of system, and is not entered separately

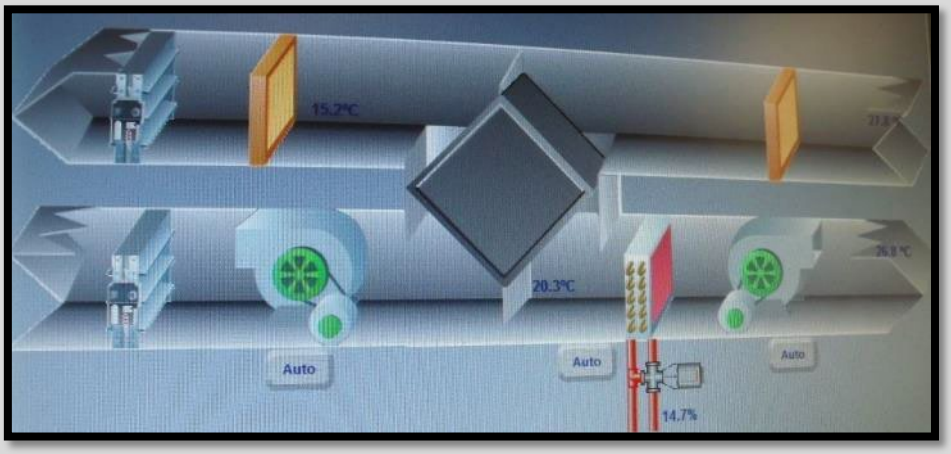
Example 3: Central heating using air distribution (system with supply and extract)

In this case:

- An AHU with supply and extract fans is usually constructed with the supply and return sections stacked over each other.
- The heating section is highlighted in red in this example. Heating is by hot water from the boiler room via the insulated pipe with protective cladding.
- Drain pipe highlighted in green. This suggests that heat recovery is present as condensation is produced as the moist warm air from inside the building transfers its heat to the cooler, incoming outside air.
- There is no cooling coil on this AHU.

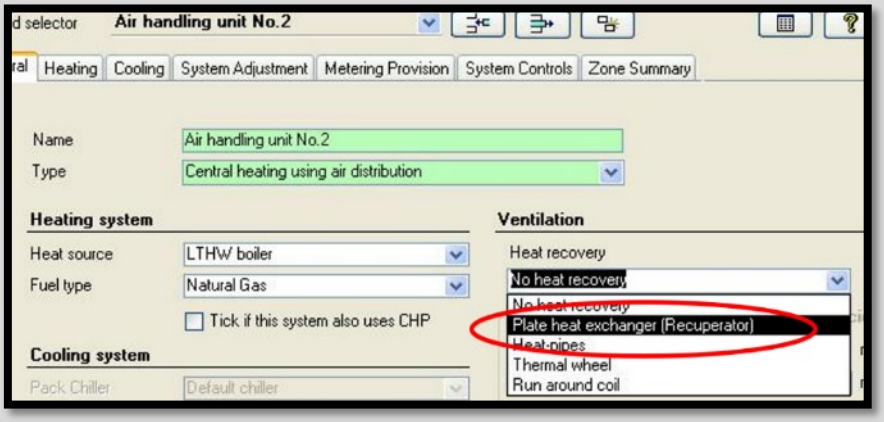


This is theBMS screenshot for this system.
Note the fresh air enters on the top left and flows diagonally through the plate heat exchanger, exiting bottom right as warm supply air.



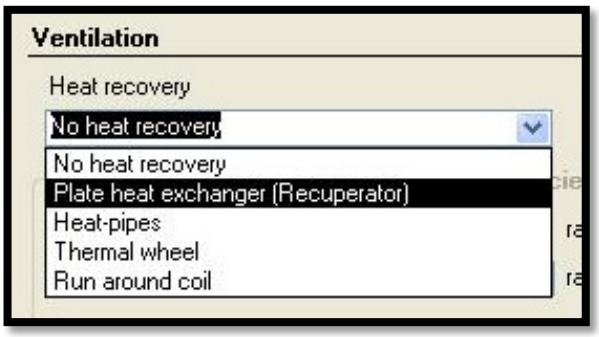
To enter in iSBEMie:

- Like the previous example, but this time heat recovery is selected.
- In this case, the heat recovery is via a plate heat exchanger.



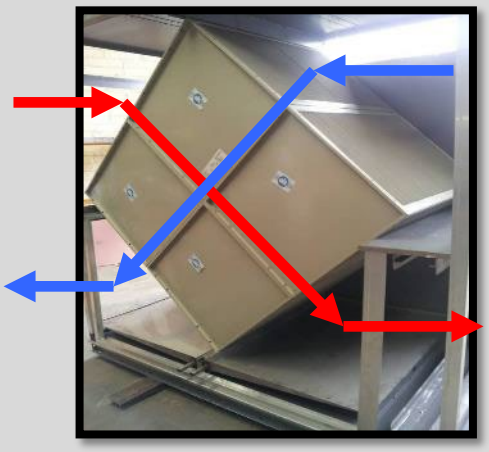
6.1.3 Heat recovery heat exchanger types

Once heat recovery is identified in a building, the type of heat recovery heat exchanger must be identified. This section illustrates heat exchanger types in heat recovery systems. Look at the Control Panel Labels (photos), distribution board labels and symbols on the AHU casing to help identify the heat exchanger correctly.



Example: A plate heat exchanger

- No moving parts.
- Tend to be bulky.
- Air flows cross each other without mixing.
- Heat exchange via a thin boundary between air streams.
- The photograph here shows a plate heat exchanger section of a large AHU which is being assembled. Note the drip trays with drain pipes.

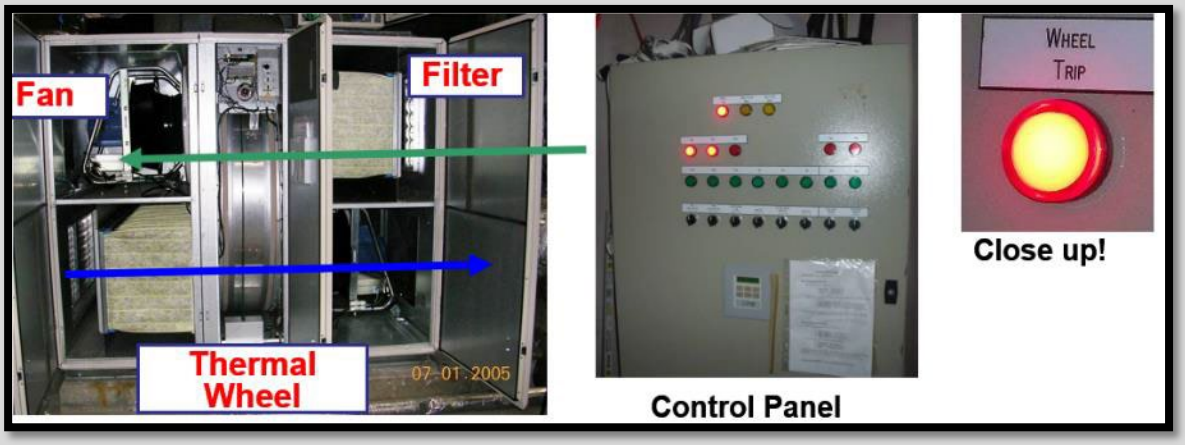


Example: Heat pipes

- Heat exchange is via refrigerant in special copper pipes.
- A mechanism like some solar panel types.
- Expensive and uncommon.

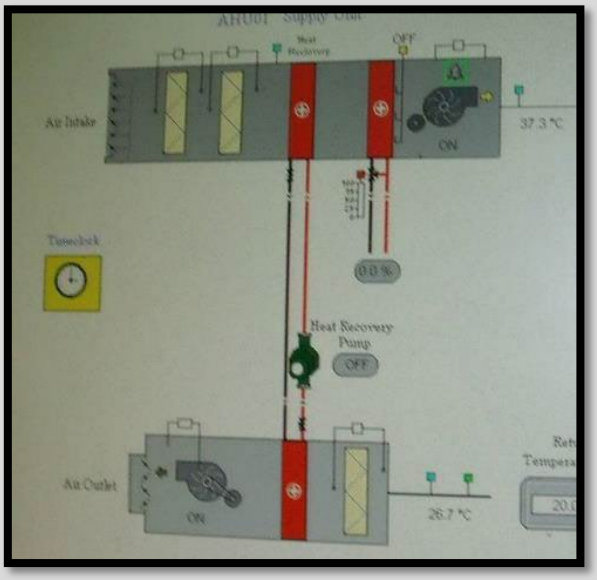
Example: Thermal (heat) wheel

- Honeycomb wheel (usually aluminium) slowly rotates and is warmed by the air being extracted.
- Warmed section rotates to meet incoming cold air and exchanges heat with it.
- All types of heat exchanger must have filters.
- The heat exchange section is very compact when compared to a plate heat exchanger



Example: Run around coils

- Sometimes used when the supply and extract sections of an AHU are remote from each other.
- The picture is a screenshot of BMS graphic for an AHU with heat exchange via run around coils.
- Rather than ducts running between the supply and extract sections, there are heat exchange coils with a working fluid used to exchange the heat. This necessitates a pump.
- In this case, the extract and supply sections of the AHU are remote from each other rather than stacked on top of each other.
- In some cases, the designer may choose to use a run around coil system where the sections are stacked on top of each other.
- Follow pipes to determine their function.



6.1.4 Other local room heaters (fanned and unfanned)

Local room heaters do not have a centralised heat source. Heat is generated in the appliance. Auxiliary energy use is low or zero as water/air are not being pumped/blown around the building. The examples shown below are unfanned. Enter "fanned" if the appliance has a fan.

Example 1: Electric heater (storage or direct acting)	Example 2: Stoves	Example 3: Open fires
		

6.1.5 Unflued radiant heaters

These are typically mounted at a high level, and heat surfaces use radiant heat. They are typically used in tall or poorly insulated/draughty buildings. If they are gas-fired, then combustion products are released into the space. They may also be fuelled by electricity.

Examples of unflued radiant heaters

6.1.6 Flued and multi-burner radiant heaters

These heaters are flued, so products of combustion are flued out of the building. Gas combustion heats a glowing tube emitting radiant heat to the space. The tube may be single or wrap around (the tube wraps around in both examples below).

Example: Single burner gas-fired radiant heater

Example: Multi-burner gas-fired radiant heater– two burners share a common flue and fan

6.1.7 Forced convection heaters

These have a fuel supply of oil or gas. Combustion takes place within the unit and air is blown into the space. There may be destratification fans. Where the unit is less than 10kW they can be classed as "other local room heater – fanned". If they are at high level, it might be difficult to tell, so choose "other local room heater – fanned" if in doubt. Unflued appliances must have fresh air intake grilles to intake 100% fresh air to prevent a build-up of fumes. Unflued appliances should be in well-ventilated areas.

Example 1: Flue, gas fired	**Example 2: Unflued gas-fired unit**	**Example 3: Flued, oil fired unit** Oil will always be flued.

6.2 Identifying HVAC systems: heating and cooling systems

This section discusses systems providing both heating and cooling.

Figure 4: Systems providing heating and cooling in iSBEMie

Single-duct VAV	Heating and Cooling
Dual-duct VAV	Heating and Cooling
Indoor packaged cabinet (VAV)	Heating and Cooling
Fan coil systems	Heating and Cooling
Induction system	Heating and Cooling
Constant volume system (fixed fresh air rate)	Heating and Cooling
Constant volume system (variable fresh air rate)	Heating and Cooling
Multizone (hot deck/cold deck)	Heating and Cooling
Terminal reheat (constant volume)	Heating and Cooling
Dual duct (constant volume)	Heating and Cooling
Chilled ceilings or passive chilled beams and di	Heating and Cooling
Active chilled beams	Heating and Cooling
Water loop heat pump	Heating and Cooling
Split or multi-split system	Heating and Cooling
Single room cooling system	Heating and Cooling

6.2.1 Split or multi-split systems

The word Split means that the system is split into two parts. There are indoor unit(s) connected to outdoor unit or units by lengths of copper pipework (see examples below). Pipework usually consists of one smaller pipe and one with a larger diameter. Indoor units can be visible in the space or hidden in a ceiling void. Inspect the ceiling void if it can be done safely. As outlined in the NEAP Survey Guide: "Accessible ceiling and floor voids must be inspected to determine what equipment, particularly HVAC equipment, is present. This provides useful information as to the type of HVAC used in the building. Where possible, photos should be taken to demonstrate the HVAC systems present."

If you identify a split or multi-split indoor unit, it is necessary to find the corresponding outdoor unit(s). A single split system has one outdoor unit for each indoor unit. A multi-split system has more than one indoor unit connecting to an outdoor unit capable of serving the load of the multiple indoor units.

- Document details from each data plate/sticker.
- Try to find the combination on the ECA / ETL website or on the Eurovent Website.

- If the indoor/outdoor combination on site cannot be found, contact the manufacturer/supplier to find suitable test data.
- If the combination of units still cannot be found, defaults are used.
- If plant items are unclear, then contact the BER Helpdesk for assistance with identification.

Example 1: Ceiling grid mounted

Example 2: High level, wall mounted

Example 3: Low level, wall mounted

Example 4: Above the suspended ceiling

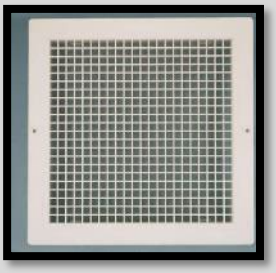
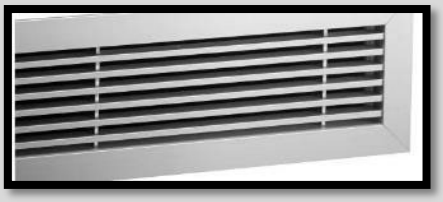
Outdoor units can serve a single indoor unit, or a single outdoor unit can serve multiple indoor units (multi-split system). The outdoor units shown below are air source heat pumps. They gather and reject heat from/to the external air.

Example 1: Typical single outdoor unit

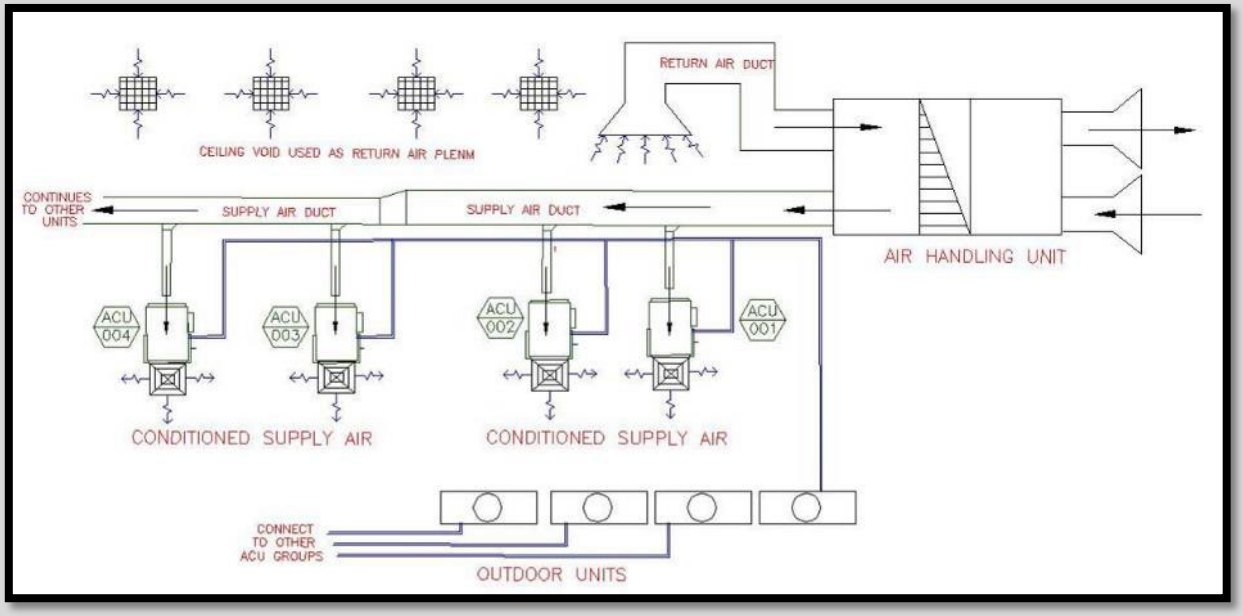
Example 2: A pair of multi-split outdoor units

Example: Multi-split system with ventilation

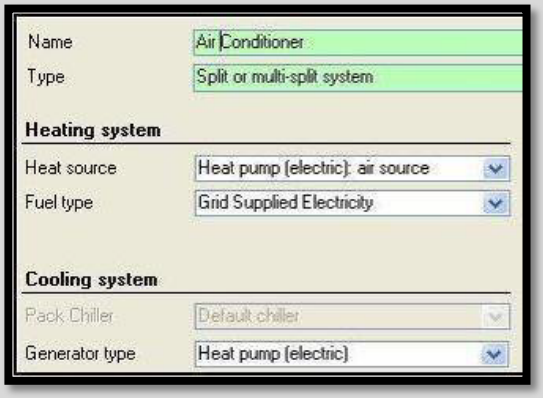
- This is a common system type.
- Site surveying reveals grilles or diffusers are evident, but this still leaves a range of possibilities.
- Grilles are the means of distributing the heated and cooled air – some examples are shown below.
- A simple test on a working system: if a piece of tissue paper sticks to the grille, it is an extract. Dust patterns can also help identification.
- The following diagrams help identify grille types, etc.

Ceiling grilles suggest equipment or ductwork above. Further investigation is required to identify the system type. 	Eggcrate grille: extract 
Square diffuser grille supply, sometimes extract. 	Linear diffuser grille supply can be either supply or extract. 
Air-conditioning wall controllers. 	Air is ducted to each indoor unit. 
Air-handling unit found outside. This AHU doesn't provide any heating or cooling, as there are no heating or gas pipes to the unit or any means of rejecting condenser heat. This particular unit has heat recovery by a heat wheel. 	The multi-split outdoor unit is as follows. There are four units, each serving a number of indoor units. In this example, they can both heat and cool the building. 

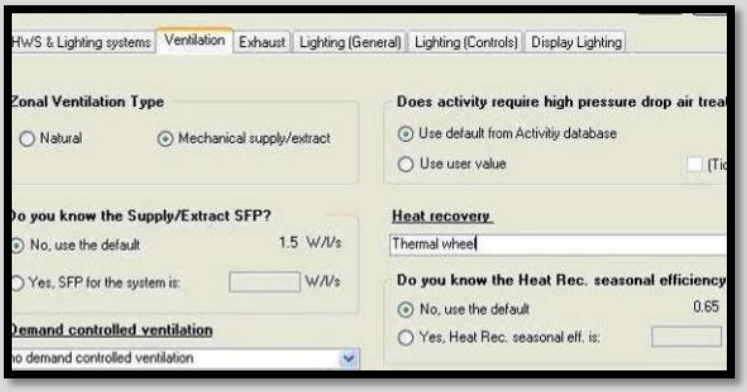
Simplified system drawing as follows:



In iSBEMie: Type is a "split or multi-split system". The heat source is "air source heat pump" (fuel is electricity).



Ventilation is entered separately. Use of non-defaults is preferable, but evidence is required.



