

BER Assessors – Dwellings Technical Bulletin

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The archive of previous bulletins is available on the [SEAI website](#).

This technical bulletin addresses a number of issues recently encountered by the BER audit team and the BER Helpdesk:

- additional combi boiler loss ;
- roof windows;
- suspended wooden ground floors in apartments;
- fuel cost comparison in DEAP;
- BER survey photograph quality;
- data Integrity for Provisional BER;
- troubleshooting DEAP v3.2.0.

The bulletin also outlines recent minor updates to the DEAP Survey Guide.

1. Combi Boilers: Additional Losses

The Helpdesk have received a number of queries relating to identification of combi boilers and their inclusion in BER assessments. A Combination Boiler, commonly known as a combi boiler, has the capability to provide domestic hot water directly and also to provide space heating in the usual manner. In some cases the combi boiler has an internal hot water store. In DEAP a combi boiler with an internal store capacity of less than 15 litres is classed as an instantaneous combi. A combi boiler with an internal store capacity of 15 to 70 litres is classed as a storage combi boiler.¹ Dwellings with combi boilers are unlikely to have hot water storage installed other than storage which may be in the boiler. In addition, the combi boiler has separate connections for water and space heating. The HARP database categorises boilers as being combi or regular boilers. In addition, HARP provides information on any storage facility or keep-hot facility in the boiler. This information may also be available from product literature or websites.

When providing hot water, combi boilers operate in response to a demand from a tap or shower. By contrast, a regular boiler heats water stored in a hot water cylinder or thermal store for use at a later time.

It takes a short amount of time for the water leaving the combi boiler to reach an adequate temperature. The energy required to meet the dwelling's hot water demand in DEAP does not take account of the energy used as the combi boiler output reaches an adequate temperature. In DEAP this extra energy input is called the additional loss for the combi boiler and is specified in DEAP Table 3a and the associated footnotes.

The Assessor selects the combi boiler type from the list provided in the DEAP Water Heating tab:

The screenshot shows a software interface for selecting boiler types. The title is 'Combi-boiler'. There are three labels on the left: 'Combi-boiler type', 'Electric keep hot facility type', and 'Additional loss for combi-boiler [kWh/y]'. A dropdown menu is open, showing five options: 'Instantaneous, without keep-hot facility', 'Instantaneous, with keep-hot facility controlled by time clock', 'Instantaneous, with keep-hot facility not controlled by time clock', 'Storage combi boiler store volume >= 55 litres', and 'Storage combi boiler store volume < 55 litres'.

Additional Loss for Storage Combi Boilers

The additional loss for a storage combi boiler depends on the volume, V , of the internal hot water store. An additional loss of zero applies if the volume is 55 litres or more (DEAP Table 3a).

¹ See DEAP Manual Appendix D for definitions of the combi boiler, instantaneous combi, storage combi and keep-hot facility. Storage > 70litres is a CPSU.

If the volume is less than 55 litres (but greater than 15 litres) the additional loss is calculated by the Assessor for entry in DEAP as follows:

$$\text{Additional Loss} = 600 - [(V-15) * 15]$$

Example

What is the Additional Loss of a combi with an internal hot water store having a capacity of 45 litres?

V = 45 litres. Substituting into the equation above gives additional loss as follows:

$$= 600 - [(45-15) * 15]$$

$$= 150 \text{ kWh/y.}$$

Table 3a, Note (a) applies to this category of storage combi boiler. Note (a) states that if the daily hot water usage is less than 100 litres/day, then the additional loss calculated above must be multiplied by **(Daily Hot Water Usage)/100**.

In this example if the daily hot water usage is 79 litres/day, the additional loss is:

$$= 150 * (79/100)$$

$$= 118.5 \text{ kWh/y.}$$

The daily hot water usage is displayed on the Water Heating tab in DEAP. If Note (a) applies the Assessor must make the adjustment to the additional loss. This adjustment is not made if the daily hot water usage \geq 100 litres.

Instantaneous Combi Boilers - Keep-hot Facility

Some instantaneous combi boilers maintain the water in the internal store above a set temperature even when there is no hot water demand and the boiler is not in use. This is called a keep-hot facility. It may operate by burning fuel or by heating an electrical element in the internal store. When an instantaneous combi boiler is selected from the list of combi boiler types it is also necessary to specify whether there is a keep-hot facility powered by electricity, using the second drop-down list:

Combi-boiler	
Combi-boiler type	Instantaneous, with keep-hot facility controlled by time clock
Electric keep hot facility type	Electric keep-hot facility, controlled by time clock
Additional loss for combi-boiler [kWh/y]	600
Electricity consumption of electric keep hot facility of combi boiler [kWh/y]	600

If there is no keep hot facility present then the “Electric keep hot facility type” entry is set to “None”.

