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1 Window defaults in DEAP and use of DEAP Table 6a

The [March 2011 Technical Bulletin](#) outlined use of DEAP Table S9 when specifying default window U-values in DEAP for existing dwellings, particularly when not all relevant details of the window can be identified. Since that guidance was published, some Assessors have asked SEAI if it would be reasonable to use DEAP Table 6a as an alternative to Table S9 in this scenario.

SEAI has considered these requests and would like to advise assessors that for existing dwellings, it is acceptable to use DEAP Table S9 as outlined in the March 2011 Technical Bulletin **OR** Table 6a as will be outlined in this article. In all cases, the preferred option is to use accredited data for window U-value and solar transmittance where accredited data is available.

When using Table 6a in DEAP, the following guidance applies. When using Table S9, the guidance in the March 2011 technical bulletin applies.

In using Table 6a to identify appropriate window defaults, several physical properties of the window must be identified, namely:

- glazing type: single, double or triple-glazing;
- frame type: wood, PVC or metal;
- insulating gas: air or argon;
- low-emissivity coating: hard coating, soft coating or no coating;
- insulating gap between glazing panes: 6 mm, 12 mm or 16+ mm;
- thermal break present (in metal-framed windows).

During a site survey of a dwelling, these properties can be determined as follows:

Glazing type & frame type: should be easy to determine so will not be discussed any further.

Insulating gas (for double/triple-glazing): A manufacturer's brochure or product literature stating Argon is used would be sufficient proof for the purposes of DEAP. In the absence of information specifying the type of gas it should be assumed to be Air.

Low-emissivity Coating: A manufacturer's brochure or product literature indicating the presence of a low-e coating is sufficient proof for it to be included in the DEAP assessment. If the glazing is known to have a low-e coating, but no detail is given about the type of low-e coating then the most conservative option should be chosen, namely a hard coat with $\epsilon_n = 0.2$.

In the absence of information specifying whether a low-e coating is present or not, the glazing is to be assumed as being uncoated.

Insulating gap between panes (for double/triple-glazing): the width of the gap can be established using one of the following methods:

1) Manufacturer's data, e.g. a manufacturer's brochure or product literature giving details of the gap.

2) Manufacturer's data on pane thickness & Assessor's measurement: e.g. if the pane thickness is stated on the manufacturer's brochure or product literature, then the gap may be calculated by measuring the thickness from the indoor surface to the outdoor surface of the glazed unit (not including the frame thickness).

Example: Double-glazing with specified 4mm thick glass. Glazing unit measured to be 20 mm thick:

Gap thickness = $20 - (4 + 4) = 12$ mm. Any such calculation should be kept on file with the Assessor's records.

In the absence of information relating to glazing pane thickness, the panes can be assumed to be 4mm thick.

Note: for triple-glazing the gap calculated in this manner must be halved to give the value used in Table 6a. The thickness of the three panes must be accounted for if measuring triple glazing gap from the surfaces of the glazed unit.

Example: Triple-glazing with assumed 4mm glass thickness. Glazing unit measured to be 36 mm thick: Gap thickness = $[36 - (4+4+4)]/2 = 12$ mm.

3) Measurement: Laser devices now exist which can measure the thickness of panes and the thickness of the gap(s) in double/triple glazed windows. Data provided by such a device may be used in a BER assessment provided the device meets appropriate European standards or has the CE mark. If there is any doubt the Assessor should contact the device manufacturer for confirmation that the device adheres to relevant standards. The glazing gap specified in DEAP is rounded as per the table below.

4) Where there is no information available on glazing gap thickness and no measurement is possible: Assume a 6mm gap between panes.

When the gap between panes is determined, the options in DEAP (6mm, 12mm, ≥ 16 mm) are selected as follows:

Gap between Panes	Option chosen in DEAP Table 6a
<12mm	6mm
≥ 12 mm ; <16mm	12mm
≥ 16 mm	16mm

Thermal break (for metal-framed windows): in the absence of documentary proof of thermal break (such as manufacturer's literature) or a visible thermal break, the easiest way to establish whether a metal window frame has a thermal break is to feel an internal part of the metal frame. If there is no thermal break the frame will feel noticeably colder than the glass. This technique obviously works best on a cold day when there is a significant temperature difference between inside and outside. If the Assessor determines that there is a thermal break using this technique it should be assumed to be 4mm thick. If in doubt, assume there is no thermal break.