Example: Split system with ventilation

- Can have a system like the previous example serving smaller areas.
- In this example, there is a small AHU in the ceiling void. It is under construction with four ducts yet to be fitted.
- The AHU doesn't provide any active heating or cooling. There are no heating or gas pipes to the unit or any means of rejecting heat.
- The unit in this example has a plate heat exchanger for heat recovery (as is more common in small units such as this).

An indoor unit in the ceiling void. Note the drain pipe and the refrigerant pipes.

The outdoor units in this system are single rather than multi-split.

6.2.2 Fan coil units

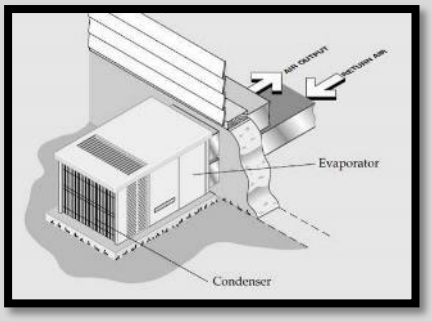
Fan coil units may be exposed or concealed in a space. They can look like the indoor split system units shown previously. When identifying these systems, always try to locate the heating and cooling sources (outdoor units). If the outdoor unit is a chiller rather than a heat pump, they are classified as fan coils.

Ceiling grid mounted	High level, wall mounted
	
Low level, wall mounted	**Above suspended ceiling**
	

6.2.3 Single room cooling systems

Example: Single room cooling systems

- These systems are like split systems.
- Heat-pump-based system (albeit not a split system).
- The outdoor and indoor parts are not separated by refrigerant pipework. Packaged together as one unit.
- No ducting.
- Packaged systems are common in offices in warm countries, although may be used to cool server rooms in Ireland.



6.3 Identifying HVAC systems: Further examples with heating

Example 1: Gas-fired heat pumps

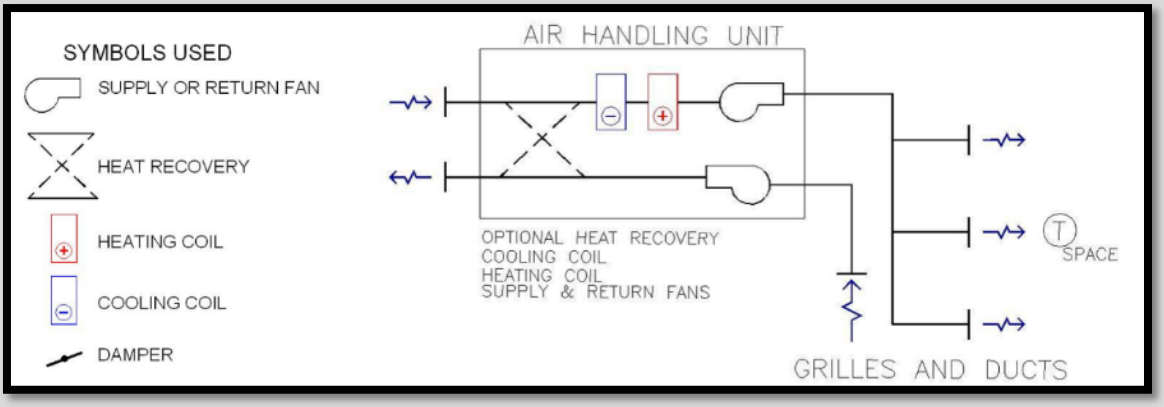
Air source heat pumps use external air as a heat source. Heat is gathered from the air when heating, and rejected to the air when cooling. The examples shown above were powered by electricity. In some cases, the compressor is powered by an engine running on gas or oil rather than electricity.

This photo shows a natural gas-powered multi-split unit.

The units look similar to regular large multi-split outdoor units and are often manufactured by the same manufacturers that make regular multi-split units. The yellow gas pipes entering the units identify them as being gas fired. Further evidence will be found by reading the data plate.

Example 2: Constant volume system – fixed fresh air

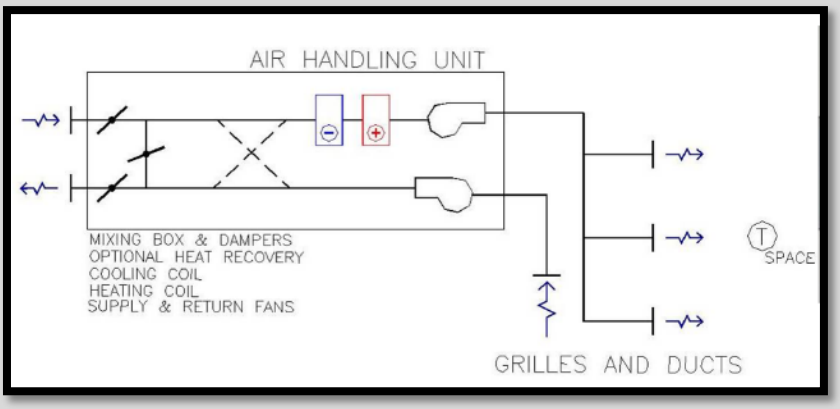
These systems have AHUs and central cooling coils. Distribution of air is by ducts and grilles. Several items must be examined to fully determine the nature of the system. The difference between these and "Central heating using warm air distribution" is central cooling. The diagram below is a simplified schematic for constant volume fixed fresh air.



- The volume of air is constant.
- Fixed fresh air means a fixed volume of outside air.
- Not an efficient system as the incoming volume of outside air is not varied.
- Return ductwork may be much less extensive than supply air ductwork if return air travels through ceiling plenums.

Example 3: Constant volume system – variable fresh air

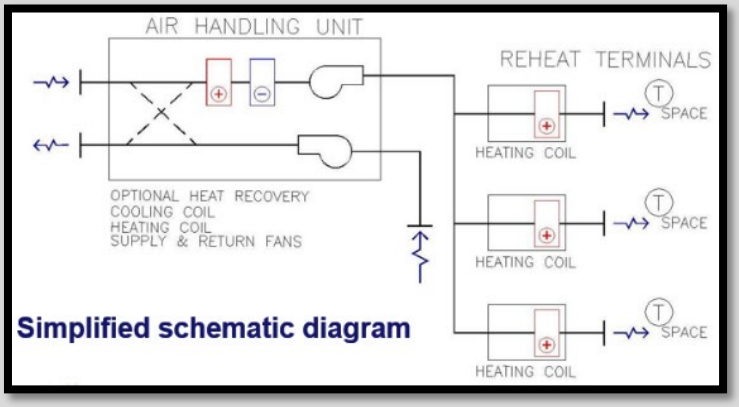
In this case, the volume of air is constant, but the mixing section will reduce the quantity of incoming fresh air by recirculation of conditioned air. These are typically more efficient than fixed fresh air systems as less conditioning of fresh air is required. The diagram below is a simplified schematic for constant volume variable fresh air.



- AHU must have a cooling coil.
- Mixing box section is bulky and three damper actuators may be visible.
- Look at BMS graphics if available.

Example 4: Terminal reheat – constant volume

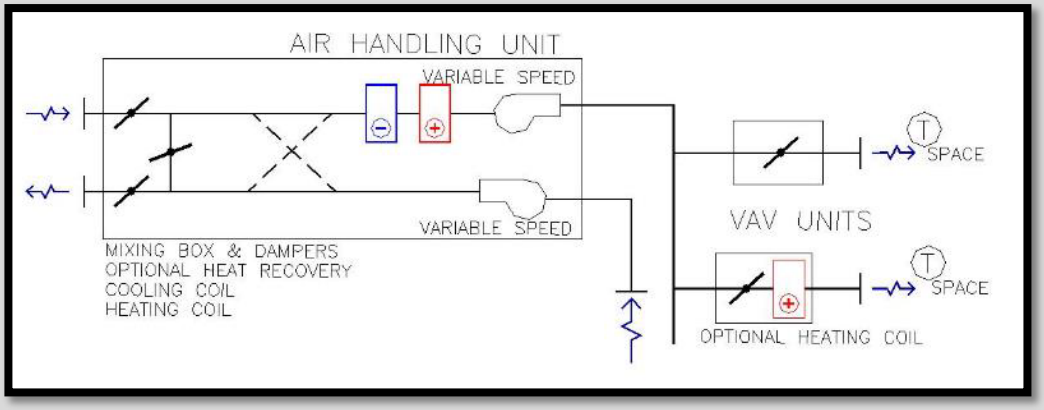
In this case, the volume of air is constant and delivers air at temperature to cool. Zones requiring heating will reheat the air locally. This can be very inefficient as air may be cooled and then reheated. Reheat is usually by hot water, but sometimes by electricity.



- Reheating is near outlets (without VAV – variable air volume).
- Look at BMS graphics if available.
- Water-based reheat coil is shown on left-hand side below.
- Electrical reheat coil is shown on the right-hand side below.

Example 5: Single duct variable air volume (VAV)

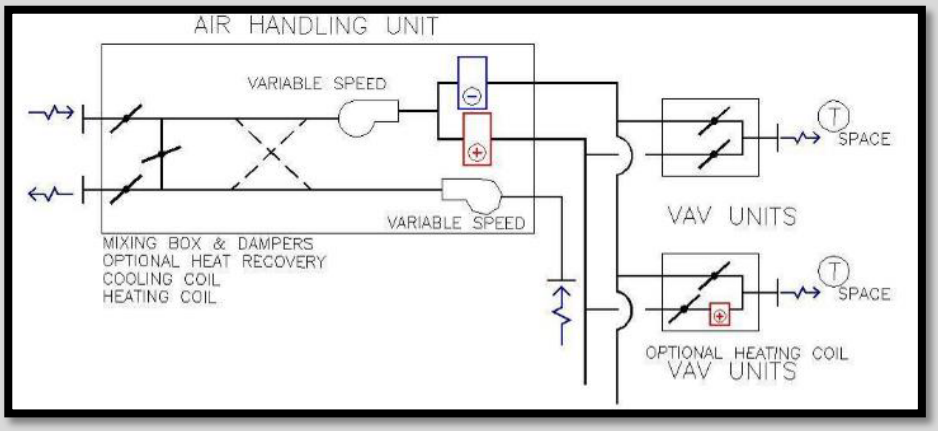
For these devices, the supply air volume is varied to suit conditions in a space, so fan energy is reduced. Unnecessary conditioning of extra air volumes is also minimised.



- AHU has central cooling.
- Obtain details from VAV box to verify its functionality.
- AHU fan usually has variable speed.
- Look at BMS front end graphics.

Example 6: Dual duct variable air volume

Like the previous example. The VAV units are served by both warm and chilled air. There may be a heating facility in VAV Box. This has more flexible temperature control but, as it has more ductwork, it is likely to be more expensive. These are generally not a common system.

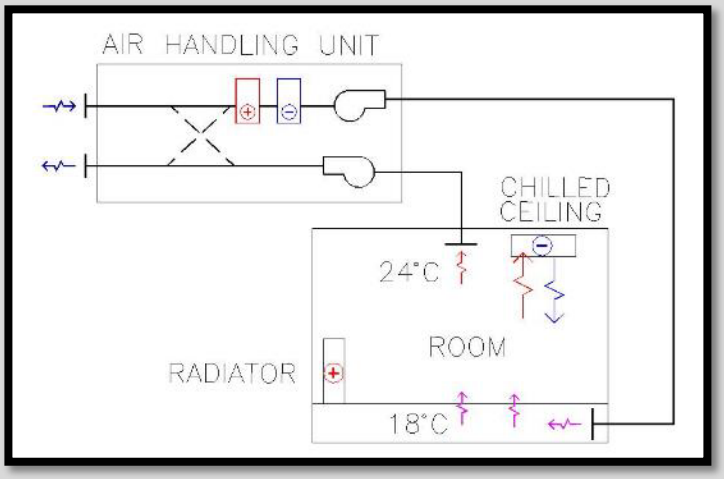


Similar to single duct VAV but:

- These systems usually have three ducts from the AHU instead of two.
- They have two ducts to the VAV box instead of one.

Example 7: Passive chilled beams or chilled ceilings

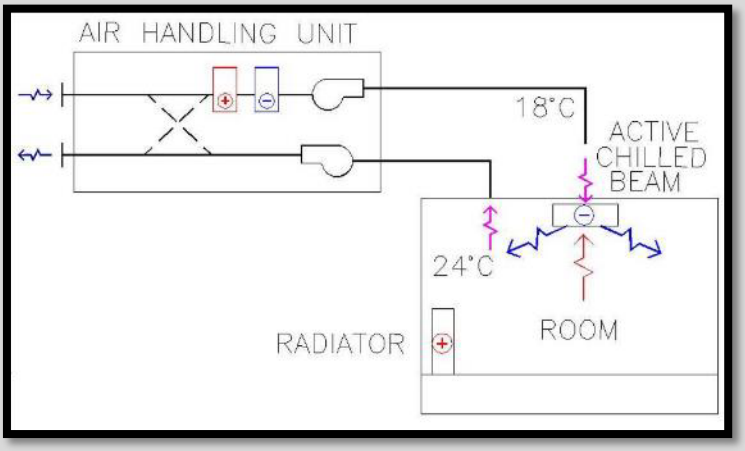
In these systems, air is supplied to space as minimum fresh air volume at mid-temperature often via a floor plenum and floor grilles (displacement system). Additional heat, when needed, can be supplied by a radiator or similar means. Additional cooling is from the chilled ceiling.



- No local fans.
- Low air volumes mean fan energy savings and air-conditioning savings

Example 7: Active chilled beams

In these systems, air is supplied to the space as minimum fresh air volume at mid temperature. Additional heat can be supplied by a radiator or similar means. Additional cooling is from the chilled ceiling. Air supplied to active chilled beam induces air from the space to pass through beams. As a result, beams have more capacity for the same physical size.



6.3.1 Cooling sources examples

Cooling system options become active in iSBEMie when a HVAC system with heating and cooling is selected. The types of cooling system are chillers and heat pumps.

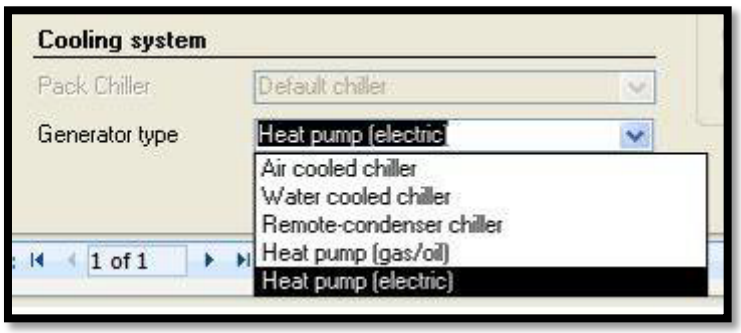


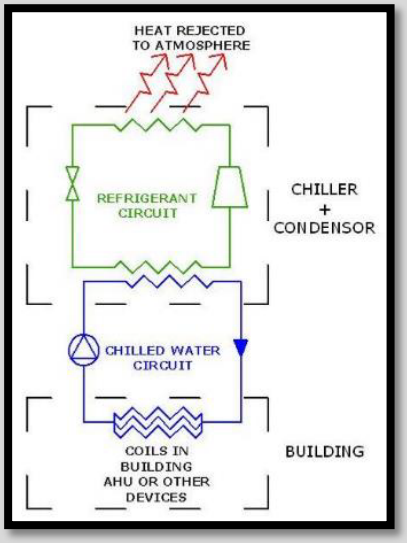
Figure 5: Cooling systems in iSBEMie

Example 1: Cooling with a DX heat pump

A heat pump coil can be fitted directly to an AHU. These types of heat pump are often called DX units (direct expansion). There is a separate condenser unit (outdoor unit). Look for refrigerant pipes entering the AHU, and locate the outdoor unit when assessing these systems. The photograph shows copper pipes entering the AHU.

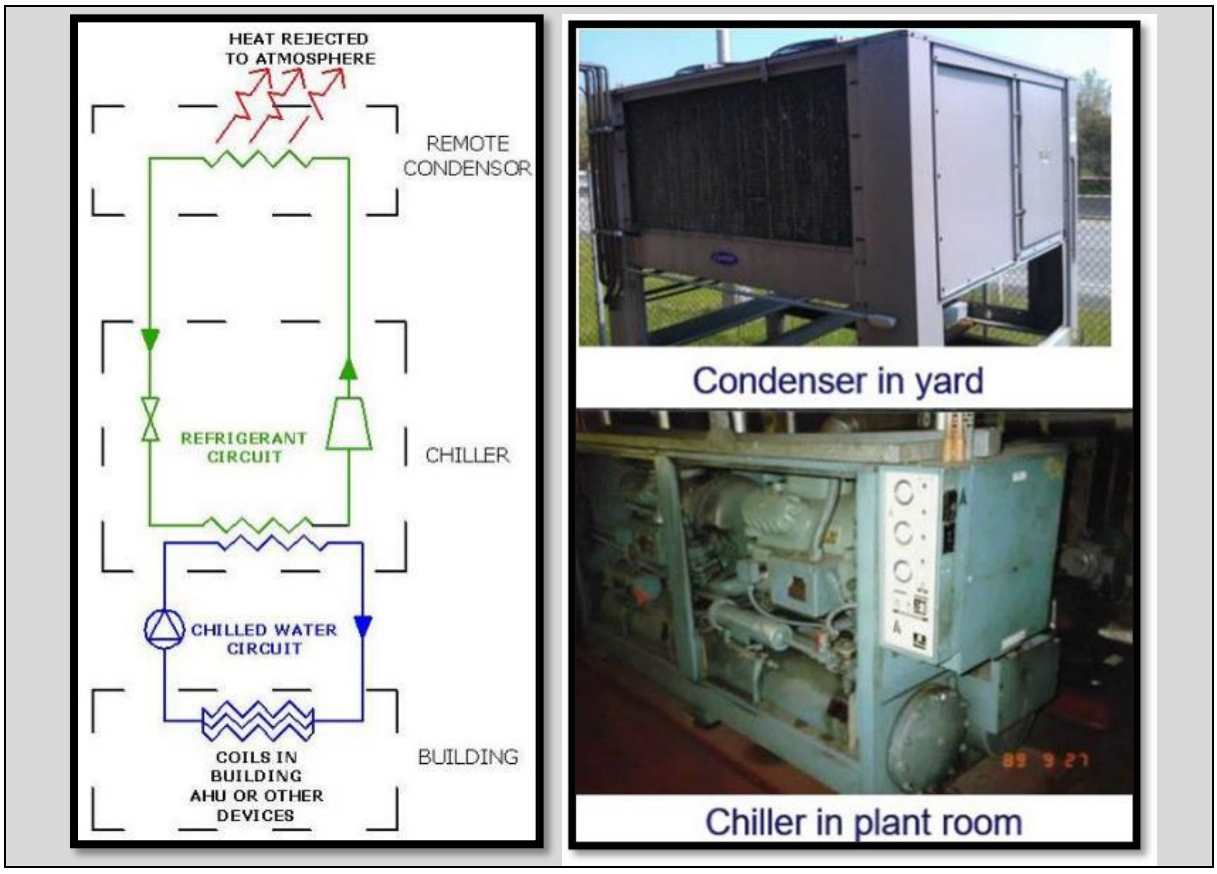
Example 2: Air cooled chillers

Chillers by definition generate chilled water. Chilled water is fed to the indoor appliances to provide cooling to the building. The warmed water is then sent back to the chiller to be cooled again. There are always one or more pumps.