An instantaneous combi with no keep-hot facility has an additional loss of 600 kWh/y but Note (a) applies in this case so the daily hot water usage is taken into account. DEAP does this automatically. The associated electricity consumption is zero as there is no keep-hot facility.

If there is a keep hot facility present that operates by burning boiler fuel the “Electric keep hot facility type” entry is set to “None”.

In this case the additional loss is 600 kWh/y if the keep hot facility is controlled by a time-clock but 900 kWh/y if it is not controlled by a time-clock. The associated electricity consumption is zero. DEAP then attributes the keep-hot facility energy usage to the main water heating fuel type.

If there is an *electric* keep hot facility present, then one of the following options is chosen:

- **Electric keep-hot facility, controlled by time clock**

For an instantaneous combi boiler with an electric keep-hot facility controlled by a time-clock, the additional loss is 600 kWh/y and the electricity consumption is also 600 kWh/y (as defined in Table 4f).

- **Electric keep-hot facility, not controlled by time clock**

For an instantaneous combi boiler with an electric keep-hot facility controlled by a time-clock, the additional loss is 900 kWh/y and the electricity consumption is also 900 kWh/y (as defined in Table 4f).

As per the footnotes in DEAP Table 3a, if the power rating of the keep-hot facility without time clock is available from the HARP database, the additional loss is calculated by the user as:

$$\text{Loss} = 8.76 \times P \quad (\text{kWh/year})$$

where P is the power rating of the heater in Watts. The electricity consumption will have the same value as detailed in DEAP Table 4f (note f).

Specification of keep-hot facilities is summarised as follows:

Keep hot Facility	Type	Time-Clock	Additional Loss (kWh/y)	Electricity Consumption (kWh/y)
No	NA	NA	600*	0
Yes	Boiler Fuel	No	900	0
Yes	Boiler Fuel	Yes	600	0
Yes	Electric	No	900 or (8.76 x P)	900 or (8.76 x P)
Yes	Electric	Yes	600	600

* Table 3, Note (a) applies in this case if daily hot water usage < 100 litres.

2. Roof Windows

A window is treated as a *roof window* if it is inclined at an angle of less than 70° from horizontal. Otherwise, treat it as a standard vertical window. This is defined in DEAP Table 1b. Roof windows are treated differently from vertical windows in 2 ways: orientation and U-value.

Orientation

For roof windows there are only two possible orientations in DEAP:

- North: when the roof window is oriented within 30° of North;

- Horizontal: for all other orientations.

Example

During an attic conversion a window is built into the line of a roof having a pitch of 30°. The roof is oriented 15° West of North. What is the orientation of the window?

Answer: The pitch of the window is less than 70° so it is a roof window and the window is oriented within 30° of North so the orientation must be “North”.

Example

A vertical dormer window faces 25° East of North. The pitch of the roof is 45°. How is the window treated in DEAP?

Answer: This dormer window is a vertical window in a pitched roof. It is treated as a vertical window, not a roof window. It is 25° from North, 20° from North-East so the appropriate orientation is “North-east”.

Example

An existing dwelling has three roof windows in a south-facing roof with a pitch of 30°. How are the windows treated in DEAP?

Answer: The pitch of the windows is less than 70° so they are roof windows and the roof is *not* oriented within 30° of North so the orientation must be “Horizontal”.

U-value

DEAP adjusts the U-value of a roof window to account for the different direction of heat flow compared to a vertical window. Details of the adjustment are given in Notes (1) and (2) of DEAP Manual Table 6a.

When adding a roof window in DEAP the Assessor should select the “Roof Window” option. DEAP will automatically adjust the U-value. The adjustment applies to default or non-default U-values alike.

Example

An Assessor observes the following window during a BER assessment:
Roof window (roof pitch 30°), wood frame, double-glazing, air filled, 6mm gap.
Roof orientation: East. Overshading: None.
What is the U-value and Adjusted U-value of the window?

Answer: The U-value is 3.1 W/m²K based on the window parameter lookups in DEAP as shown below:

Click here if you want to enter a user defined UValue and solar transmittance value	<input type="checkbox"/>
U-value [W/m ² K]	3.1
Adjusted U value [W/m ² K]	2.758

To apply the roof window adjustment the “Roof Window” option is selected giving the following:

Click here if you want to enter a user defined UValue and solar transmittance value <input type="checkbox"/>	
U-value [W/m ² K]	3.1
Adjusted U value [W/m ² K]	2.915

The U-value remains unchanged (3.1 W/m²K) but the Adjusted U-value has increased to 2.915 W/m²K to account for the different direction of heat flow. The U-value adjustment for assumed use of curtains (Section 3.2) is also applied by DEAP.