Examples using Table 6a (Assessors may alternatively use Table S9 as previously indicated):

Example 1.1

Double-glazed PVC framed window. Glazing unit thickness measured to be 16 mm.

- Gas: no information so Air is assumed.
- Low-e coating: no information available so assumed to be uncoated.
- Gap: assume panes 4 mm thick so gap thickness = $16 - (4 + 4) = 8$ mm. Glazing gap therefore assumed to be 6mm when referencing Table 6a as per the table above.

U-value from Table 6a: 3.1 W/m²K.

Solar transmittance for uncoated double glazing (from Table 6b) = 0.76

Example 1.2

Double-glazed wood-framed window. Glazing unit thickness measured to be 22 mm.

- Gas: no information so Air is assumed.
- Low-e coating: No information available. Assumed to be uncoated.
- Gap: assume panes 4 mm thick so gap thickness = $22 - (4 + 4) = 14$ mm. Glazing gap assumed to be 12mm when referencing Table 6a as per the table above.

U-value from Table 6a: 2.8 W/m²K.

Solar transmittance for uncoated double glazing = 0.76.

Example 1.3

Double-glazed wood-framed window. Manufacturer's brochure stating that window has 18mm Argon-filled gap with a hard low-e coating.

- Gas: Argon.
- Low-e coating: hard low-e coating. As the ϵ_n value is not stated assume the more conservative value which in this case is the higher value, i.e. $\epsilon_n = 0.20$.
- Gap: 16+ mm

U-value from Table 6a: 2.0 W/m²K.

Solar transmittance for double glazed with low-e hard coating = 0.72

Example 1.4

Double-glazed metal-framed window. Frame not cold to the touch compared to the glass. Glazing unit thickness measured to be 18 mm.

- Gas: Air.
- Low-e coating: no information available – assume no low-e coating.
- Gap: assume panes 4 mm thick so gap thickness = 18 – (4 + 4) = 10mm. It is appropriate in this case to round down to 6 mm.
- Thermal break: as the frame is not markedly colder than the glass it is reasonable to assume that a thermal break is present. Assume thermal break of 4 mm.

U-value from Table 6a: 3.7 W/m²K.

Solar transmittance for uncoated double glazing = 0.76.

The guidance above and guidance in all technical bulletins relating to determination of default window U-values and solar transmittance has been consolidated under a single FAQ under this [link](#). This FAQ discusses use of defaults for windows under new-final, new-provisional and existing dwelling BERs.

2 Solar Space Heating Systems in DEAP

The following guidance sets out examples in the DEAP methodology of solar space heating systems. Individual solar space heating systems provide space (and usually water) heating to a single dwelling. Group solar space heating systems provide space and water to more than one dwelling. The [BER FAQ](#) provides guidance on solar space heating systems.

Example 2.1: An individual solar space heating system

A new dwelling has 15 m² of evacuated tube solar collectors providing some of the space and water heating demand. For simplicity, the data for the solar collector is taken from Table H1 of the DEAP manual, although data listed on HARP should be used if available for the collector product in question. The solar panels are south-facing at an angle of 30° with no overshadowing.

The hot water cylinder is a 1000 litre dual coil cylinder with a Dedicated Solar Storage Volume of 750 litres and 100 mm of factory-applied foam insulation.

In order to do this calculation you will need to download the [Solar Space Heating Spreadsheet](#) and the [instructions](#) on how to use it.

The first step is to calculate the amount of heat collected by the solar panels that will be used to reduce the *water* heating load. This is done by entering the information on the solar heating system into DEAP in the usual way.

The screenshot shows the 'Solar Water Heating' dialog box with the following data:

Parameter	Value
Solar panel manufacturer	Evacuated Tube Solar collector
Solar panel model	Default values used
Aperture area of solar collector [m ²]	10.8
Zero loss collector efficiency η_0	0.6
Collector heat loss coefficient, a_1 [W/m ² K]	3
Collector performance ratio [W/m ² K]	5
Annual solar radiation [kWh/m ²]	1074
Overshading factor	1.00
Solar energy available [kWh/y]	6960
Dedicated solar storage volume [Litres]	750
Is solar storage contained within a combined cylinder?	Yes
If 'Yes' Total volume of cylinder [Litres]	1000
Effective solar volume, V_{eff} [litres]	825.0
Daily hot water usage, V_d [litres]	150
Volume ratio, V_{eff}/V_d	5.49
Solar storage volume factor (V_{eff}/V_d)	1.34
Result Solar hot water input, Q_s [kWh/y]	2459
Adjusted utilisation factor	0.37
Collector performance factor	0.72
Electricity consumption of SWH pump [kWh/y]	75

DEAP calculates the Solar Hot Water Input, $Q_s = 2459$ kWh/year.