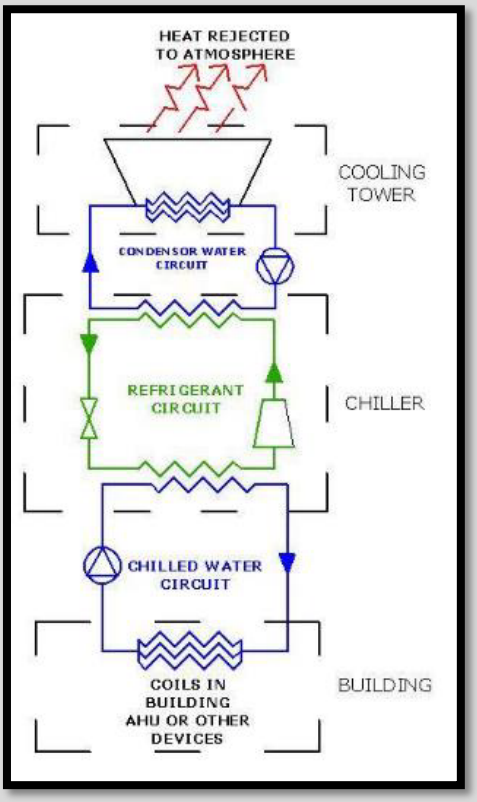
Example 3: Remote condenser chillers

In the previous example, the chiller and the condenser unit formed one unit. It is possible that the condenser might be remotely located from the chiller equipment.


HEAT REJECTED
TO ATMOSPHERE
REMOTE
CONDENSOR
REFRIGERANT
CIRCUIT
CHILLER
CHILLED WATER
CIRCUIT
COILS IN
BUILDING
AHU OR OTHER
DEVICES
BUILDING
Condenser in yard
Chiller in plant room

Example 4: Water cooled chillers

An alternative to air-cooled chillers are water-cooled chillers. There is a second water circuit which cools the refrigerant via a cooling tower. There will always be two sets of pumps.



Cooling Tower

Water Cooled Chiller

6.4 No access to plant

Where a plant room is inaccessible on site, for example no access to the boiler house or plant rooms containing chillers or air handling units, default data must be used. In cases where there is no plant access, it is not acceptable to confirm the plant using a letter from the client. The following examples demonstrate a selection of default systems.

Example 1

An assessor has access to the zones in an office building that was constructed in 1970 and is served by radiators for heating. There is no cooling present. However, the assessor cannot access the boiler room, but has noted an oil tank outside with pipework connecting the oil tank to the boiler room. A flue is also present on the roof of the boiler room. Therefore, it can be assumed that the heating system is oil-fuelled.

In this case, the assessor has enough evidence to demonstrate the system type and source of the heating, but must use the default for the efficiency of the heat source.

- Type: central heating using water – radiators.
- Heat source: LTHW boiler.
- Fuel type: oil.
- Heat generator efficiency: 0.65 (default for building's age).

Example 2

An assessor has access to the zones in an office building that was constructed in 1985 and is served by an air-distribution system. The assessor cannot access the boiler room or any plant rooms. However, a gas meter is present outside the building. The assessor has determined that much of the building cannot be adequately naturally ventilated, due to the depth of the zones, so cooling is assumed to be present. In this case, the assessor is unable to determine the type of system or the sources of heating and cooling.
In this case, the assessor assumes that there is cooling, so the system is selected from the heating and cooling type system in iSBEMie.
The system "Terminal reheat (constant volume)" is the most conservative.

- Type: terminal reheat (constant volume).
- Heat source: LTHW boiler.
- Fuel type: natural gas.
- Heat generator efficiency: 0.65 (default for building's age).
- Cooling source: air cooled chiller.
- Default the EER and the SEER.

This example is when there is an air-based system but little other information available.

Alternatively, if there were enough information that the HVAC was a split-system, then a "Split" or "Multi-split system" would be entered with ventilation added by zone. The final system definition will be dependent on what information is available.

6.5 Inadequate HVAC systems and unheated buildings

Section 3.4.3 of How to Use iSBEMie (Volume 2) states: "If a zone is defined as having no heating or cooling, i.e. assigned to 'Zones without HVAC system', but the activity type selected for the zone is one which typically requires conditioning (according to the Activity Database), a red exclamation mark "!" will appear next to this parameter as a warning to the user, in case this was done in error."

The flow charts in Appendix 7 of the NEAP Survey Guide are essential when assessing whether the building has adequate HVAC.

The following gives guidance as to how the various building types are treated:

1) Completed building with installed HVAC system.

i.e. A building where construction has been completed and all HVAC systems have been installed.

2) Completed building with partial/no HVAC system.

e.g. A building where construction has been completed, and where a HVAC system is expected but has not been completed or installed at the time of the BER assessment.

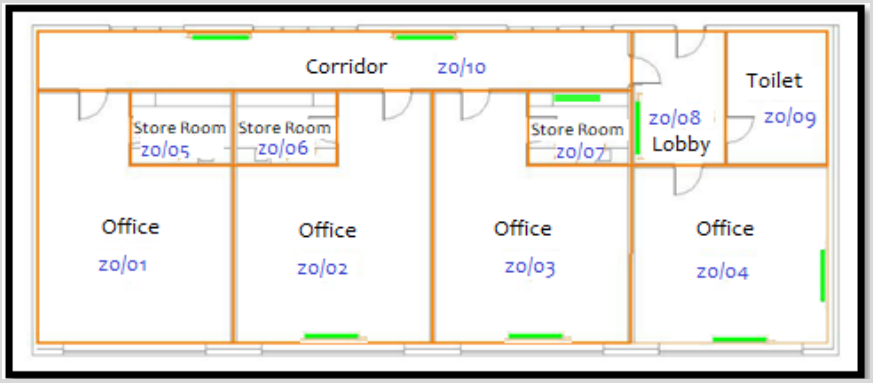
For these building types, where no HVAC system has been installed or where a HVAC system has been partially installed, it is expected that a HVAC system is applied to zones which require conditioning based on the activity type assigned to it, as highlighted by the red exclamation mark "!", with the exception of toilets and carpark zones.

The following shows how such a building is dealt with in SBEM.

Updated guidance: Completed building with partial/no HVAC system

The building below represents an existing office building where a HVAC system has been partially installed/removed. Some zones in the building are heated using a direct-acting electric heaters. The assessor creates a HVAC system within SBEM called "Heating system 1", to represent the heaters shown in green in the diagram.

Internal walls are assumed uninsulated as per Appendix A4.1 'Project Database' in the NEAP Survey Guide, as there is no evidence of insulation.



The following shows the HVAC system applied to each zone:

Zone	HVAC System	Reasoning
Zone Z0/01	Heating only electric resistance	This space has the activity "Generic Office Area" applied to it. Offices would typically require conditioning and would be continually occupied. Therefore, a HVAC system must be applied. As no HVAC system has been installed, the assessor must use a default system as per the NEAP Survey Guide A4.3; there is only electricity to the building, the zone is shallow and has plenty of window opening, so doesn't require cooling. For information: The snippet below shows red exclamation mark "!" produced in iSBEMie when "Zones without HVAC" is applied to a "Generic Office Area". HVAC system ! Zones without HVAC system
Zones Z0/ 02, 03, 04, 07, 08, 10	Heating system 1	Based on the installed system. (The BER Assessor might also merge these zones.)
Zones Z0/ 05, 06	Zones without HVAC system	The activity "Store" does not typically require conditioning. Following guidance in Appendix 7 of the NEAP Survey Guide, the HVAC Assigned to the Store "Zones without HVAC". Following guidance in Appendix 8 of the NEAP Survey Guide, Elements in Offices (walls) adjoining the store rooms are entered as connecting to: CAS
Zone Z0/09	Zones without HVAC system	The activity "Toilet" does not typically require conditioning. Following guidance in Appendix 7 of the NEAP Survey Guide, the HVAC Assigned to the Toilet "Zones without HVAC". Following guidance in Appendix 8 of the NEAP Survey

		Guide, Elements (walls) adjoining zone 09 are entered as connecting to: UAS – partially conditioned adjoining spaces

3) Completed building with no HVAC system due to high internal loads.
i.e. A building where construction has been completed, and where a HVAC system has not been installed due to the high internal loads.

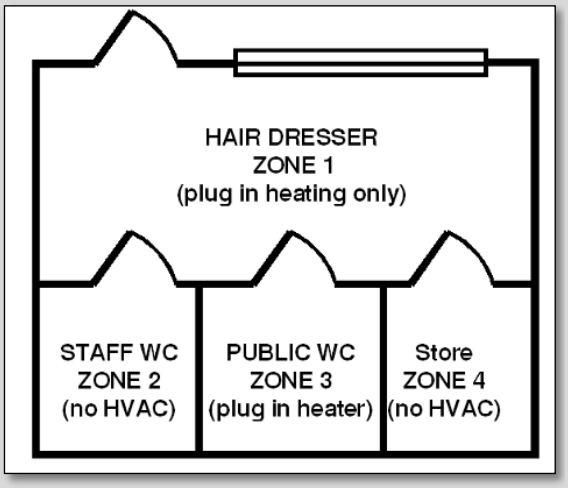
For these building types, such as a laundrette, where no heating or cooling has been installed because of the high internal load from a process within the building.

Updated guidance: Version 5.5h of iSBEMie allows an XML to be produced when all zones are entered as "Zones without HVAC". The previous guidance on entering the "Notional Building's Heating System" **no longer applies.**

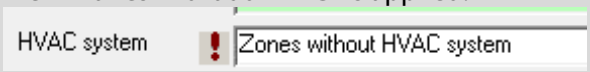
6.5.1 Further examples of inadequately heated buildings

The following examples demonstrate the use of default heating systems in unheated or inadequately heated finished buildings. These examples do not apply to shell and core buildings or unfinished buildings.

Example 1

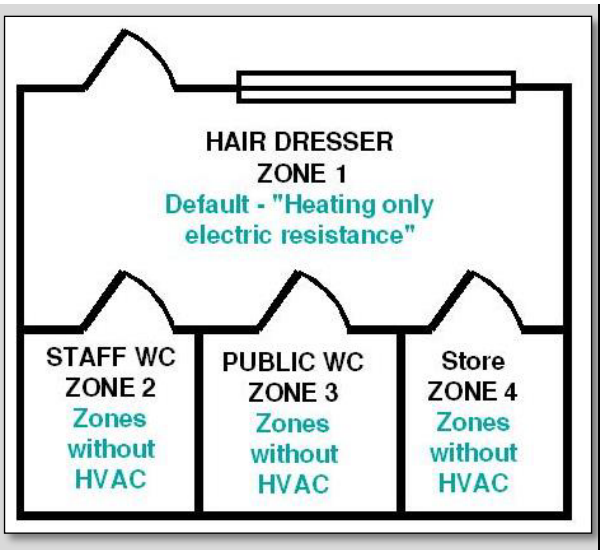


This is a sketch of a hairdresser's premises. There is no fuel other than electricity to the building and there is no fixed heating system; only portable plug-in heaters. Zone 1 is "Small Shop Unit Sales area – general" zone type and is expected to have heating in the NEAP methodology as it produces a red "!" in iSBEMie when "Zones without HVAC" is applied.



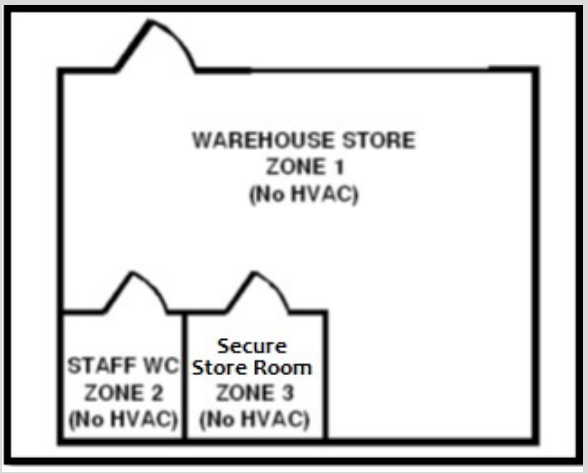
As outlined in the NEAP Survey Guide, Section A7.2, table A7, a default must be selected from Section A4.3 of the NEAP Survey Guide for this zone. In doing so, the "Zone conditions" and "Building conditions" in Appendix A4.2 of the NEAP Survey Guide must be read when selecting the default system. After consideration of "Zone conditions" and "Building conditions," the default is: "Heating only electric resistance".

The remaining zones are entered as zones without HVAC. While the unheated toilets produce a red "!" when "Zones without HVAC" is applied, they are transient, and so do not have a default system applied to them as per the NEAP Survey Guide. The store does not produce a red "!" when "Zones without HVAC" is applied, and so it is entered as "Zones without HVAC". If the toilets or store had a fixed system, it would be entered as found.



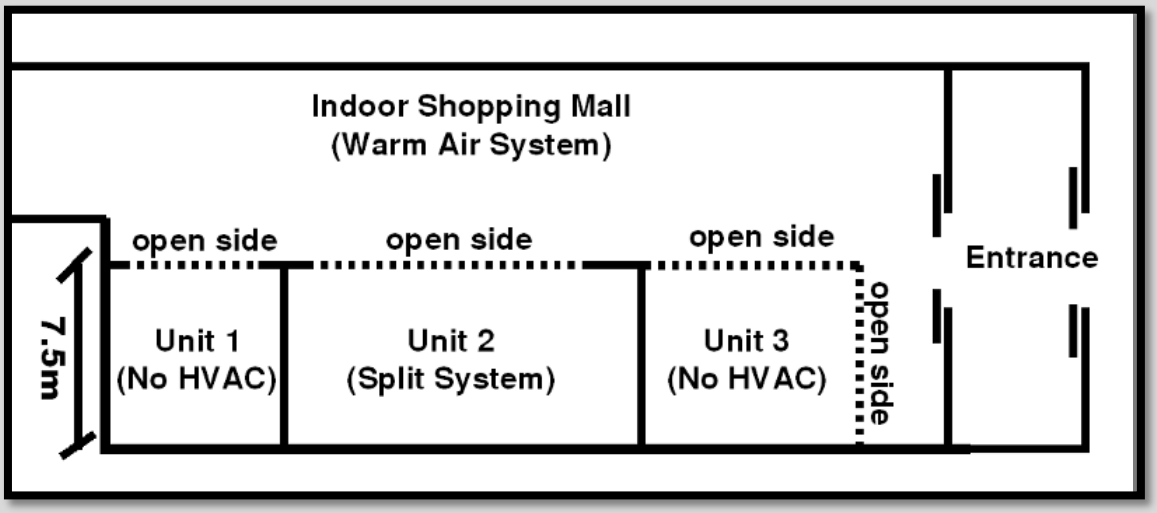
Example 2:

This is a sketch of a small warehouse. There is no fuel other than electricity to the building and there is no HVAC system of any sort in the building. The warehouse store, zone 1 and the small store zone 3, will not produce a red "!" when "Zones without HVAC" is applied, and so it will have "Zones without HVAC" applied from NEAP Survey Guide A4.3. The toilet will produce a red "!", but is considered transient, and so this too will have "Zones without HVAC" applied.



Updated guidance: Version iSBEMie 5.5h allows production of an XML without need to have a HVAC system in a model. The final model can be produced with the three zones set with "Zones without HVAC".

Example 3:



The sketch above shows a shopping mall with three units. Each unit is to be rented separately, and each needs its own BER Certificate.
These retail units are not transient and are not process heated, so following the NEAP methodology, a heating system must be applied. It is necessary to determine if these open-sided zones are indirectly conditioned by adjoining zones, either within the same BER assessment or adjoining premises (most notably, the main shopping mall).

It is not clear that Unit 1 is indirectly conditioned by the mall. It is open on only one side, therefore Unit 1 has a default HVAC system from the NEAP Survey Guide A4.3 applied in SBEM.

Unit 2 has its own Split System applied as HVAC in its BER assessment.

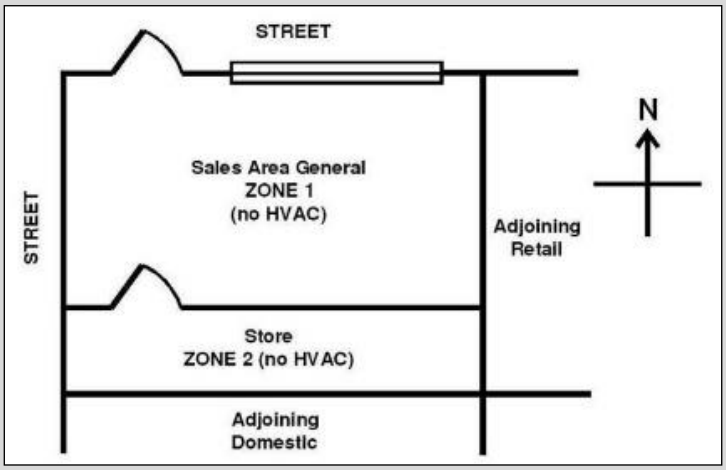
Unit 3, is open on two sides to the mall and is clearly operating under the same conditions as the surrounding mall. The details of the mall's system will need to be obtained and used as the system assigned to Unit 3.

Appendix 8 of the NEAP Survey Guide provides detailed guidance on identifying indirectly conditioned spaces.

Example 4:

This is a finished building, constructed in the 1900s. All elements are selected as "no date, uninsulated" as there is no evidence of insulation.

This unit has two zones, namely the main sales area and a store room. There is no heating system. The unit is not shell and core. Electricity is the only fuel supplied to the unit. There is separate domestic accommodation above and to the rear of the unit.



Retail unit, Zone "Small shop unit sales area – general"

Since zone 1 has an activity that produces a red "**!**", a default system is selected from Appendix A4.3 of the NEAP Survey Guide. As per the building condition and zone conditions in the NEAP Survey Guide Appendix A4.3, the correct system to select is "Heating Only Electrical Resistance". zone 2 is a store room and so "Zones without HVAC" is used in zone 2.

Updated guidance: Section 8 of the NEAP Survey Guide was checked to confirm which of "Unconditioned adjoining space" or "UAS – partially conditioned by surrounding spaces" best matched the store room conditions for south-facing wall of Zone 1. It was decided that elements in sale area adjoining the store room were to be defined as: UAS – partially conditioned by surrounding spaces.

The ceiling of zone 1, as it connects to domestic accommodation above, is defined as connecting to "Conditioned adjoining space".

Refer to Appendix 8 on the NEAP Survey Guide for guidance on the conditioning on adjoining buildings.