Example

An Assessor notes the following details during a survey of a New Dwelling: Roof window (pitch 45°), wood frame, triple-glazing, 18mm gap. Orientation: Southeast. Overshading: None.

There is also an IAB certificate stating U-value for the window of 1.55 W/m²K and solar transmittance for the glazing of 0.56.

What is the U-value and Adjusted U-value of the window?

Answer: As the certificate is from an accredited source, the data given is used.

Click here if you want to enter a user defined UValue and solar transmittance value <input checked="" type="checkbox"/>	
U-value [W/m ² K]	1.55
Adjusted U value [W/m ² K]	1.460
Solar transmittance	0.56

To apply the roof window adjustment the “Roof Window” option is selected giving:

Click here if you want to enter a user defined UValue and solar transmittance value <input checked="" type="checkbox"/>	
U-value [W/m ² K]	1.55
Adjusted U value [W/m ² K]	1.636
Solar transmittance	0.56

The U-value remains unchanged (1.55 W/m²K) but the Adjusted U-value has increased to 1.636 W/m²K to account for the different direction of heat flow. The U-value adjustment for assumed use of curtains (Section 3.2) is also applied by DEAP.

3. Suspended Wooden Ground Floor

In the Ventilation tab of DEAP, if data from an air permeability test is not available an estimate of the level of air infiltration to the dwelling is made based on the dwelling structure. In this case, one of the items which the BER Assessor must specify is whether there is a suspended wooden ground floor in the dwelling or not.

This entry refers specifically to the ground floor of dwellings which have a floor at ground level. It does not apply to dwellings such as mid floor or top floor apartments.

4. Fuel Cost Comparison using DEAP

The main and secondary space heating systems are identified based on DEAP Appendix A. In some cases, it may be necessary to make a cost-comparison between two or more heating systems to see which is the cheapest to run, as outlined in DEAP Manual Appendix A, Section A2. A number of BER Assessors have asked the BER helpdesk how to carry out this calculation.

This is done by calculating the BER for each heating system in turn and noting the Delivered Energy in the DEAP Results tab. The Delivered Energy (in kWh) is multiplied by the fuel cost (in €/kWh) to give the annual cost of running the dwelling for each of the heating systems.

The fuel cost data can be taken from the Domestic Fuel Cost Comparison file [here](#).

As an example, consider a dwelling in a smokeless fuel area with three habitable rooms and two heat sources present: an open fire and a direct-acting electric heater. Each heater heats only one habitable room. Therefore the cheapest to run is chosen as the main space heater.

The BER was first calculated with the open fire (efficiency = 30%) as the main heating system and the electric heater (efficiency = 100%) as secondary. Fuel costs in the example below are based on prices published in October 2011.

Main: Open Fire;	
Delivered Energy:	50301 @ 0.0463 €/kWh = €2328.94
Secondary: Direct-acting Electric Heater;	
Delivered Energy:	1677 @ 0.1777 €/kWh = €298.00
Total:	= €2626.94

The BER was then calculated with the electric heater as the main heating system and the open fire as secondary:

Main: Direct-acting Electric Heater	
Delivered Energy:	11264 @ 0.1777 €/kWh = €2001.61
Secondary: Open Fire	
Delivered Energy:	4172 @ 0.0463 €/kWh = €193.16
Total:	= €2194.77

When changing the main heating system above, it may also be necessary to make changes on the Distribution System Losses & Gains tab to reflect a different level of control and responsiveness in the main heating system.

Each value was multiplied by the respective Unit Fuel Cost taken from the Domestic Fuel Cost Comparison file to give the annual running cost. In this case as the second option is cheaper to run so the electric heater is chosen as the main heating system and the open fire as the secondary system.

5. BER Survey Photograph Quality

As described in the [DEAP Survey Guide](#), “BER Assessors should endeavour to gather as much data, photographs, sketches/plans and supporting evidence as possible (and indeed practicable) to increase the likelihood of an accurate survey and assessment which will stand up to auditing by SEAI”.

Issues have arisen during BER Audits regarding the quality of photographs taken by Assessors. Recurring problems include:

- blurred photographs – due to camera movement;
- underexposed photographs – particularly photos taken in attics & boiler houses when the flash has been used incorrectly;
- poorly focused photographs – caused by not giving the camera time to focus, not having sufficient distance between camera and object, or, misuse of the camera’s macro function. This applies particularly to pictures of nameplates on boilers, heating appliances, 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 QA scheme. In some cases, BER Assessors may wish to compress photographs to a smaller file size as smaller documents are easier to transmit by email. This is acceptable provided the photograph remains clear.