The next step is to calculate the amount of heat collected by the solar panels that will be used to reduce the *space* heating load. This is the surplus heat from the collectors during the heating season and is calculated by entering the following information into the Solar Space Heating spreadsheet.

Total Hot Water Heating Demand: this value, in kWh/y, is copied from the Water Heating tab of DEAP.

Water Storage Volume: in litres, copied from the Water Heating tab of DEAP. In this case it has a value of 1000 litres, as mentioned above.

Annual Space Heating Requirement: in kWh/y, copied from the Dist. System Losses & Gains tab of DEAP.

Adjusted Efficiency of Main Heating System: taken from the Energy Requirements -> Space Heating tab of DEAP. Note that this is the *adjusted* efficiency taking into account the effect of heating controls.

The next step depends on the type of solar space heating system. The Solar Space Heating spreadsheet covers two types:

- (1) Systems with a cylinder or thermal store for storing the solar heat for both water and space heating.
- (2) Systems with a cylinder for water heating only and with solar space heat supplied immediately to the heated space in the form of warm air.

In the spreadsheet you select the appropriate system from the dropdown list and follow the final steps set out in (1) or (2) below:

(1) Systems with a cylinder for storing the solar heat for both water and space heating.

For this type of system the details of the solar heating system need to be entered into the spreadsheet. The information is the same as that already entered into DEAP.

The spreadsheet then calculates the Space Heat Contribution – the renewable contribution to part L from the system - and the Delivered Space Heating Energy Saved which must be used to account for the system in DEAP.

Result		
Space heat contribution [kWh/y]	1186	If checking compliance with TGD L Renewables requirement, this is the renewable contribution.
Delivered space heating energy saved [kWh/y]	1251	Enter this to DEAP "Renewable and energy-saving technologies" section as "Energy produced or saved".

This data is entered in DEAP in the Energy requirements – Fuel Data tab as shown below:

Renewable and energy saving technologies		Type	Part L total contribution [kWh/y]	Delivered energy [kWh/y]	Primary energy conversion factor	CO ₂ emission factor [kg/kWh]
Renewable energy 1	Technology/Comment					
Energy produced or saved	Solar Space Heating	Renewable Thermal	1186	1251	1.1	0.272
Energy consumed	None			0.00	0.00	0.000

The 'Primary energy conversion factor' and 'CO₂ emission factor' are for the main space heating fuel in the dwelling, in this case Mains Gas.

(2) Systems with a solar store for water heating only and with solar space heat supplied immediately to the heated space in the form of warm air.

In this case the following data must also be entered in the "Immediate" worksheet of the Solar Space Heating spreadsheet:

Total Floor Area: from the Dimensions tab of DEAP.

Total Heat Loss: from Building Elements – Heat Loss Results tab in DEAP.

Thermal Mass Category of Dwelling: from Net Space Heat Demand in DEAP.

As before the spreadsheet calculates the Space Heat Contribution and the Delivered Space Heating Energy Saved,

Result		
Space heat contribution [kWh/y]	496	If checking compliance with TGD L Renewables requirement, this is the renewable contribution.
Delivered space heating energy saved [kWh/y]	523	Enter this to DEAP "Renewable and energy-saving technologies" section as "Energy produced or saved".

which are entered into DEAP as shown in this diagram:

Renewable and energy saving technologies		Type	Part L total contribution [kWh/y]	Delivered energy [kWh/y]	Primary energy conversion factor	CO ₂ emission factor [kg/kWh]
Renewable energy 1	Technology/Comment					
Energy produced or saved	Solar Space Heating	Renewable Thermal	496	523	1.1	0.272
Energy consumed	None			0.00	0.00	0.000

Example 2.2: A group solar space heating system

A group solar space heating system is a group heating system (2 or more dwellings heated by the same heating system) in which some of the dwelling heating load is provided by an array of solar collectors, e.g. an apartment block with a boiler providing space heating and hot water to all the apartments and an array of solar collectors on the apartment building roof which also provides space heating and hot water to each apartment.