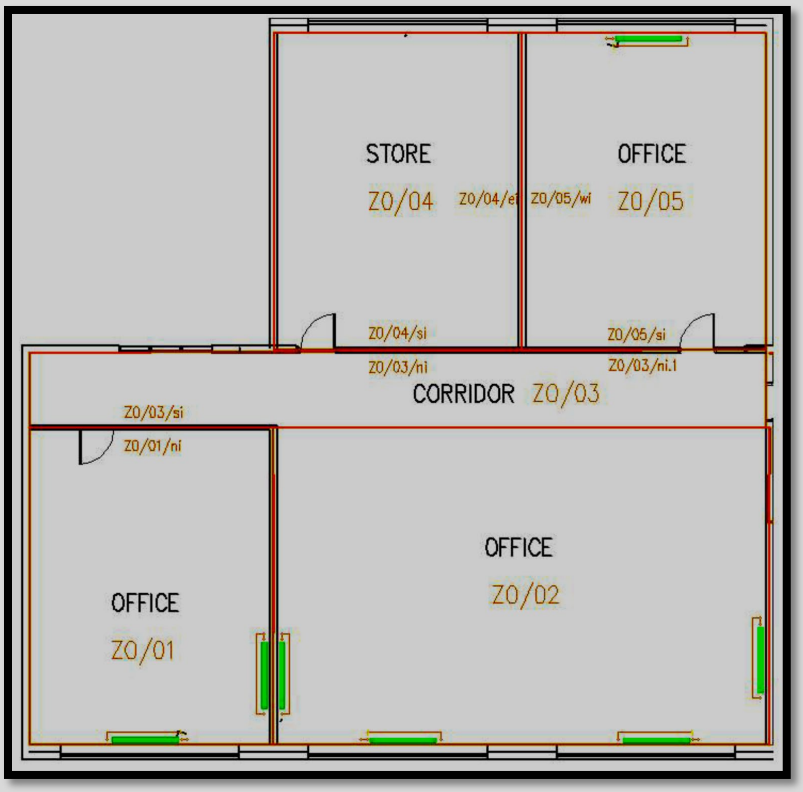
6.6 Indirectly conditioned spaces

Correct identification of a zone being conditioned, or not, can significantly impact the rating. As outlined in Section 3.3 of How to use iSBEMie (Volume 1): "Zones which are not serviced by a 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".

Appendix 8 of the NEAP Survey Guide has a flow chart and some examples which will assist with the adjacency of spaces.

Example: Indirectly conditioned spaces

The single storey building in the drawings represents an existing office building served by a radiator system. As can be seen zones Z0/01, Z0/02 and Z0/05 are directly heated by the radiator system. Zones Z0/03 and Z0/04 have no direct HVAC system. There is no partition between Z0/02 and Z0/03, so there is movement of air from the heated offices into the corridor, therefore the corridor is indirectly heated. Zone Z0/04 is totally enclosed, so the heated air cannot move freely from the surrounding conditioned zones to Z0/04.



Less than 50% of the Z0/04's elements connect to conditioned spaces since there is a roof overhead, so the store is seen as Unheated Adjoining Space when viewed from surrounding zones.

The following HVAC system is applied to each zone:

Zone	HVAC System applied	Reasoning
Z0/01, Z0/02 and Z0/05	Radiator System	Directly heated.
Z0/03	Radiator System	Indirectly heated by same system supplying surrounding zone by movement of air.
Z0/04	Zones without HVAC system	Unconditioned and enclosed.

Some of the internal surface envelope conditions are as follows:

Element	Adjoining Condition	Reasoning
Z0/01/ni, Z0/04/si and Z0/05/si	Conditioned Adjoining Space	The elements are adjacent to Z0/03 which is indirectly heated.
Z0/03/si and Z0/03/ni.1	Conditioned Adjoining Space	The elements are adjacent to Z0/01 and Z0/05 respectively which are directly heated.

Z0/03/ni and Z0/05/wi	Unheated Adjoining Space	The elements are adjacent to unconditioned Z0/04 which has less than 50% elements Connect to surrounding CAS.

6.7 Efficiency

Guidance for HVAC systems efficiency is detailed in Section 3.5.2 of How to use iSBEMie (Volume 2) and the NEAP Survey Guide, Section 7.11 and Appendix 5.

In iSBEMie, the **HVAC Systems-> General** tab requires some key entries:

- **Enter name and type of system**. See How to use iSBEMie (Volume 2), Table 7. The basis for choosing the heating system must be recorded. Plantroom and ceiling void details to be accompanied by at least one of:
  - Photographs of AHUs, ducting, ceiling void equipment, heating/cooling batteries, fresh air intakes, etc.
  - Copies of technical data sheets from Operation & Maintenance (O&M) manuals.
  - As-built drawings and specifications.
- Evidence for selection of **heat source and fuel type** from plantroom survey must be accompanied by at least one of:
  - Photographs of heat source plant (e.g. boiler nameplates and manufacturer name).
  - Copies of technical data sheets from O&M manuals.
  - As-built drawings and specifications.
- Similar levels of evidence are required for identifying the presence of the following. See NEAP Survey Guide, Section 3 7.11, 7.12 and 7.21 for full details:
  - CHP plant.
  - Cooling system generator.
  - Ventilation heat recovery. Heat Recovery efficiency sources as per Section 6.1 of the NEAP Survey Guide.

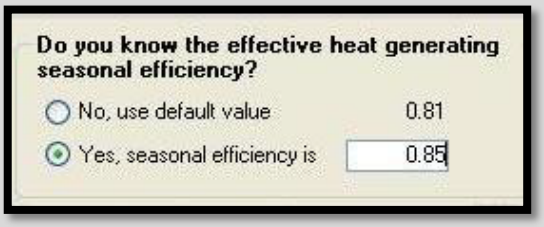
Under the **HVAC Systems-> heating** tab entries for ECA qualification and efficiency are outlined as follows:

- **The effective heat generating seasonal efficiency** is calculated in compliance with the NEAP Survey Guide, Appendix 5. Apply credits to Seasonal Boiler Efficiency to derive Effective Heat Generating Seasonal Efficiency if credits are applicable as per Appendix A5.1 of the NEAP Survey Guide.

- Plantroom evidence, as well as the following, are relevant:
  - Photographs of boiler nameplates and manufacturer's data sheets; As-built drawings and specifications.
  - Efficiency is acceptable from sources as per Section 6.1 of the NEAP Survey Guide.
  - Copies of technical data sheets from O&M manuals.
- If using default efficiency, retain evidence to support reasoning for its use.

Example 1: Format of efficiency entries

Efficiency is entered as a fraction rather than a percentage. For example, a boiler with effective heat generating efficiency of 85% is entered as follows:



Similarly, a heat pump with effective heat generating seasonal efficiency of 4.0 is entered as 4.0. This guidance is also applicable to a number of other entries such as hot water system efficiencies. Refer to Section A5.2 of the NEAP Survey Guide for guidance on conversion of Ecodesign declaration (%) for heat pumps to the form suitable for entry into NEAP software.

In general, when carrying out BER assessments, review the "Ratings" tab before publishing. Errors can be identified by comparing the notional values to the actual values as well as looking at the overall rating. For example, if the building has reasonably ordinary insulation, heating systems, etc, the different energy uses (heating, cooling, auxiliary, lighting and hot water) are likely to be of the same order of magnitude as the notional building. Note, however, that the notional building has cooling in conditioned zones regardless of the presence of a cooling system in the actual building.

In the example below, the user had incorrectly entered heating as a percentage rather than a fraction. The actual heating demand as calculated (1.68) is several orders of magnitude lower than the notional building heat demand. This suggests a significant error in the data entered by the assessor (in this case, 85.00 was incorrectly entered as the heating system efficiency rather than 0.85 as shown above).

	Heating	Cooling	Auxiliary	Lighting	Hot Water	Total	
Actual	1.68	0	10.73	88.4	0.72	101.53	kWh/m2/yr
Reference	74.33	0	4.81	33.91	112.26	225.31	kWh/m2/yr
Notional	74.33	34.66	3.34	33.91	112.26	258.52	kWh/m2/yr

Updated guidance: Version 5.5h software will warn if values are entered incorrectly, but the warning will not appear until the user clicks out of the efficiency field. Unfortunately, the warning does not extend into the bi-valent tab.
Always review each sub-tab of iSBEMie, or equivalent software, prior to publication.

Example 2: Acceptable efficiency evidence from a datasheet

This example shows extracts from a manufacturer datasheet.

- Make/model of boiler detailed in the datasheet (anonymised in this example).
- CE marked document.
- 100% load efficiency shown.
- 30% load efficiency shown*.
- Boiler Efficiency Directive referenced.

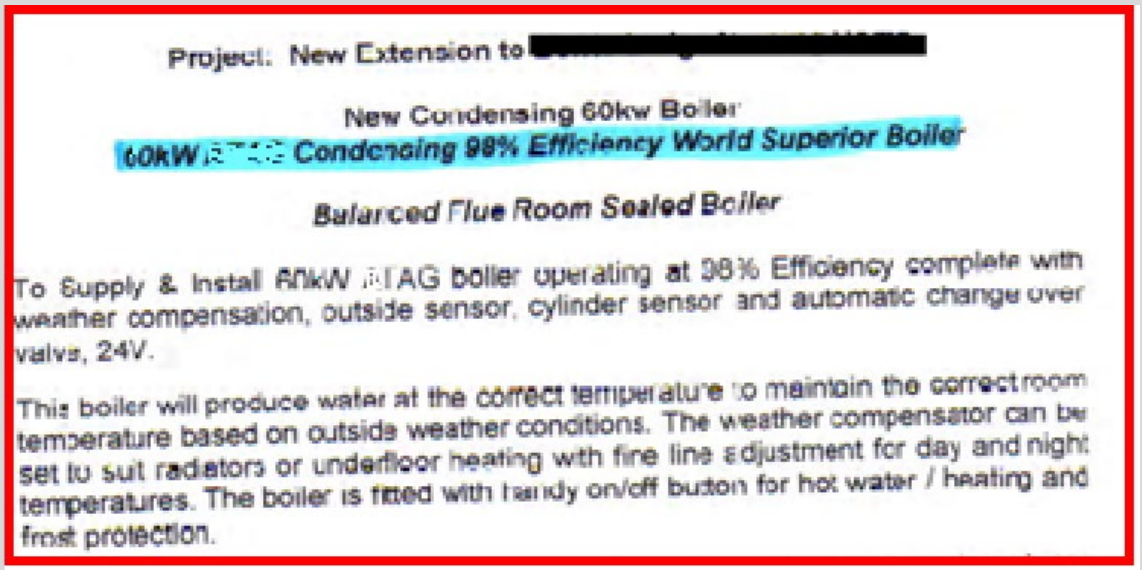
Output and Efficiency				
Heat input, central heating	max.		kW	75.0
	min.		kW	17.0
Heat output, central heating	max.	(80 - 60°C)	kW	73.5
	min.	(80 - 60°C)	kW	16.7
	max.	(50 - 30°C)	kW	79.5
	min.	(50 - 30°C)	kW	18.3
Efficiency	Pmax	(80 - 60°C)	%	98.0
	Pmin	(80 - 60°C)	%	98.5
	Pmax	(50 - 30°C)	%	106.0
	Pmin	(50 - 30°C)	%	107.5
	30%	(30°C)	%	109.0
Efficiency class Directive 92/42 EEC				★★★★

Tip: When some efficiencies are > 100% it is a clear indicator that they are NET values and must be converted to GROSS as per the previous example. If unclear whether NET/GROSS, check with supplier/manufacturer. If still unclear, assume they are NET, and convert to GROSS for a conservative approach.

Example 3: Unacceptable efficiency evidence

In this case, the assessor has been provided with a document from boiler supplier/installer showing:

- Building address (anonymised here).
- Boiler make/model/type.
- Efficiency 98%.
- No identification of full and part load efficiencies.
- No reference to relevant standards/directive.



Project: New Extension to [redacted]

New Condensing 60kw Boiler

60kW [illegible] Condensing 98% Efficiency World Superior Boiler

Balanced Flue Room Sealed Boiler

To Supply & Install [illegible]kW [illegible]AG boiler operating at 98% Efficiency complete with weather compensation, outside sensor, cylinder sensor and automatic change over valve, 24V.

This boiler will produce water at the correct temperature to maintain the correct room temperature based on outside weather conditions. The weather compensator can be set to suit radiators or underfloor heating with fine line adjustment for day and night temperatures. The boiler is fitted with handy on/off button for hot water / heating and frost protection.

The assessor should check with the supplier (in writing) to confirm if the required evidence is available in another document. In the absence of further information, SBEM defaults are used.

Example 6: Correct entry of SEER and EER for cooling using Eurovent data

In the following example, a split system is proposed for a new office development and the assessor wishes to obtain acceptable cooling efficiency data for use in SBEM. This example presents some of the means of obtaining acceptable non-default data. Sections 6.1 and 7 of the NEAP Survey Guide provide further detail on acceptable sources of data.

Using EcoDesign data:

The Ecodesign data was located and gave a heating efficiency $\eta_{s,h}$ of 185.1%.
Using the formula in the NEAP Survey Guide, Section A5.2, this is converted in SCOP for use in SBEM.
185.1 x 2.5/100 = 4.63

Information requirements for air-to-air air conditioners

RXYSQ[redacted] + 4 x FXSQ[redacted]								
Outdoor side heat exchanger of air conditioner: air								
Indoor side heat exchanger of air conditioner: air								
Type: compressor driven vapour compression								
Driver of compressor: Electric motor								
Élément	**Symbol**	**Value**	**Unité**		**Élément**	**Symbol**	**Value**	**Unité**
Rated cooling capacity	$P_{rated,c}$	14.0	kW		Seasonal space cooling energy efficiency	$\eta_{s,c}$	303.4	%

The same document has cooling data, below:

Élément	Symbol	Value	Unité
Seasonal space cooling energy efficiency	$\eta_{s,c}$	303.4	%
Declared energy efficiency ratio or gas utilisation efficiency/auxiliary energy factor for part load at given outdoor temperatures Tj			
T_j = + 35 °C	EER_d or $GUE_{c,bin}/AEF_{c,bin}$	2.7	
T_j = + 30 °C	EER_d or $GUE_{c,bin}/AEF_{c,bin}$	5.0	
T_j = + 25 °C	EER_d or $GUE_{c,bin}/AEF_{c,bin}$	10.5	
T_j = + 20 °C	EER_d or $GUE_{c,bin}/AEF_{c,bin}$	19.9	

The four values are taken and inserted into the formula found in NEAP Survey Guide section A5.3.
$SEER = a(EER_{100\%}) + b(EER_{75\%}) + c(EER_{50\%}) + d(EER_{25\%})$

Where:
EER x% is the part load energy efficiency ratio at 100%, 75%, 50% and 25% operating conditions.
a, b, c, and d are the load profile weightings.

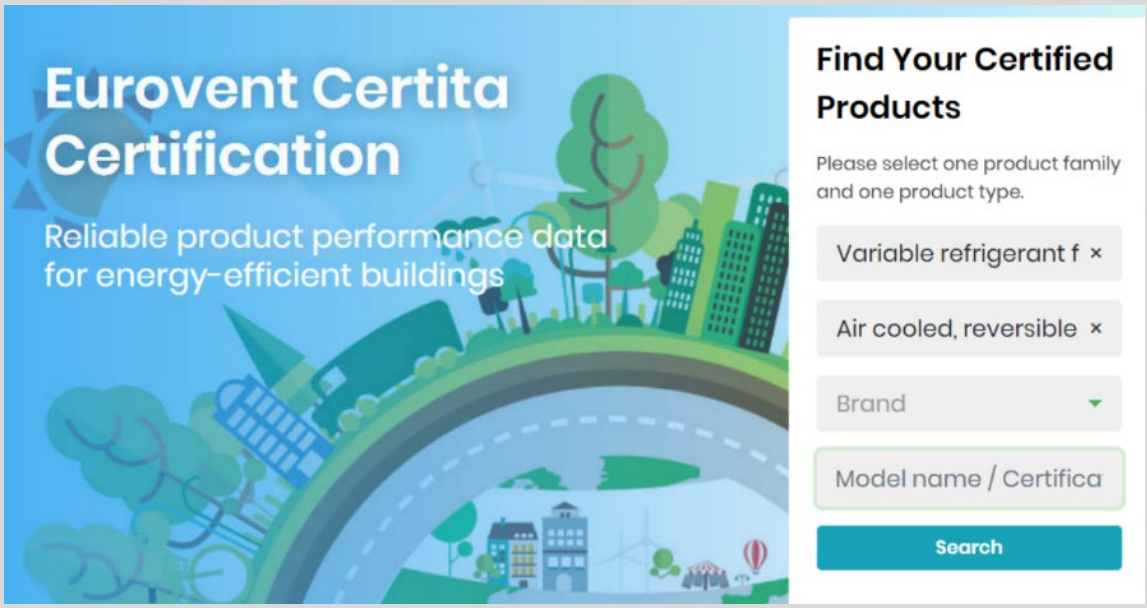
The values for the office profile are used since this is an office development.

	a	b	c	d
Unknown load profile	0.25	0.25	0.25	0.25
Office load profile	0.03	0.33	0.41	0.23

$$SEER = a(EER_{100\%}) + b(EER_{75\%}) + c(EER_{50\%}) + d(EER_{25\%})$$
$$SEER = 0.03(2.7) + 0.33(5.0) + 0.41(10.5) + 0.23(19.9)$$
$$\underline{\mathbf{SEER = 10.61}}$$

Using the Eurovent website

The model is a Variable refrigerant volume Split Unit that is reversible, heating and cooling



1) Go to the website: https://www.eurovent-certification.com/en/
2) Select the product types.
3) Select the manufacturer and fill in the data.
4) There may be more than one result corresponding to various indoor unit combinations.
5) Select combination to be used.
6) Download the certificate (snips of the SCOP and the four EER values shown below).

IU Names *(Names of combinable Indoor units)*	4x FXS
IU Range Names *(Range Names of combinable Indoor units)*	FXS(

Before proceeding, check the bottom of the certificate to ensure the indoor units are correct.

ηsh	185	%

EERout *(Outdoor Energy Efficiency Ratio)*	2.7
EERB	5
EERC	10.5
EERD	19.9

7) As shown the Ecodesign example, the values are converted for entry into SBEM.
8) The entries in SBEM are as follows:
    a. Heat Generation Seasonal Efficiency = 4.63
    b. EER = 2.7
    c. SEER = 10.61, in compliance with EN 14511 as referenced in the NEAP Survey Guide.

6.8 Bi-Valent Systems

As per the iSBEMie User Guide (Volume 2), a bi-valent system is used where two or more types of heat sources provide heating to a zone. The efficiency of the bi-valent system is based on the respective loads, efficiencies and emission factors.