In order 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 particular attention to the use of flash, macro and focus.

The following simple tips should also be adhered to:

- hold the camera steady;
- give the camera time to focus;
- for close-up shots, the camera’s macro function may take several seconds to gain correct focus;
- use the flash in poorly lit spaces (the camera’s auto-flash setting will do this automatically, generally with good results);
- when using the flash on a object several metres away try to ensure there are no objects in the foreground as this can affect the focus and/or over-expose the photograph;
- check the photograph and if it is not of sufficient quality **re-take the photograph.**

6. Data Integrity for Provisional BER

As per Section 5 of the BER Assessor's [Code of Practice](#), "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 be representative of the specification and drawings of the building. The BER assessor must verify each item entered in the provisional BER and in a similar manner to the final or existing BER must have documentary evidence to support all entries such as signed off specifications, U-value calculations and so on.

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 should be based on the relevant guidance documents and the assessor should keep a record with the assessment detailing the reason for the default chosen.

Here are a few examples of acceptable and unacceptable documentation:

Data Entry	Acceptable Supporting Documentation	Unacceptable Supporting Documentation
U-Value of Opaque Elements	<ul style="list-style-type: none"> - Specification/ Drawing detailing materials used in element construction and - U-Value Calculation and - Appropriate References to Thermal Conductivities used in U value calculation 	- Specification/ Drawing stating U value of element is X.XX value
Pressure Test Results	<ul style="list-style-type: none"> - Refer to Technical Bulletin September 2009 "Pressure testing in DEAP and for TGD L compliance" 	- Specification/ Drawing stating Pressure Test shall achieve X m ³ /h/m ² with no other supporting data.
Thermal Bridging Factor	Refer to DEAP manual Appendix K 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	- Specification/ Drawing stating the building will conform with "Limiting Thermal Bridging and Air Infiltration - Acceptable Construction Details" with no details provided.

	clearly showing the relevant details. These drawings should be signed off by the developer/builder, site engineer or architect confirming that the uncompleted building shall be built to these details.	
Heating System Efficiency	- Specification/ Drawing detailing proposed heating system - Efficiency of Heating System based on HARP Database/ Certified Test Data/ Table 4a and 4b of the DEAP manual.	Specification/ Drawing stating that the boiler efficiency shall be X%.

7. DEAP Survey Guide Update

The DEAP Survey Guide and Survey Form have been updated and are available www.seai.ie/deap. These changes are primarily to align to the DEAP v3.2.0 software and manual. The changes are summarised as follows:

- References to DEAP Table 12 instead of TGD L Table A1/A2 for thermal conductivity defaults;
- Reference to DEAP Table 2a on calculation of hot water storage volume added;
- Reference added to DEAP Section 3.2 for window default derivation;
- Hot water storage location now to be detailed by the Assessor;
- Detail on location and number of oil boiler fuel pumps and central heating pumps;
- Added detail on fan coil radiators;
- Added reference to DEAP 10.3.3 for solid fuel type identification;
- Added reference to individual heating system CHP plant;
- Reference to DEAP Appendix C for group heating system distribution loss factor calculation;
- Sheltered sides entry does not have a default;
- Updated references to new wall types from DEAP Appendix S;
- Survey form requires client name and property address and purpose of rating;
- Survey form references basement apartment dwelling type;
- Survey form now lists biodiesel and bioethanol fuel types;
- Survey form caters for unglazed solar collectors and specification of area type (gross or aperture);
- Further emphasis on mandatory requirement for survey evidence and BER records.

8. DEAP v3.2.0: Troubleshooting

SEAI launched DEAP v3.2.0 on 1st December 2011. There are a number of new functions in the software as detailed in the [DEAP v3.2.0 Release Notes](#).

SEAI have been contacted by BER Assessors on minor issues found in the software relating to the following:

- Downloading DEAP using Firefox and Chrome browsers;
- Importing the MPRN address to the property address;
- Outdoor central heating pumps;
- Upgrading from previous versions of DEAP;
- Dwelling county issues;
- Specifying heated basements in DEAP.

The release notes (Appendix A) now details these issues along with simple workarounds to ensure they do not impact on ratings. Assessors are advised to familiarise themselves with the release notes to avoid these issues arising.

SEAI intends to perform a minor DEAP release in the coming months to rectify these issues.