In order to calculate the group solar space heating contribution to an individual dwelling in the group heating scheme you will need to download the [Group Solar Space Heating Spreadsheet](#) and the [instructions](#) on how to use it.

It is important to note in this case that the solar space heating system is part of the group scheme and not specific to an individual dwelling. As a result, the Assessor **does not need to enter data on the solar collectors in the Water Heating section of DEAP**. Instead, the spreadsheet is used to calculate the percentage contribution of the solar collectors to the total heat provided by the group heating scheme.

The group solar space heating spreadsheet requires the following data:

Data Required	Value
Total Floor Area	From DEAP Dimensions tab
Main Space Heating System: Delivered Energy	From DEAP Results tab
Main Water Heating System: Delivered Energy	From DEAP Results tab
Distribution Loss Factor	From DEAP Energy Requirements: Space Heating tab (taken from DEAP Table 9)
Fraction of heat from CHP unit/recovered from Power Station	From DEAP Energy Requirements: Space Heating tab
Total floor area of all dwellings served by the group heating scheme	Depends on the development in question.
Total aperture area of solar collectors in group heating scheme	From client.
Dedicated solar storage volume of group heating scheme	From client.
Zero loss collector efficiency of solar collectors	From certified test data or HARP database or DEAP Table H1
Collector heat loss coefficient	From certified test data or HARP database or DEAP Table H1
Annual solar radiation	DEAP Table H2
Overshading factor	DEAP Table H3

The following example shows data for one apartment in a block of eight apartments (each apartment has a total floor area of 80 m²) with a group heating scheme (a gas boiler) and a group solar array on the apartment building roof. The array has a gross area of 100 m² which gives an aperture area of 72m² according to Table H2 - default values from Table H1 are used – and a dedicated solar storage of 5000 litres. The collectors are south-facing at a 30° tilt.

Take the following inputs from the DEAP calculation software completed as described in the instructions document			
Tab	Item	Value	
Dimensions	Total floor area [m ²]	80	
Results	'Main space heating system', 'Delivered energy [kWh/y]'	5298	
Results	'Main water heating system', 'Delivered energy [kWh/y]'	3849	
Energy requirements	Distribution loss factor [-]	1.05	
Energy requirements	Fraction of heat from CHP unit/recovered from power station [-]	0	
Other inputs			
	Sum of floor areas of all dwellings served by the group heating scheme [m ²]	640	
	Proportion of collector area and storage volume allocated to this dwelling	0.125	
Inputs for solar system			
Complete the following inputs as described in Appendix H of the DEAP document i.e. in the same manner as for a solar water heating system serving a single dwelling.			
			Amount allocated to this dwelling
	Aperture area of solar collector - of group system [m ²]	72	9.00
	Dedicated solar storage volume - of group system [litres]	5000	625
	Zero-loss collector efficiency, η_0 [-]	0.6	
	Collector heat loss coefficient, a_1 [W/m ² K]	3	
	Collector performance ratio, a_1/η_0 [W/m ² K]	5.00	
	Annual solar radiation [kWh/m ²] from Table H2	1074	
	Overshading factor [-] from Table H3	1	
Result			
	Solar contribution as percentage of heat output from heat-only plant (i.e. excluding CHP)		34% -

The last line, highlighted in blue, indicates that 34% of the heating provided by the group heating scheme thermal heating comes from the solar collectors. This information must be entered in DEAP in the Energy Requirements -> Space Heating tab:

Heat Source	Fuel type	Efficiency[%]	Percentage of heat [%]	Primary energy conversion factor	CO ₂ emission factor [kg/kWh]
Heating System 1	Mains Gas	90.00	66	1.10	0.203
Heating System 2	None	0.00	0	0.00	0.000
Heating System 3	None	0.00	0	0.00	0.000
Solar Space heating system			34		
Factors for heat delivered to dwelling from heating systems 1/2/3			100 of 100 ✓	0	0

In this case, the “Renewable and Energy Saving Technologies” in DEAP is not required as the space and water heating derived from the group solar heating system is accounted for in full by this “34%” figure. In addition, DEAP will use this figure to calculate any applicable Renewable Energy contribution for Part L compliance checking.