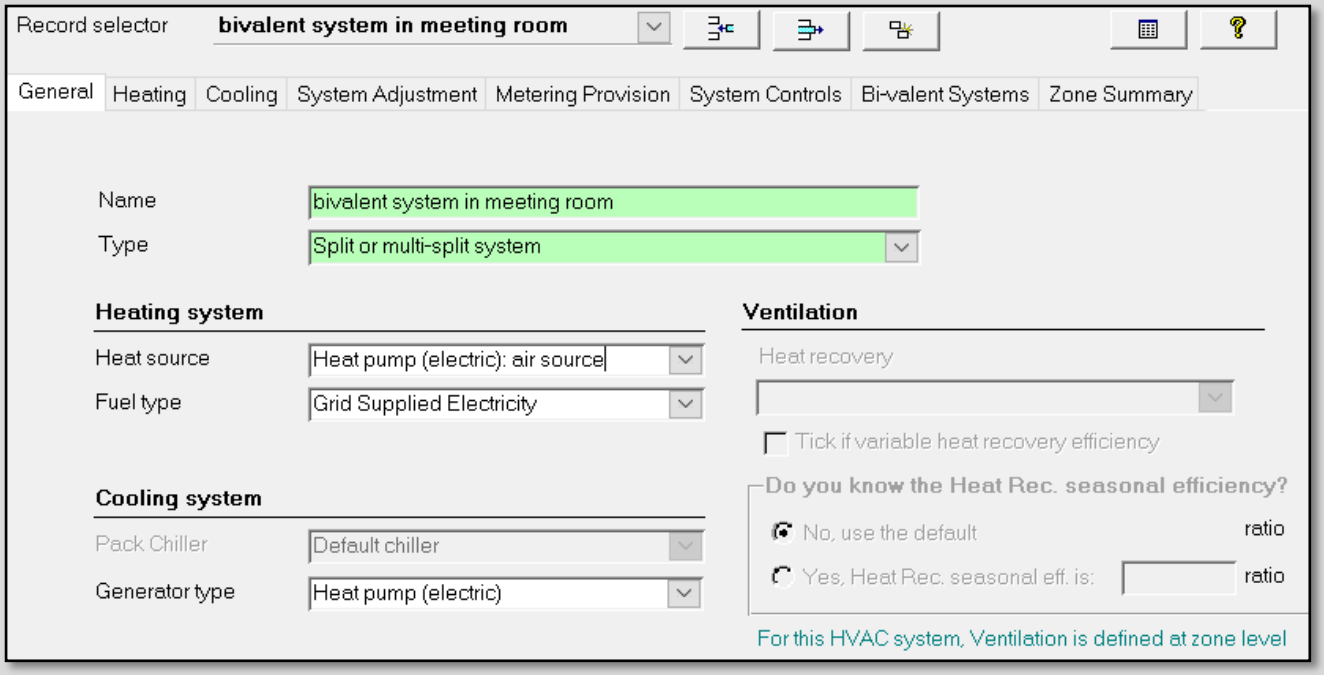
Updated guidance: There is revised guidance regarding the division of heat to the bi-valent components. Previously a 50:50 division was always recommended where no information is known, but now there is a short set of rules published in the revised NEAP Survey Guide and some are illustrated here.
The following example demonstrates the entry of a bi-valent system consisting of a boiler and split system into iSBEMie.

Example 1: Bi-valent heating system – gas boiler and air conditioning

A zone is served by a central heating radiator system and air-conditioning split system. The central heating system is served by a gas-fired boiler with a default efficiency of 81%. It is not known what the sharing of the annual heating demand is. The air-conditioning split system has a COP of 3.1. The EER is 2.6 and the SEER is 3.6.

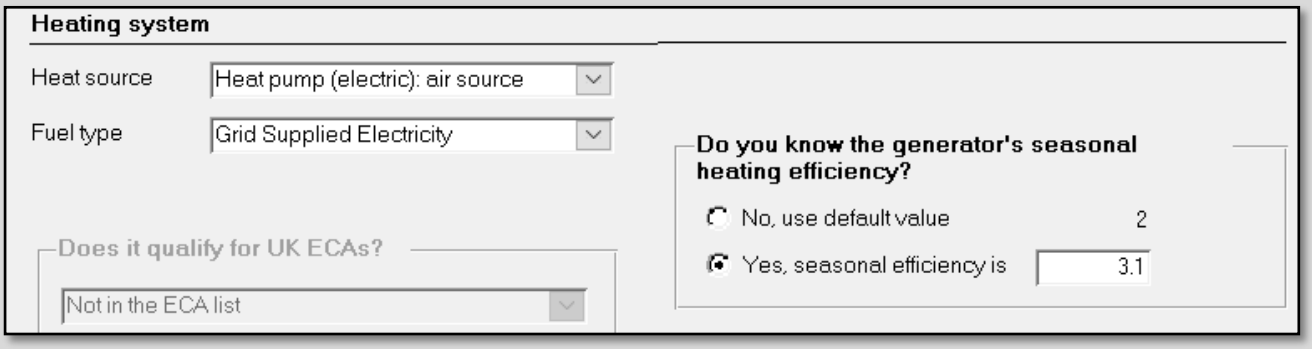
The system will be called “bi-valent system in meeting room”.

The bi-valent calculation is integrated into the software. Refer to the end of iSBEMie User Guide (Volume 2), Section 3.5.2, for additional guidance on its use.

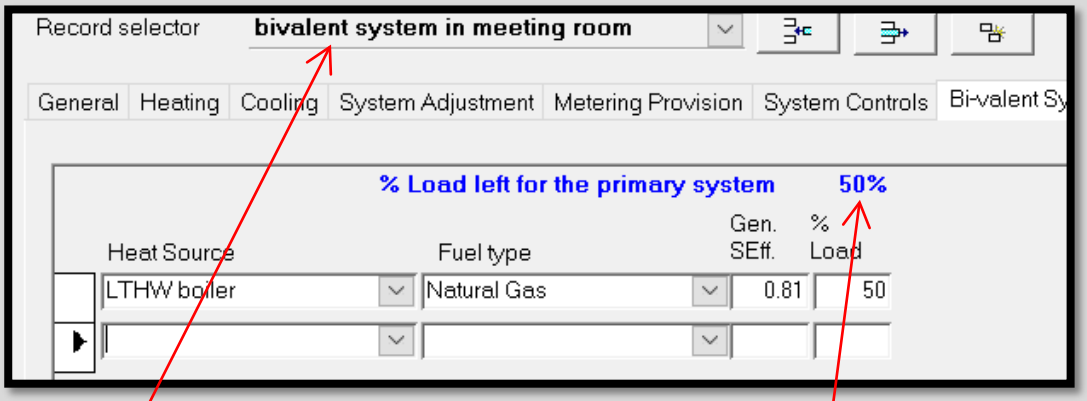


Updated guidance: With reference to the NEAP Survey Guide, Section A4.2, "bi-valent system defaults": Two multi zone systems only: 50% is assigned to each system. To simplify matters, **split-systems are considered as multi-zone system** because they can be central systems.

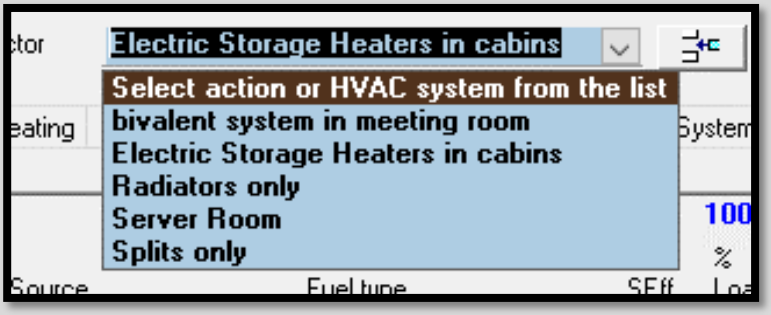
Firstly, the system type split or multi-split is defined as shown above. Selecting split or multi-split is necessary to **allow the cooling aspect to be taken into account**.



Next the LTHW boiler heating source values for the "bi-valent system in the meeting room" are entered in the bi-valent sub-tab.



The system is made bi-valent by populating the "bi-valent" sub-tab.

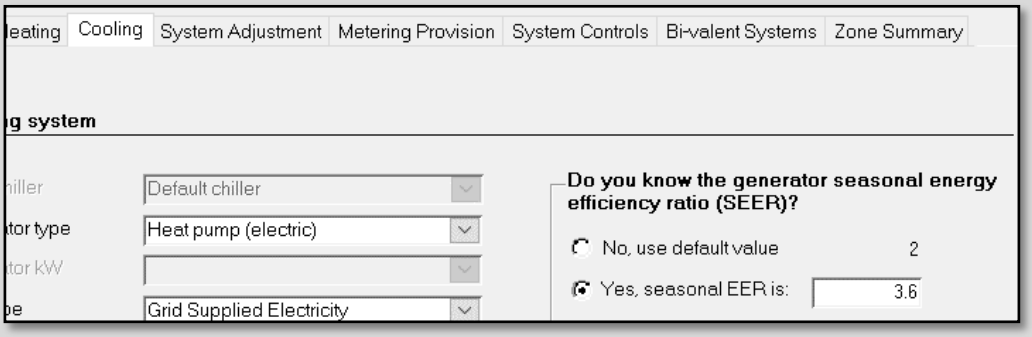


The left screenshot shows that this example building has multiple HVAC systems. **Be careful to select the correct system to make bi-valent.**

In this example it is assumed the boiler-based system accounts for 50% of the load. The default efficiency of 0.81 is used. It can be seen that the primary portion of the system now carries 50% of the load, see text in blue above.

To delete an entry, select the box to the left of the bi-valent entry and press the delete key on your keyboard.

Finally, the cooling source details are entered and the system will be assigned to its zone(s).

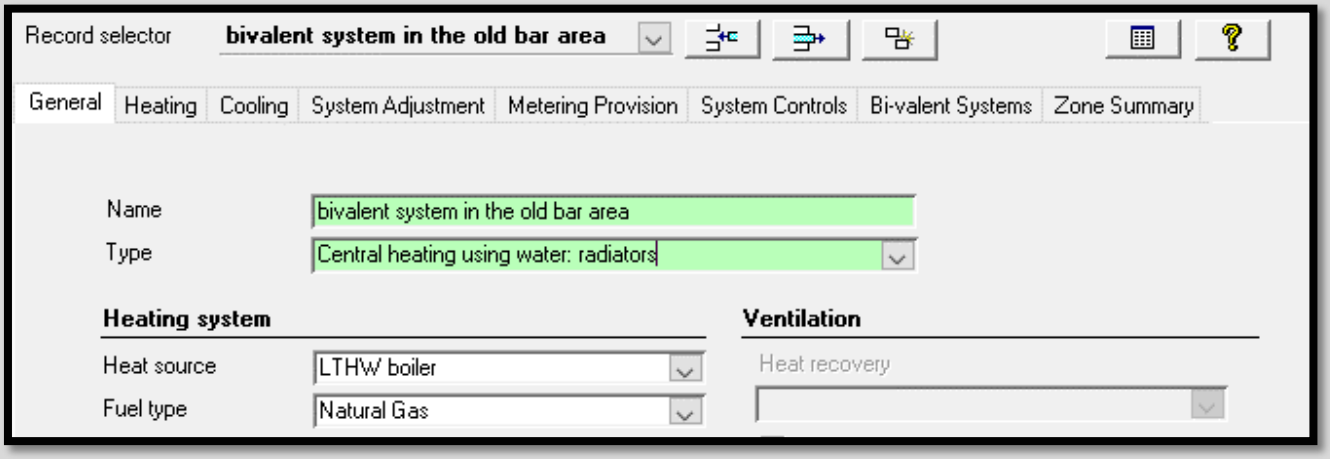


Remember to assign the bi-valent system to the relevant zone(s) after going to all that effort!

Example 2: Bi-valent heating using radiators and stove

In an area of a public house, there is a stove and radiators. The radiator-based system is served by a natural gas-fired boiler with a seasonal efficiency of 85.5%. The percentage split of the annual heating demand between the stove and the radiator system is unknown.

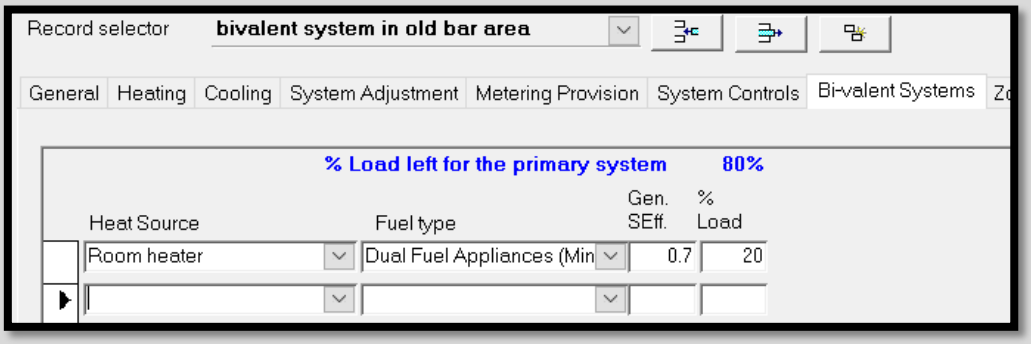
A Bi-valent heating system must be created to serve this zone.



Updated guidance: With reference to the NEAP Survey Guide, Section A4.2, 'Bi-valent system defaults':
One multi-zone system and one or more local (single zone) system(s): 80% is assigned to the central system and 20% to the local system (or equally divided between the local systems).

Firstly, enter the boiler and radiator-based system in the HVAC/General tab. This is because it will be the larger contributor to the heating demand and also because there is allowance then to enter details, such as variable speed pumping, and to tick controls measures. These are not accessible to a heating system in the bi-valent section.

Next, go to the bi-valent tab.



If the stove was on its own, it would be entered as a "Room heater" in iSBEMie. The default seasonal efficiency for a "Room heater" in iSBEMie is 0.7 and this is what is used in the bi-valent screen for the seasonal efficiency of the stove.

Important: Ensure the load left for the primary system is correct. Press ENTER after entering 20.

Ensure the "Record selector" at the top is the system you wish to make bi-valent.

Ensure the "Gen. SEff." Figure is a decimal. The warning that occurs when the efficiency is entered in % form is not included on the bi-valent tab.

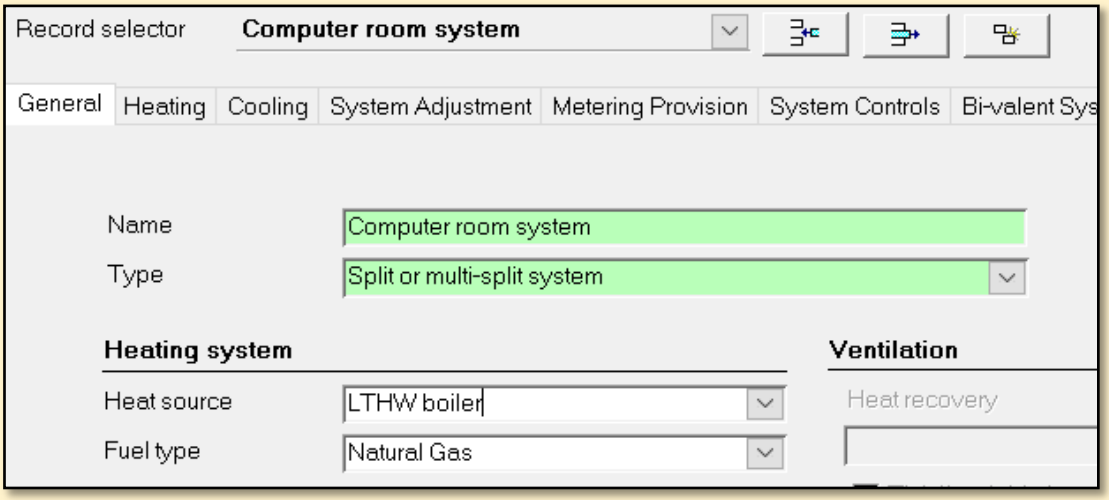
Example 3: Gas boiler and air conditioning

NOT Bi-valent!

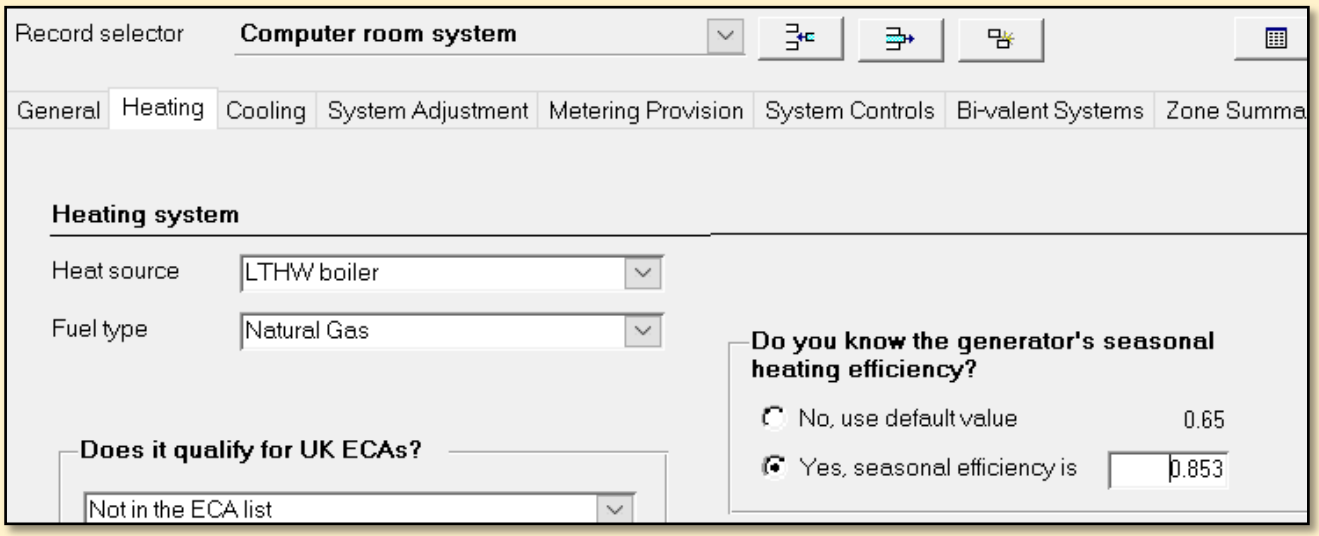
A zone is served by a central heating radiator system and air-conditioning split system. The central heating system is served by a gas-fired boiler with an efficiency of 85.3%.

It is known that only the split-system can cool the space. It has NO HEATING ability. The split system is old and no reliable data can be obtained.

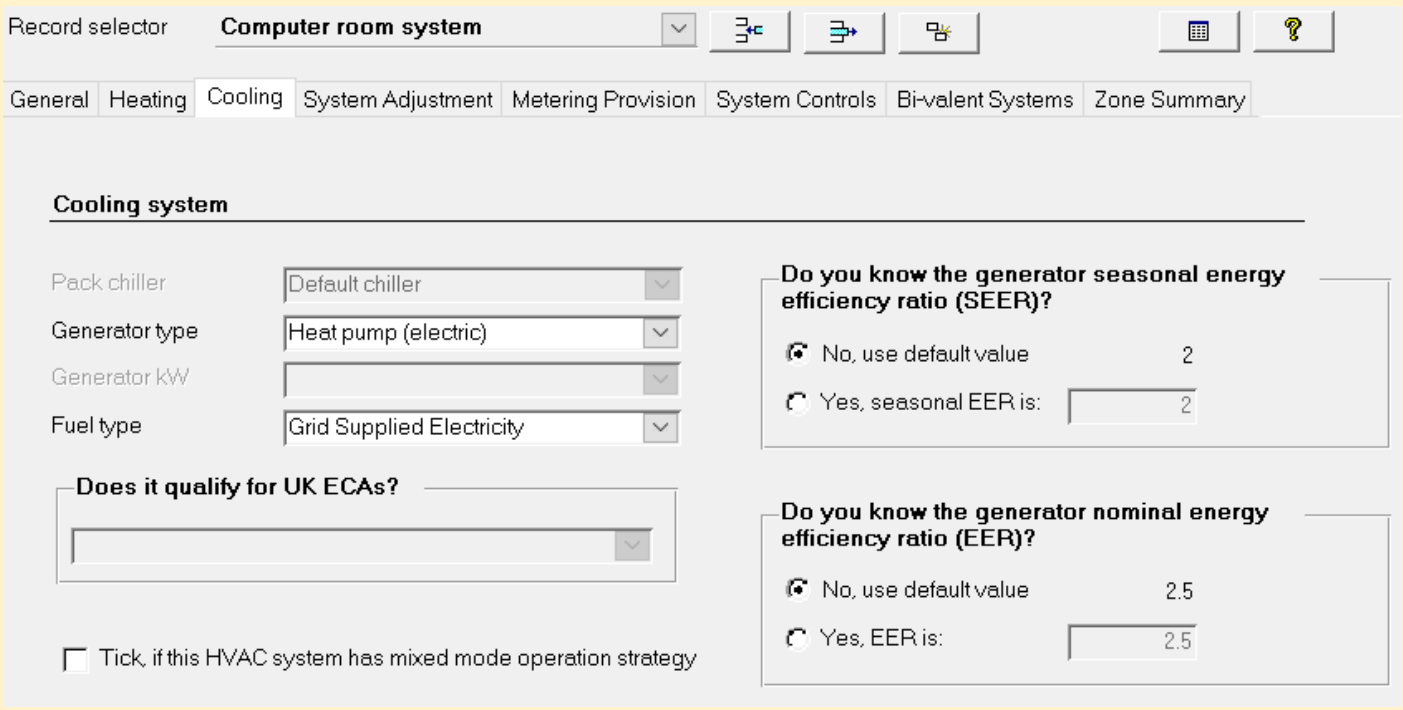
The system is **not a bi-valent system** because a bi-valent system requires two or more heat sources. There is only one heat source. Guidance on this sort of situation can be found in ISBEMie User Guide (Volume 2), Section 3.5.2, top of page 69.



Firstly, the system type Split or Multi-split is defined as shown above. Selecting split or multi-split is necessary to **allow the cooling aspect to be taken into account**. Since the heat source is a boiler, LTHW boiler is selected as the heat source, instead of the more usual "Heat pump (electric): air source" that would normally be used with a split system.



Next the heating source details are entered in the Heating tab, in this case we have a non-default efficiency 0.853.



The cooling source details are entered, both values are defaulted for this example.
Finally, the system will be assigned to the relevant zone(s).

Note: For an existing building where information is minimal, and you are uncertain if a unit is cooling only or heating and cooling, assume the split system can perform both heating and cooling so Example 1 above will apply.

6.9 Exhaust systems

Exhaust systems are often found in the following types of zones: kitchens, toilets (particularly toilets without windows), enclosed store rooms, workshop areas.

Exhaust systems must not be confused with ventilation systems. Exhaust systems extract air only, whereas ventilation systems have both supply and extract. Ventilation systems must only be entered where there is clear evidence of a supply, such as a second grille, duct or fan supplying air to the space by mechanical means. It is unlikely that you will encounter a situation where a zone has both "Ventilation" (supply and extract) and an "Exhaust" system serving the same space. If you encounter an unusual situation regarding ventilation and exhaust, contact the BER Helpdesk for assistance.

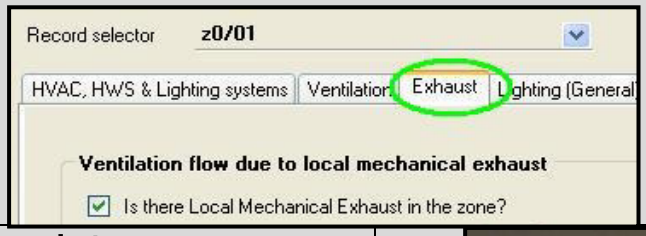
Documentary evidence to support the inclusion or exclusion of an extract system can be met by one of the following:

- As-built mechanical drawings marked up showing zones.
- Survey form and photographs.

See section 7.25 of the NEAP Survey Guide for further details.

The exhaust encountered in Examples 1 & 2 below is entered using the "Exhaust" sub-tab.

Updated guidance: A short list of default exhaust flow rates has been provided in Appendix A4.8 of the NEAP Survey Guide.



Example 1

An extract disc to office toilet ceiling. The dust residue pattern around the disc indicates extract. There is no supply grille evident in the toilet or in the lobby, so the system is entered as "Exhaust" only.

There are three toilet appliances in the zone. The zone is 16 m^2. No other details are known about the system.

If an internal toilet is identified on site, then it is likely there will be an extract fan but only enter exhaust if it exists.

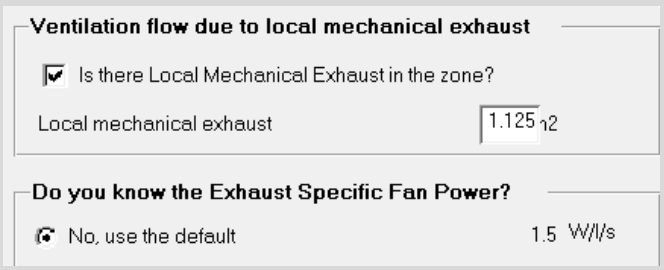
Example 1: Solution

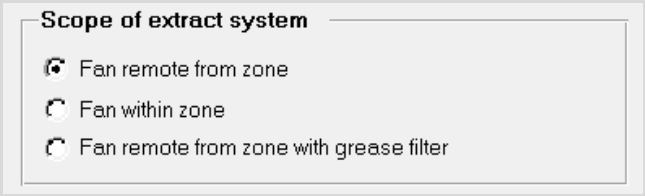
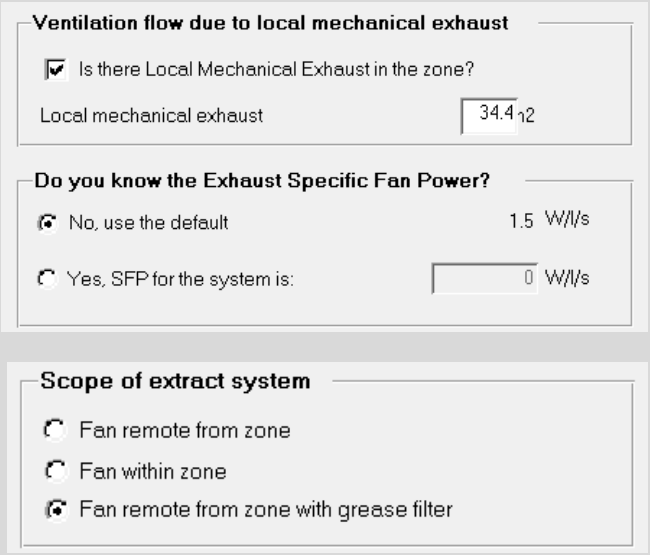
A non-default flow rate value must be calculated by the assessor, using the guidance in Appendix A4.8 of the NEAP Survey Guide.
3 x *6l/s divided by 16 m^2 = 1.125 l/s/m^2

The SFP must be defaulted since there is no data on the fan.

The fan is in a duct and is remote from the zone, so this is selected as well.

Note how the calculated value of 1.125 l/s/m^2 differs considerably from the initial default value of 5 l/s/m^2



**6l/s is taken from the table in Appendix A4.8 of the NEAP Survey Guide.*	
Example 2 The restaurant kitchen in this example has "Exhaust" only. For this kitchen, the make-up air for the space is obtained by opening the end outside door, which is fitted with an insect screen. There is no supply fan, supply duct, or grilles evident, so the system is entered as "Exhaust" only. The kitchen is 84 m^2 in area and 3.1 m in height. Nothing is known about the fan(s) make or model.	
Example 2: Solution A non-default flow rate value must be calculated by the assessor, using the guidance in Appendix A4.8 of the NEAP Survey Guide. *40ACH is multiplied by the height 3.1 m and divided by 3.6 to convert ACH to l/s/m^2. 40 x 3.1 /3.6 = 34.4 l/s/m^2 The SFP must be defaulted since there is no data on the fan. The fan has a grease filter, so this is selected as well. Note how the calculated value of 34.4 l/s/m^2 differs considerably from the initial default value of 5 l/s/m^2 **40ACH is taken from the table in Appendix A4.8 of the NEAP Survey Guide.*	

6.10 Ventilation systems

Ventilation systems have both supply and extract whereas exhaust systems extract air only. Ventilation systems must only be entered where there is clear evidence of a supply, such as a second grille, duct or fan supplying air to the space by mechanical means. It is unlikely that you will encounter a situation where a zone has both "Ventilation" (supply and extract) and an "Exhaust" system serving the same space. If you encounter an unusual situation regarding ventilation and exhaust, contact the BER Helpdesk for assistance.

Documentary evidence to support the inclusion or exclusion of an extract system can be met by one of the following:

- As built mechanical drawings marked up showing zones.
- Survey form and photographs.

See section 7.24 of the NEAP Survey Guide for further details.

Example 3

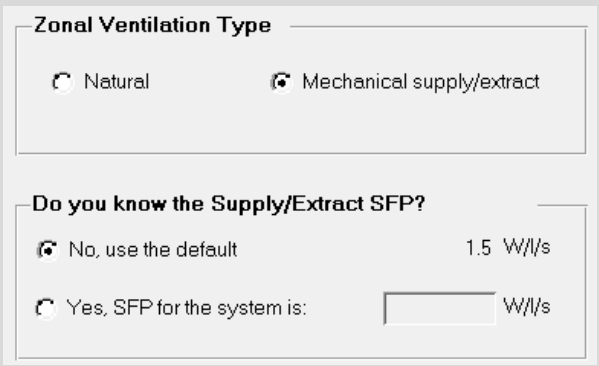
Office with supply and extract grilles. Enter as "Ventilation". Since "Ventilation" includes both Supply and Extract this means that an "Exhaust" entry is not used. In this case, the supply grille is the louvred grille. while the extract grille is an eggcrate grille.
No other information is known. so default entries will be accepted.

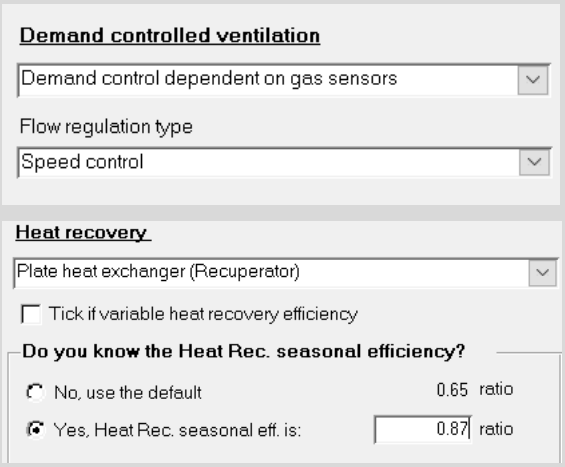
Example 4

A meeting room in a new office building is to be heated with radiators but fitted with ventilation and heat recovery. The unit will be speed controlled by a wall controller and a CO2 sensor. A data sheet for the proposed unit has been provided. The unit can run at four speeds. Full speed data is shown below.

External Static Pressure	Pa	150
Temperature Exchange Efficiency	%	87
Specific Fan Power	W/(l/s))	1.37
Input Power	W	190
Sound Pressure Level	dB(A)	33

The temperature exchange efficiency is 87%, and this figure is confirmed within the document as meeting the relevant standard.
The specific fan power of the unit at maximum speed is 1.37W/l/s, but this represents only the unit rather than the complete ducted system with its pressure drops. SBEM requires the system SFP. SFP at the design pressure drops should be sought or else commissioning reports should be used.





The default figure of 1.5W/l/s will be used unless the system figures are provided.

- SFP is default as we are uncertain if the SFP represents the system or just the unit
- Demand-controlled ventilation is selected based on gas (CO_2) sensors.
- The unit responds by varying speed, so speed control is selected.
- The non-default heat recovery efficiency is also entered.

Note: Ventilation is integral to some of the systems in SBEM. Systems such as central heating using air distribution, VAV systems, fan coil systems, constant/variable volume systems are all air based and so the ventilation aspect is brought in once you select them in a zone.

Systems such as boiler and radiators, split systems and any local heating systems can have ventilation added by the SBEM user if it is present.
When a system is air based and brings in ventilation, the zonal ventilation tab cannot be edited by the user. Changes to the ventilation are carried out at HVAC level.

6.11 Hot water systems

This article outlines several scenarios and examples supplementing guidance on hot water systems in the NEAP Survey Guide and iSBEMie User Guide.

6.11.1 Default instantaneous electric water heaters

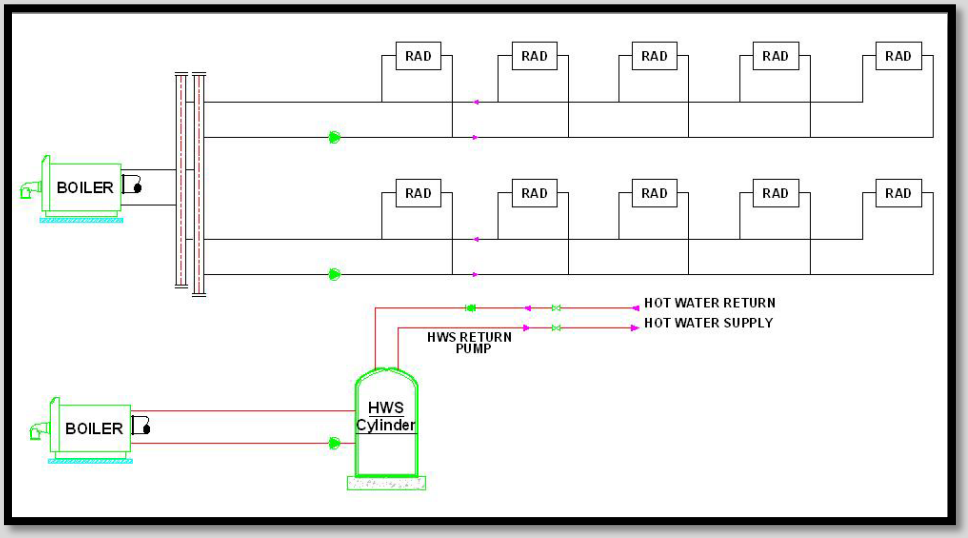
NEAP Survey Guide, Section A4.4, details the approach when a building has no hot water systems installed or when the hot water heater cannot be accessed.

6.11.2 Identifying dedicated hot water boiler systems

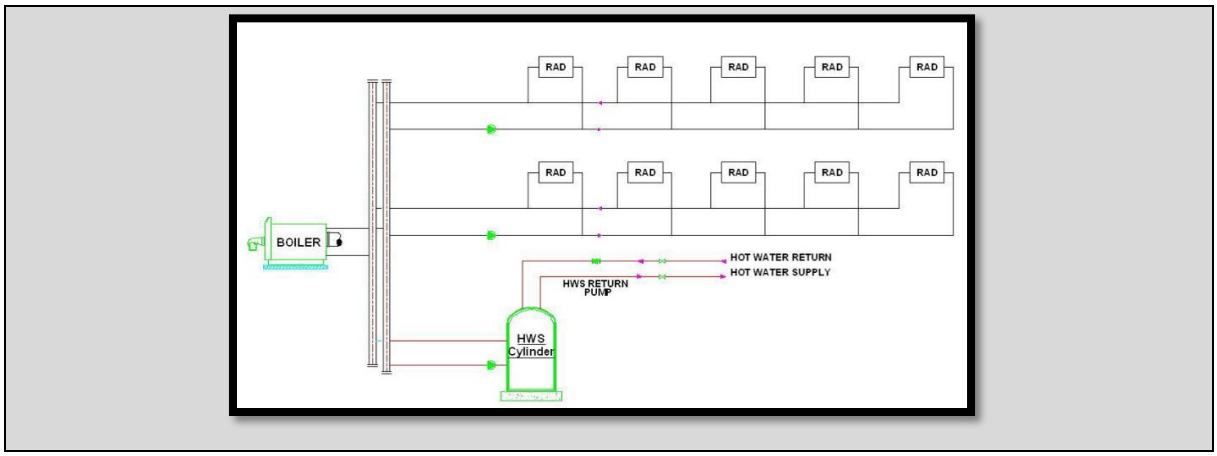
Dedicated hot water boilers are defined in SBEM as follows: "A heat generator serving a separate hot water storage unit. It does not provide a space heating service." The following example demonstrates when dedicated hot water boiler is applied in a NEAP assessment.

Example: A dedicated hot water boiler system

This schematic shows a system where **"**Dedicated hot water boiler" is the heat source for a hot water system. The boiler only serves the hot water storage system. Space heating is served by a separate boiler.

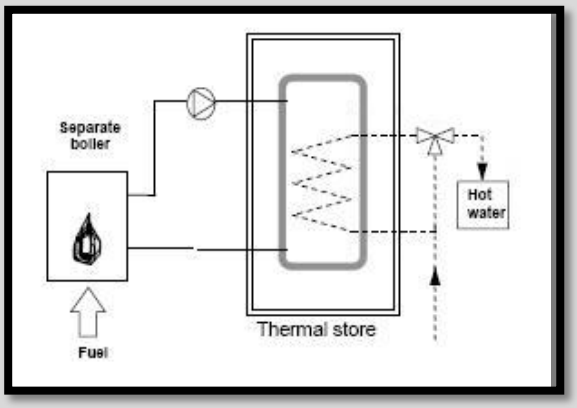
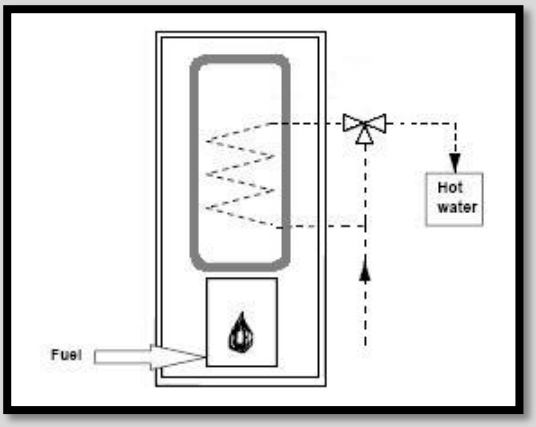


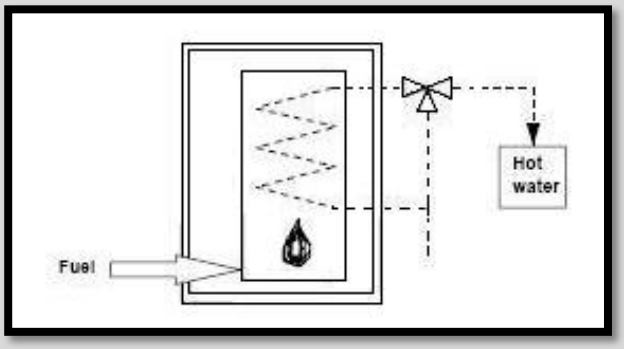
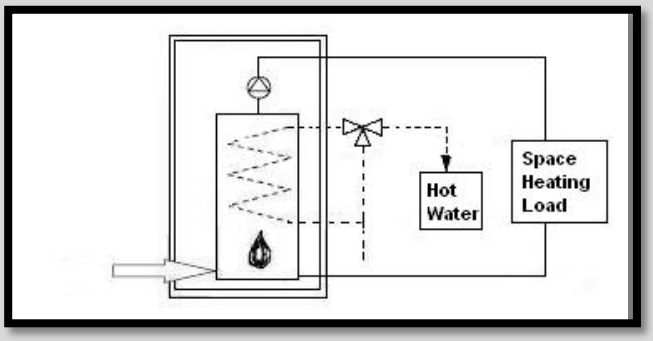
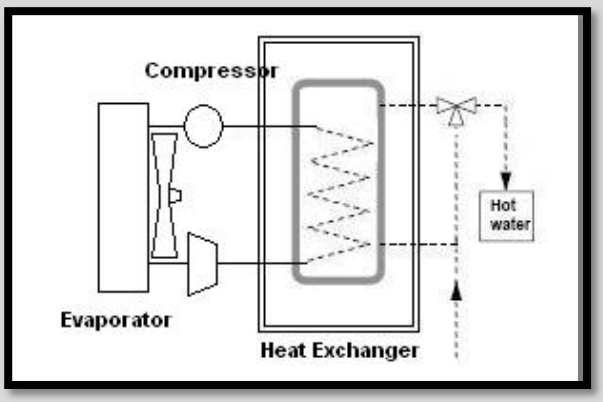
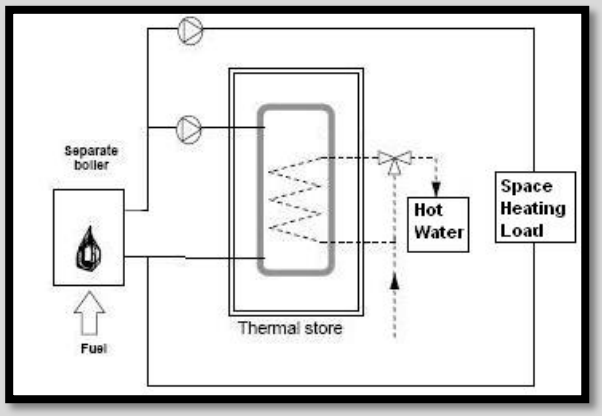
It is not correct to select "Dedicated hot water boiler" when the boiler also serves the space heating system, for example, the schematic below. In the case where the boiler is serving both the space heating and the hot water storage system, select "Same as HVAC".