The Assessor must follow DEAP Appendix A when identifying the main and secondary heating systems operating in conjunction with the solar space heating system or solar water heating system. A main space and water heating system and associated fuel must be specified for individual heating systems at all times. This reasoning for this is outlined in the [BER FAQ](#). Likewise, for group heating, at least one fuelled thermal heating system should be specified along with the solar space heating system. The solar space heating will reduce the overall primary energy requirement of the dwelling and this is reflected in DEAP.

3 Storage and direct electric heaters in DEAP

This article describes properties of different commonly found types of electric heating and how they are specified in DEAP assessments. Amongst these are storage heaters, direct electric heaters, and heaters which combine storage and direct heating.

Electric Storage Heaters: Old storage heaters consist of a thermally massive material – such as clay bricks or ceramic blocks within the heater – which can be heated by an embedded electrical element.

The principle of operation is as follows: at night electricity is passed through the element thereby heating the thermal mass. This stored heat is slowly released during the course of the following day.

Typically they have two controls:

- an input dial which controls the amount of electricity flowing into the storage heater during the night which in turn determines the amount of heat stored, and,
- an output dial which controls the rate at which the heat is released the following day.

If the following day is likely to be cold then the input dial is set high so that a lot of heat is stored overnight for use the following day. If heat is required throughout the day then the output dial is set low and the stored heat is released slowly. If heat is particularly required in the morning then the output dial is set high and the stored heat is released quickly.

As they run on cheaper night-rate electricity, storage heaters are relatively cost-efficient to run. The main disadvantage is a lack of responsiveness. If the occupant feels cold during the day he/she can't immediately switch the storage heater on. It only ever gives out heat that it has stored during the course of the previous night.

As a result, in DEAP old "large volume" storage heaters such as this have poor responsiveness as seen in the table below. Also, as outlined in DEAP Appendix A, if storage heating is the main heating system then a secondary system must be specified in DEAP.

Note that, in practice old storage heaters were usually sized to provide 90% of a dwelling's heating requirement with direct-acting electric heaters, portable or fixed, providing additional heat when required.

Direct-acting electric heaters: There are different types of direct-acting electric heater – convactor heaters, radiant heaters, panel heaters – but they all operate on the same principle: when the occupant feels cold he/she can switch on a direct-acting electric heater and it will immediately generate heat to warm the room. They are often used as a back-up system to storage heating, or may be used as the main heating system in some cases.

Modern direct-acting electric heaters may have sophisticated control systems with timers and thermostats controlling individual heaters giving excellent control and responsiveness in DEAP.

Integrated storage/direct-acting electric heaters: This is a storage heater (relying on stored heat generated during the previous night) and a direct-acting electric heater (which generates heat when it is switched on) contained in the same casing. The system is sized so that most of the heating load is provided by the storage heater at the cheaper night rate electricity. The system may be thermostatically controlled so that any shortfall is automatically provided by the direct-acting electric heater. Also, if the occupant feels cold he/she can manually switch on the direct-acting electric heater to get immediate heat.

If an integrated storage/direct-acting system is the main heating system in a dwelling then a secondary system must be specified in accordance with the guidance in Appendix A of the DEAP manual. However, these integrated storage/direct-acting electric heaters are more responsive than most other types of storage heaters and this is reflected in the DEAP responsiveness category from Table 4a.

Note that a dwelling with any of the systems described above may have a poor BER because of the high primary energy conversion factor of electricity.

System	Control Category	Responsiveness Category	Temperature Adjustment
Storage heaters	3	Ranges from 5 down to 2 depending on type of storage heater as outlined in DEAP Table 4a	0.3 or 0 depending on level of control as outlined in DEAP Table 4e, Group 4
Direct-acting electric Heaters	2 or 3 depending on level of control as outlined in DEAP Table 4e, Group 6	1	0.3 or 0 depending on level of control as outlined in DEAP Table 4e, Group 6
Integrated storage/direct-acting electric heaters	3	2	0.3 or 0 depending on level of control as outlined in DEAP Table 4e, Group 4

This table summarises the relevant DEAP inputs for these electric heaters. All are 100% efficient, with fuel type of "electricity". The efficiency adjustment factor in DEAP is "1". Full detail is available in DEAP Table 4a and Table 4e. The table shown above does not include electric boilers or underfloor electric heating.