6.11.3 Identifying hot water generator types

There are several generator types listed in the iSBEMie HWS tab, outlined as follows:

	**Dedicated hot water boiler:** A dedicated hot water boiler as defined in SBEM as "a heat generator serving a separate hot water storage unit. It does not provide a space heating service."
	**Standalone water heater:** A standalone water heater as defined by SBEM as "a unit that combines hot water storage and a heat generator in a single unit. It does not provide a space heating service." The units can be large, in excess of 500 litres, or small, down to 7 litres, for under-sink type heaters. They can be fuelled by electricity or by combustion within the unit.

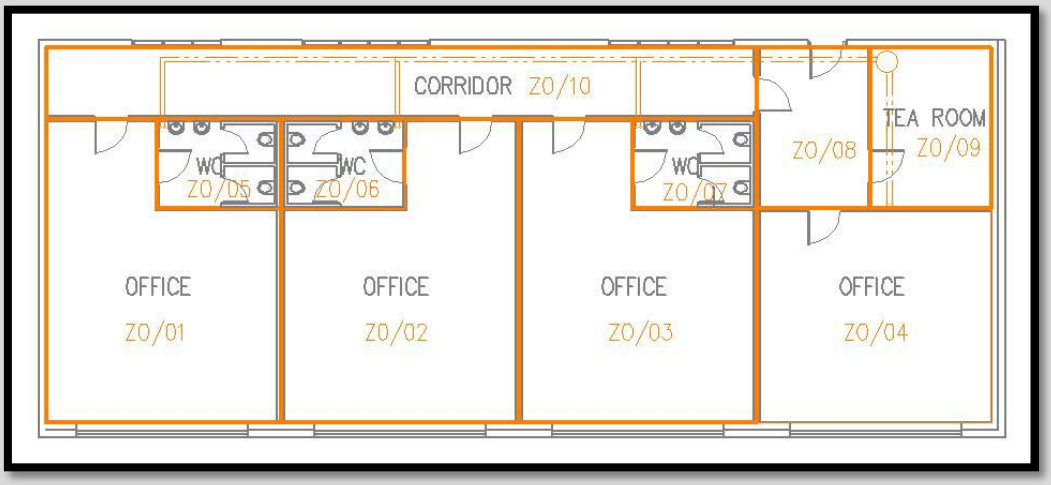
	**Instantaneous hot water heater** An instantaneous hot water heater as defined in SBEM is a water heater without storage. The water heater instantly heats water as it flows through the generator and does not retain water internally. The units can be large, for use in shower facilities or hotels, or small, for individual taps at basins. They can be fuelled by electricity or by combustion within the unit.
	**Instantaneous combi** An instantaneous combi heater as defined in SBEM is a space heating boiler that also provides domestic water heating with no (or limited) storage capability.
	**Heat pump (under HWS)** A heat pump can be assigned as the hot water heater here. Use if the heat pump is supplying hot water only or if the heat pump is also supplying space heating. Where the heat pump is also supplying space heating there will be different efficiency figures available for hot water heating and space heating. Using this entry, also separate entries for the two efficiency values in SBEM.
	**Same as HVAC system** This option is chosen if the hot water is provided by an existing HVAC system serving the space heating load. If a heat pump is providing space heating as well as domestic hot water DO NOT use this option. Use the option above which will allow a heat pump efficiency for hot water to be entered separately from heat pump efficiency for space heating.

6.11.4 Assigning hot water systems to zones

HWS systems must be assigned correctly to zones. iSBEMie User Guide (Volume 2), Section 3.5.9, Paragraph 3, describes when to assign a HWS to a zone. Depending on the activity, each zone has a hot water demand. For example, an office has a hot water demand for the washing of hands of its occupants. As stated in the iSBEMie User Guide, this demand is associated with the office rather than the toilet. Therefore, the office zone must be assigned with the HWS system.

Example 1: Assigning HWS systems to zones

The following plan shows a HWS system supplying hot water to the toilets and tea rooms in an office unit.



The assessor incorrectly assigned the actual HWS system (Installed HWS) to only the toilets and tea room, and a default HWS (Basic HWS) to the remainder of the zones:

Zone	HWS Applied
Z0/01 Office	Basic HWS
Z0/02 Office	Basic HWS
Z0/03 Office	Basic HWS
Z0/04 Office	Basic HWS
Z0/05 WC	Installed HWS
Z0/06 WC	Installed HWS
Z0/07 WC	Installed HWS
Z0/08 Lobby	Basic HWS
Z0/09 Tea Room	Installed HWS
Z0/10 Corridor	Basic HWS

The assessor should have assigned the actual HWS system (installed HWS) to all the zones:

Zone	HWS Applied
Z0/01 Office	Installed HWS
Z0/02 Office	Installed HWS
Z0/03 Office	Installed HWS
Z0/04 Office	Installed HWS
Z0/05 WC	Installed HWS
Z0/06 WC	Installed HWS
Z0/07 WC	Installed HWS

Z0/08 Lobby	Installed HWS	
Z0/09 Tea Room	Installed HWS	
Z0/10 Corridor	Installed HWS	

Example 2: Assigning HWS to zones when there is more than one HWS

Where more than one HWS serves a zone, the HWS system assigned to a zone is the HWS system that accounts for the majority of the HWS demand in that zone.

To identify the system serving the majority of the HWS demand, determine what each system serves and the associated hot water demand for each system. For example, an office zone may be served by two hot water systems, one serving an adjoining tea room and one serving the adjoining toilets and changing rooms. The specification of the units is as follows:

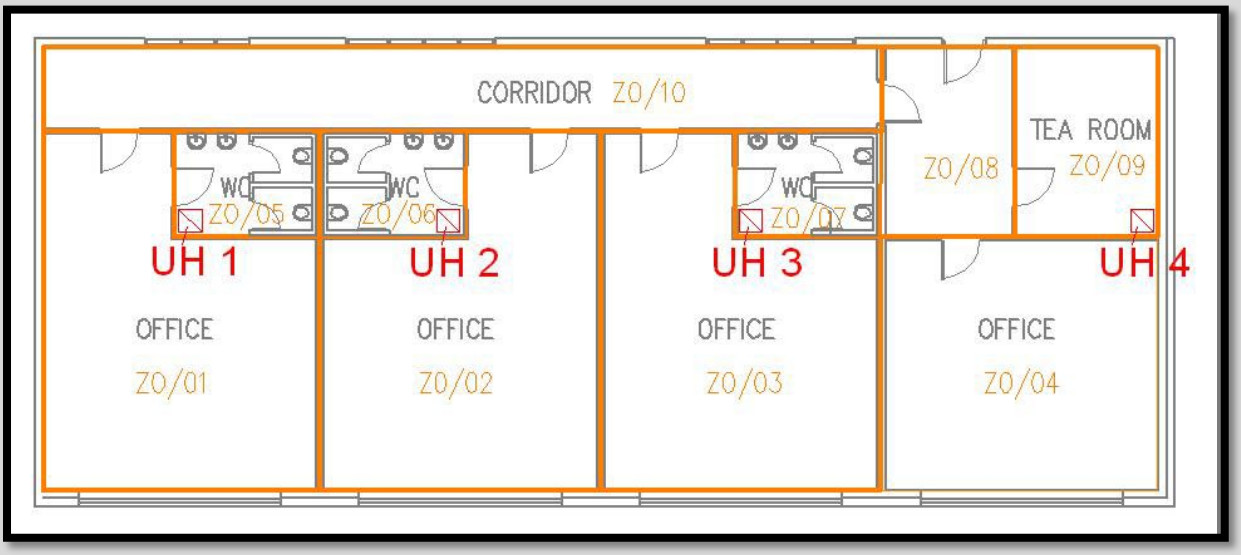
- Tea Room – 1.5kW electric instantaneous electric heater.
- Toilets and& Changing Rooms – 30kW gas-fired standalone water heater with 220-litre storage.

The unit serving the toilets and changing rooms will meet the majority of the HWS demand in this instance. Therefore, this system is assigned to the office zone.

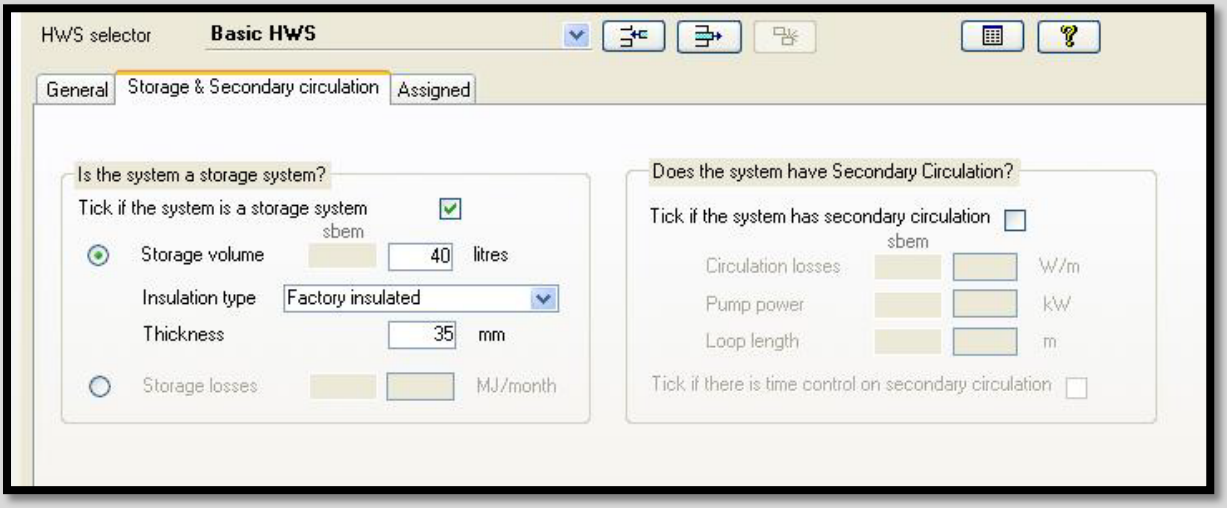
6.11.5 HWS storage systems examples

Example 1: Multiple electric water heaters with storage

In this example, there are four electric water heaters (UH1 to 4) of the same make and model with a storage capacity of 10 litres in each unit. They were installed in 2004.



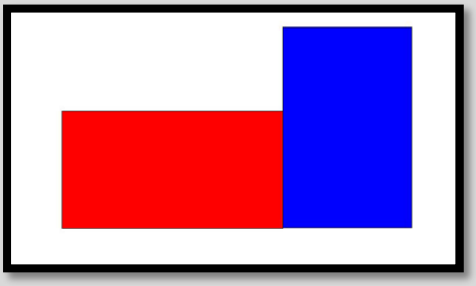
Where a combination of HWS generators act independently of each other, the total storage volume is included in SBEM as follows:



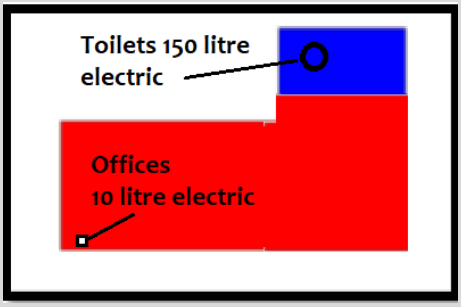
Example 2: Multiple storage systems served by a number of system types

In cases where a number of HWS systems with storage capacity are present and they act simultaneously, the storage capacity is dealt with as follows:

1) **Where two or more HWS systems serve specific independent parts of the building, these systems are included in SBEM and the associated storage volumes assigned to each system.** The example below shows an extension (blue) which was added to the original building (red). A new HWS system was installed to serve the extension (blue) section while the original HWS system was maintained to serve the original building (red). The two systems are entered in SBEM and assigned to the appropriate zones.



2) **Where two or more HWS serve the same zones simultaneously, the HWS system assigned to the zone is the HWS system that accounts for the majority of the HWS demand in that zone.** The storage capacity should account for all the storage systems.
The example below shows a large office (red) with a toilet zone (blue). The toilet (blue) section has a large poorly insulated 150-litre hot water cylinder while the office zone (red) has a new small 10-litre under-sink unit for tea making.



Toilet zones in SBEM do not use any hot water, since they are transient; it is the workers in the office that use the hot water in the toilets. Therefore, if the 150-litre hot water cylinder were to be assigned to the toilets. no losses will be included in the model. Only the much smaller losses from the under-sink heater will be accounted for. To avoid this happening, the assessor should calculate the storage volumes and assign the 160 litres of storage to both zones. Differences in insulation thickness can be accounted for by a weighted average. Refer to of iSBEMie User Guide (Volume 2), Section 3.5.9.3, for additional guidance on this sort of situation.

3) Additional systems installed for back-up only
iSBEMie User Guide (Volume 2), Section 3.5.3, details how to treat systems that do not work simultaneously (e.g. one of the systems is installed for backup purposes).

6.11.6 Hot water storage insulation thickness

Where possible, always record the actual insulation thickness of hot water storage in NEAP assessments. Otherwise, the NEAP Survey Guide, Section A4.4, details hot water storage insulation thickness defaults based on the age of the hot water storage unit.

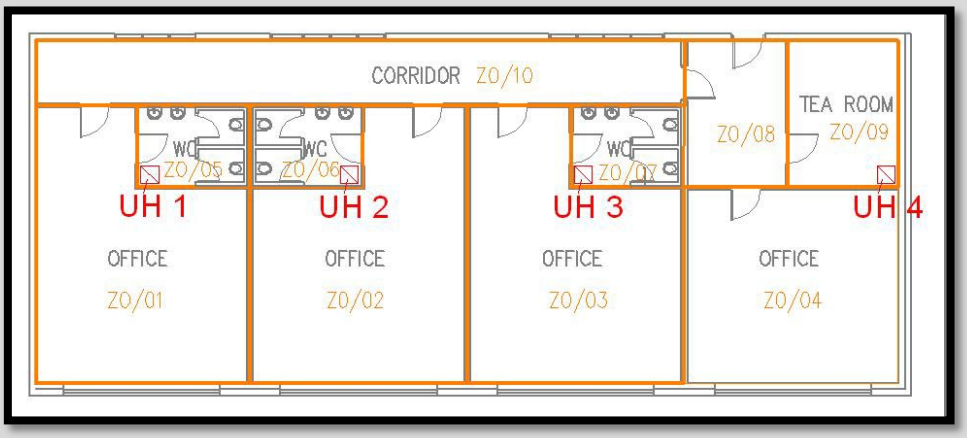
As an example, take a building constructed in 1950, with heating and hot water system upgraded in 2005. Where the assessor can demonstrate the age of the hot water system, using documentary evidence, they can base the insulation level on post-1999's defaults. However, where the assessor cannot provide documentary evidence to support the age of the hot water system, they must base the insulation on pre-1993's levels. A sample of documentary evidence that would be acceptable includes:

- Invoices detailing the upgrade for the building.
- Date on the data plate of the storage unit.
- As-Built drawings dated 2005 showing the work carried out on the hot water system.
- A CE mark on the heater indicating it was manufactured post 1993.

When combining storage volume, the insulation thickness must also be combined for the storage units based on a weighted volume average.

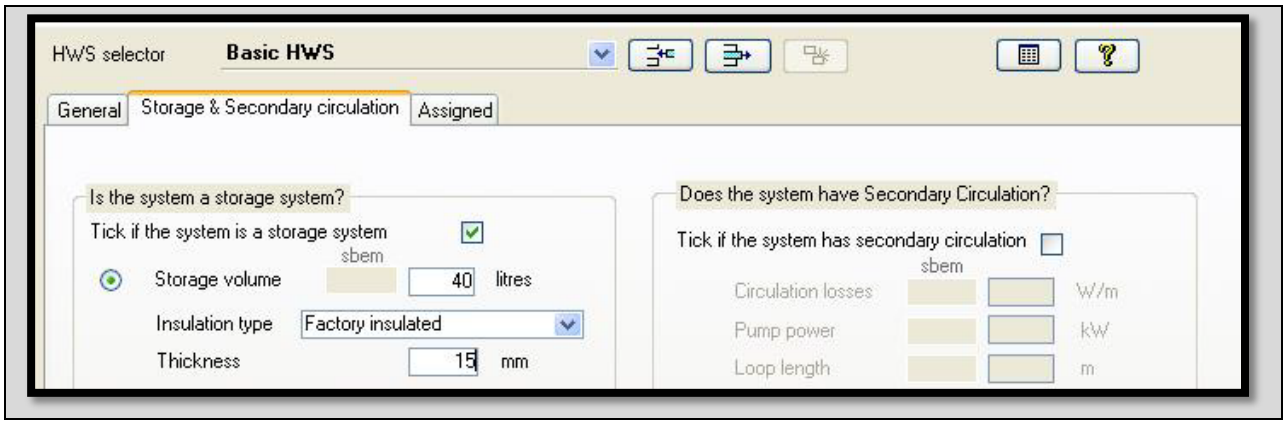
Example: insulation thickness for multiple hot water storage units:

The diagram shows four electric water heaters (UH 1 to 4) with a storage capacity of 10 litres in each unit. Two of the units were installed in 1990, one unit was installed in 1998 and the final unit installed in 2005. The actual insulation thicknesses cannot be identified.



Therefore, the weighted average insulation thickness, by volume, is as follows:
(20 litres x 0 mm + 10 litres x 25 mm + 10 litres x 35 mm) / 40 litres = 15 mm

The storage volume is entered as follows:



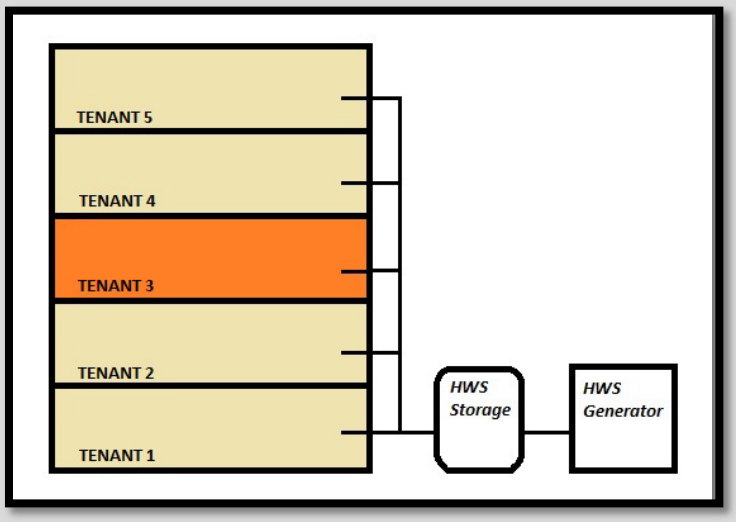
6.11.7 HWS and multi-tenant premises

When assessing a property of a tenant or occupant in multi-tenant premises, the following guidance applies to the treatment of hot water services.

HWS supplied by landlord or from a central water heating system
Where the hot water services are supplied to each tenant by a central water heating system (e.g. from the landlord to the tenants' premises) the efficiency and storage volume are based on the details of that central system. Where this information is not available, default data must be used.

Example

In this case, the assessment is being carried out for Tenant 3.



The HWS storage for Tenant 3's BER assessment is based on the following:

[Total central HWS storage x floor area of Tenant 3]/Σ floor area of Tenants 1,2,3,4,5.

The efficiency of the HWS generator for Tenant 3's BER assessment is based on the central HWS generator.

6.12 Lighting

This section supplements the guidance on lighting in the iSBEMie User Guide and the NEAP Survey Guide.

6.12.1 Identifying lighting type

Appendix 11 in the NEAP Survey Guide helps to identify several different lighting types.

Generally, where a specific light fitting cannot be identified, take the most conservative (highest power density) option relevant for the fitting in question. For example, high bay fittings are used in a zone, the assessor can provide photographic evidence to demonstrate their presence. However, the assessor is unable to determine whether the fitting is a High-Pressure Sodium Fitting or Metal Halide. In this case, the Aassessor must obtain additional documentary evidence such as As-built drawings and specifications to identify the specific lamp type. Where these are not available, select the more conservative option – in this case the Metal Halide fitting.

Refer to *Table 12* on page 110 in the iSBEMie User Guide (Volume 2) for guidance on the lumens per circuit watt for fitting types to assist with selection of the most appropriate default for a lighting type

Where no lighting system is present, select "Tungsten or Halogen" as shown in the "Shell and core" guidance in Section 3.4 of this document.
The following examples demonstrate how to distinguish Metal Halide, Tungsten lamps and CFL lamps.

Tungsten/Halogen: Example 1

The light source is more compact than standard tungsten filament lamps but is not regarded as low energy lighting. These lamps are entered in SBEM as "Tungsten or Halogen". If uncertain, these lamps can be distinguished from Metal Halide by switching off and switching on again. Tungsten and tungsten halogen lamps will start instantly.

Tungsten/Halogen: Example 2

This type of bulb has become more common and is a halogen replacement for a standard tungsten bulb. While this bulb is slightly more efficient than standard tungsten bulbs, they still entered in SBEM as "Tungsten or Halogen", **NOT** CFL.

Metal Halide examples

Metal halides are a discharge type of lamp and therefore require warm-up time to allow them to reach their total luminosity. They are not suitable for use with motion/presence sensors. Some metal halide lamps are suitable for dimming with appropriate control gear. If uncertain, these lamps can be distinguished from tungsten by switching off and switching on again. They will require about a minute to restart and reach full brightness, unlike tungsten. The bulb itself may need to be examined to be certain. If in doubt, use the higher energy option from the likely options.

Metal halides are recommended to be installed behind toughened glass as they can occasionally explode when they approach the end of life.

Compact Fluorescent (CFL) examples

These can sometimes be confused with LED bulbs. It is important to take a proper look at lamps when carrying out a survey. CFLs are available in many shapes and sizes. If unable to determine whether a bulb is CFL or LED, then the higher energy user (CFL) is specified.

The above lamp, sometimes called a DD lamp because of its shape, is often found in the circular fittings located in small spaces such as toilets.

A recessed can-type fitting with two CFL tubes.

4-pPin “PL” type lamp. Can be over 500 mm long, so there is a possibility to mistake it for a T-5 lamp. The lamp is distinguished by its connections being at one end, unlike T-5, and other linear tubes which have connections at each end.

CFL replacement for a tungsten spot lamp bulb. These were an energy-saving alternative to tungsten spotlight bulbs. but have mostly been surpassed by LEDs. They can still be found in existing buildings but are unlikely to be included in a new lighting installation.

A large 150W CFL for use in a warehouse. This sort of lamp can replace a metal halide lamp in warehouses, or similar buildings, as an energy saving alternative. Recently LED alternatives have become available, see later in this section.

Light Emitting Diode (LED) examples

LED lighting is replacing almost all lighting types. LED replacement can be found for many fittings and, consequently, LEDs come in many shapes and sizes.

The above lamp is a replacement for a tungsten of CFL bulb. Unlike tungsten, it has a plastic section above the screw cap which contains electronics.

LED replacement for a tungsten spot lamp bulb.

The above lamp is an LED replacement for a warehouse fitting. Called "corn lamps" because of their shape.

LED in new fittings are integral to fittings rather than a removable part. The light fitting shown above is an LED.

LED panels have replaced recessed T-8 fittings in this shop.

6.12.2 Non-functioning lighting

This section details scenarios where lighting is either not working or missing.

	**Example 1** Some of the T-8 Fluorescent lighting in this assessment had been disconnected, as evident by cables hanging down. It is correct to include this lighting as T-8 Fluorescent rather than "Tungsten or Halogen" as the lighting is otherwise intact and could be reconnected by a new occupant.
	**Example 2** This light fitting is missing its bulb. Since the occupant has the choice to install Tungsten, CFL or LED the most pessimistic must be chosen for the purposes of assessment. The most pessimistic is "Tungsten or Halogen".
	**Example 3** This light fitting is missing its tube. The assessor is unlikely to know if the fitting is T-8 or T-12. The most pessimistic must be chosen for the purposes of assessment. "Fluorescent no details" is chosen as its power density is the most pessimistic.

6.12.3 Identification and proof for occupancy and photoelectric sensors

The following pictures show some common types of lighting sensors.

	This T-5 light fitting has an inbuilt sensor. This sensor can perform dimming as well as presence detection. With this fitting, the sensor can also be configured to provide just dimming or just presence detection depending on the application. Only LEDs, T-5s or high-frequency T-8 lamps have the capability to dim. Of course, not all LEDs, T-5s or T-8s have dimming hardware fitted to them.
	While this sensor is used for presence detection, its exact function can only be determined from manufacturer's data or from the test described later in this section.
	This fitting contains a microwave motion sensor. It is typically visible as a shadow on the fitting. If lights are found to operate automatically but a sensor cannot be observed, it may be that it is integral to a fitting like this one. The assessor must identify the presence of automatic lighting controls (e.g. by tests or documentation) rather than assume a shadow on a fitting is a sensor.
	Some sensors designed for corner mounting look like intruder-alarm sensors.

<u>It is usually not possible to determine the lighting sensor function from a visual inspection.</u>

In conjunction with the guidance given in Section 7.27 of the NEAP Survey Guide, the method below will assist in identifying sensor types.

1) Turn on the lights and open any blinds in the room. You might wish to leave the room for 10 minutes to allow the system to stabilise.

2) Re-enter the room and observe if the lights are still on or if they switch on when you re-enter. This will test for occupancy control.
3) Observe which lights are switched on. Then close the blinds if there are blinds. Observe any change to the lighting levels to identify photoelectric controls.
4) If there are no blinds, shine a torch on the light sensor and observe if the lights tend to turn down or off. Then cover the light sensor with your hand and observe any changes to lighting levels to identify photo electric controls.

At this stage, you should know the type of switching/dimming and the areas that are controlled. Note that there may be some delay built into both presence detection and dimming systems to prevent the lights from ramping up and down excessively. This can happen, for example, with passing clouds and persons entering the space.

The results of the above test or similar may accompany other site survey notes, drawings, specs and Operation and Maintenance (O&M) manuals if available to substantiate selection of automatic lighting control type.

6.12.4 Entering a full lighting design

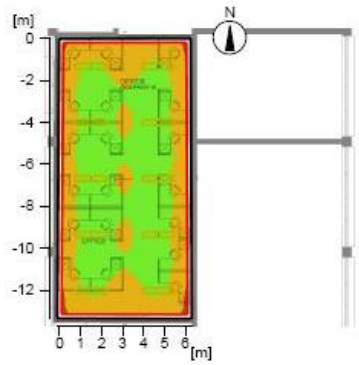
When carrying out a BER with plans and specifications available for the building a more accurate rating is obtained when "Full lighting design" is employed instead of selecting lamp types from the drop-down menu. To use this method, obtain the lighting design figures (typically from the building services engineer).

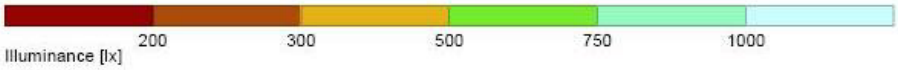
Example: Full lighting design

Below is an example of the typical data that can be obtained from a lighting designer:

Summary, Office

.1 Result overview, Evaluation area 1





General

Calculation algorithm used	Average indirect fraction
Height of luminaire plane	2.70 m
Maintenance factor	0.85
Total luminous flux of all lamps	66000 lm
Total power	760.0 W
Total power per area (84.40 m²)	9.00 W/m² (1.80 W/m²/100lx)

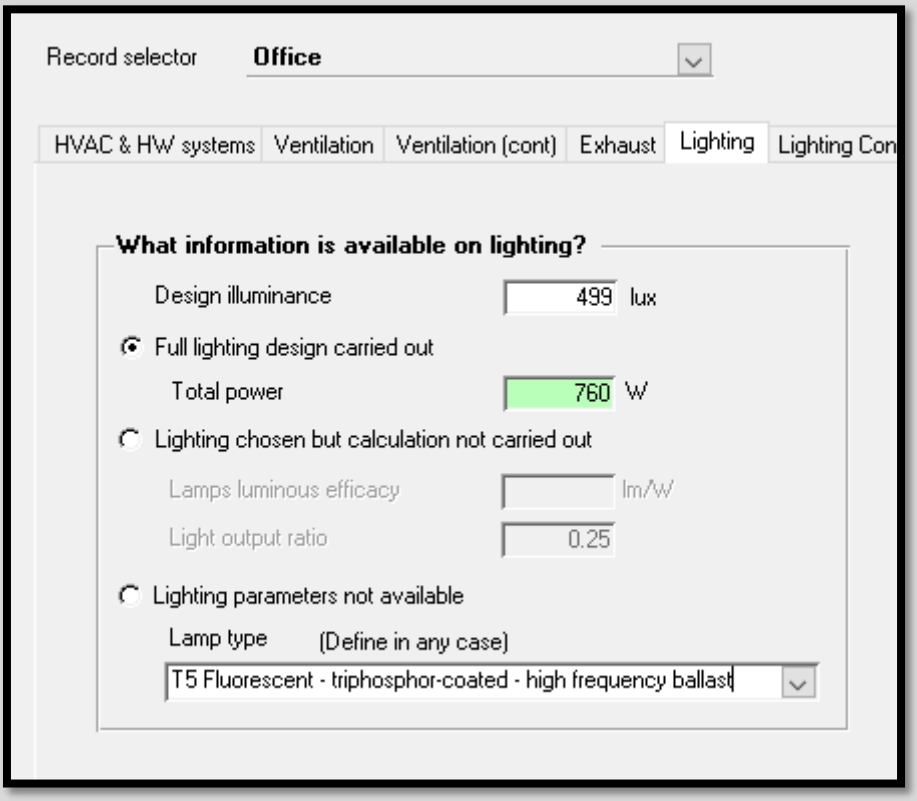
Evaluation area 1	**Reference plane 1.1** Horizontal
Em	499 lx
Emin	323 lx
Emin/Eav (Uo)	0.65
Emin/Emax (Ud)	0.50
UGR (4.4H 9.1H)	<=18.7
Position	0.75 m

Major surfaces	Em	Uo
m 1.5 (Ceiling)	154 lx	0.45
m 1.1 (Wall)	205 lx	0.33
m 1.2 (Wall)	213 lx	0.31
m 1.3 (Wall)	207 lx	0.34
m 1.4 (Wall)	215 lx	0.31

The figures used are:

- The total power = 760 Watts
- The mean/average Lux (in this case designated by Em) = 499 lx. **If in doubt, ask the lighting designer to clarify which figure represents the mean/average lux level.**

The full lighting design data above is only for one area in a building. Relevant documentation for each zone is required if "Full lighting design carried out" is to be applied to all zones in an assessment. The exception is where a building has identical rooms, e.g. a row of classrooms, and so one calculation will be valid for several rooms. When a zone is missing data, one of the other entry options is used.



The screenshot above shows the values from the lighting software report entered into the lighting tab. It is important to also enter the actual lighting type even though the "Lighting parameters not available" field is not selected as the basis of the calculation. The lighting type, in this case, was T-5. Entering T-5 will prevent an "upgrade recommendation" being included in the Advisory Report which accompanies the BER Certificate.

Documentary Evidence for completed installations: In order to use the "Full lighting design carried out" entry the assessor must have a signed statement from a suitably qualified consultant – normally the M&E (Mechanical & Electrical) engineers responsible for the lighting design – showing the installed power and design illuminance for each of the zones. Refer to Section 7.26 of the NEAP Survey Guide for details on the documentary evidence required.

6.12.5 Display windows

Display windows may be found in the following building types:

- Shops, including retail-warehouse, undertakers, showrooms, post offices, hairdressers, shops for sale of food for consumption off premises.
- Financial and professional services: banks, building societies, estate and employment agencies, betting offices.
- Food and drink: restaurants, pubs, wine bars.
- Assembly and Leisure: cinemas, concert halls, sports and leisure use.

Display windows can exist in a building without display lighting. Similarly, display lighting can exist in a building without display windows.

Display windows face on to a street. They are often single glazed. They are designed to allow the product or service offered in the building to be advertised to people in the street.

Selecting that a window is a "display window" reduces the effect of heat loss from the poorer U-value associated with a large single glazed window. This is achieved by assigning the equivalent window in the Notional Building to be a display window rather than a regular window.

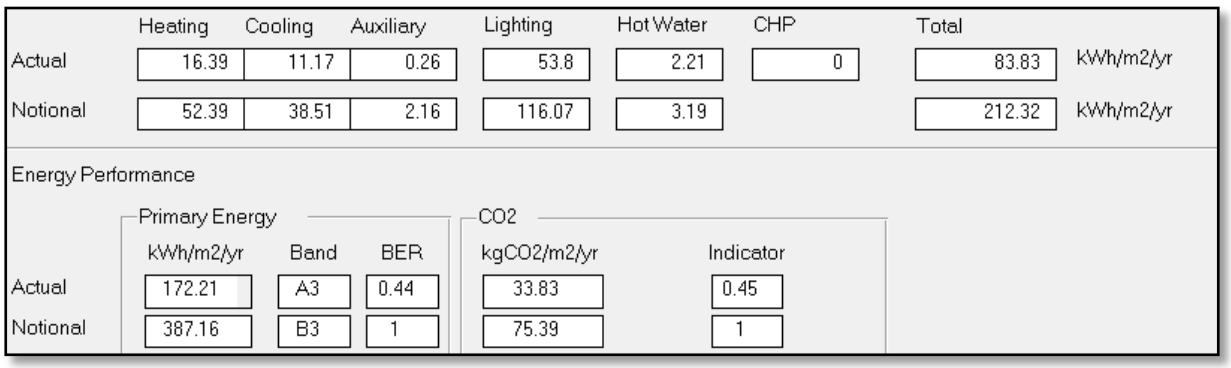
Display windows and display lighting are defined in the NEAP Survey Guide, Section 7.7, with further guidance on display lighting in the NEAP Survey Guide, Section A4.11.

6.12.6 Display lighting

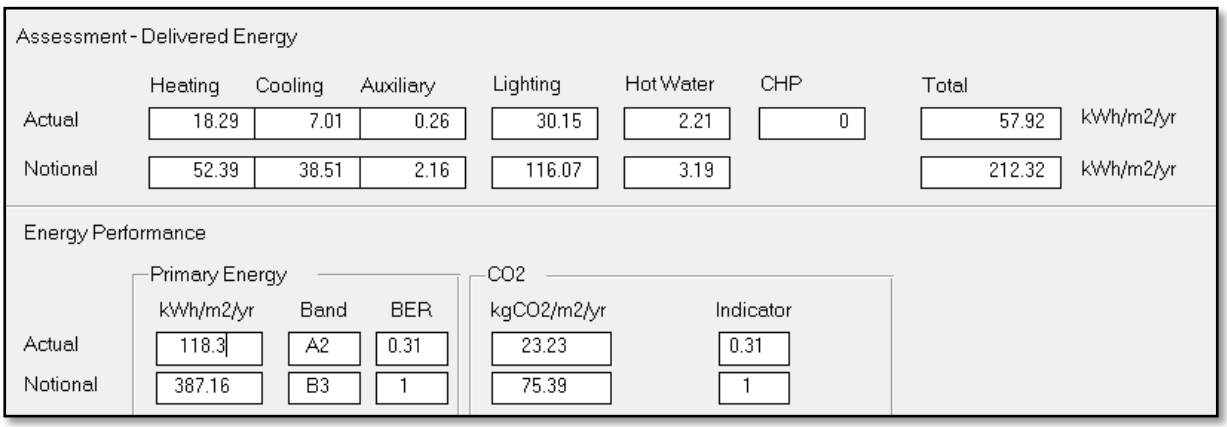
SBEM assumes the presence of display lighting in some zone types. This means that SBEM will add additional lighting energy to these zone types. The display lighting energy added can be significant.

Display lighting is defined in the NEAP Survey Guide, Section 7.28, with further guidance on display lighting in the NEAP Survey Guide, Section A4.9.

When carrying out a BER assessment on a building with any of these activities remember to adjust the display lighting if required as described in the NEAP Survey Guide.



Screenshot of a modern small shop where display lighting is not altered from its starting point (15 lm/W).



When display lighting is adjusted to 100 lm/W, the rating changes a grade.

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Rialtas na hÉireann
Government of Ireland

Sustainable Energy Authority of Ireland
Three Park Place
Hatch Street Upper
Dublin 2
Ireland
D02 FX65

e info@seai.ie
w www.seai.ie
t +353 1 808 2100