EuroWindoor position on assessment of thermal transmittance based on reference size and/or actual window

General information

EuroWindoor would like to provide more input on the five options for assessing thermal transmittance based on reference size and/or actual window, as presented by the Commission in the meeting with experts of national authorities on the 3rd December 2024. This input further highlights the benefits and challenges of each approach with the intention to provide constructive solutions.

As overall we like to point out that the energy efficiency of the building is the primary focus of the legislator and that the thermal transmittance of the windows is addressed as a required input parameter. Therefore, the evaluation of the required accuracy of the products' assessment method should also be considered at building level. A basic rule for cost-conscious and high-quality construction also follows the principle of simplicity in engineering: 'Not as exact as possible, but as exact as necessary!' The standardisation is also based on this principle, in that a sufficient accuracy of the values is commonly agreed, which makes practical implementation possible and affordable.

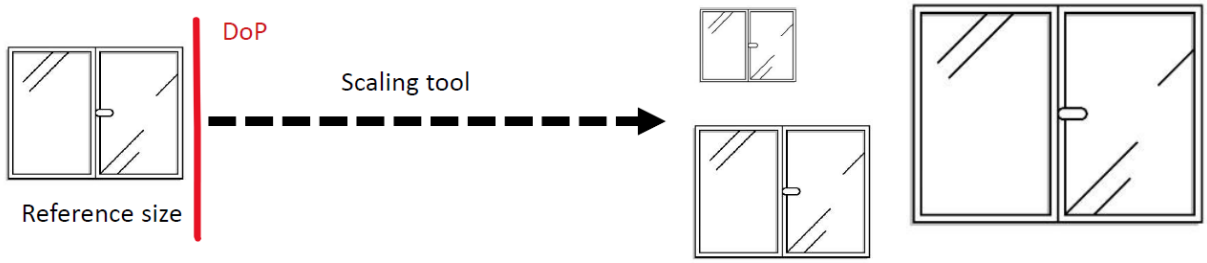
Depending on the required level of detail for the assessment in combination with the involvement of the Notified Body according to the new AVS 3 system (assessment of the performance and confirming that the product type and the product category were correctly determined) the increase of costs for implementation and the associated product prices could be tremendous and the bottleneck in terms of the NB's capacities and personnel will have an extremely high impact on the complete construction sector. AVS 4 could lower the burden and difficulties but does not include verification from a Notified Body.

In addition, EuroWindoor wants to raise awareness that for assessment of thermal transmittance of windows not only scaling of sizes is of relevance but also large number of varying configurations which are increasing the amount of product types for each individual project. So far, EuroWindoor understood that the Commission is focused on the sizing issue only. The solution must be adaptable to accommodate various combinations of components — not just different sizes — ensuring its applicability across diverse configurations, e.g. by using "reference windows" defined in the harmonised Technical Specification. Also, other influence by e.g. non-vertical glass may have extra impact on U-values for windows, making it even more complicated.

Today manufacturers declare U_W-values based on reference windows and this is the only U-value declared [EN 14351-1 Annex E]. The manufacturer is in addition obliged to be able to inform the U-value of the specific product size and configuration [EN 14351-1, Annex E note c] – this value is given outside the DoP/CE-marking. Depending on the MS regulation, building energy performance calculation is based either on the declared U_W (reference window), on the specific U-values of each window element or on the average value of all windows in the building. The information for all three cases are provided but only partially via the DoP/CE-marking.

This practice has functioned well for several decades but can be argued to not fully suffice the CPR requirement to exhaustiveness. The CPR requires harmonised product standards (hEN) to be exhaustive, meaning that Member States cannot require information that is not included in the Standardisation Request (SReq) for the future hEN while different options have been presented by the Commission for consideration of Member States.

1 Option 1 - Reference sizes only



Background:

The idea of Option 1 is to remain with the reference size for U-value in the DoPC and leave it to the MS to make conversion of the U-value to the specific size if needed to cover their regulatory needs. The methodology and guidance for this conversion should be integrated in a standard (EN ISO 10077-1 is suggested) and should be based on information already planned to be part of the future DoPC.
Thereby the fulfilling of regulatory needs of MS can continue without significant changes to the present practice, the burden to manufacturers (and thereby the product costs) stays the same, the burden to calculate the building energy performance could be slightly lowered in some MS and the provisions of the CPR are respected.

A first version of the method has been developed as a simple spreadsheet, showing very strong correlation between detailed calculation results and results based on the scaling tool for all investigated examples, see Annex I. Further analysis is planned, especially how to deal with varying configurations.

Such method can be implemented as a simplified method in e.g. EN ISO 10077-1 which already deals with the detailed assessment of the U-value of any size of window. This in turn can be implemented in the national building energy performance methodology. In many MS, dedicated compliance tools are in place which can use the method directly and the process for the calculation will become slightly less burdensome than today where the engineer/architect has to enter the U-value of each and every window. This will not be necessary since only the declared U_W shall be entered and the specific U-value will be assessed automatically by the calculation tool depending on actual window size.

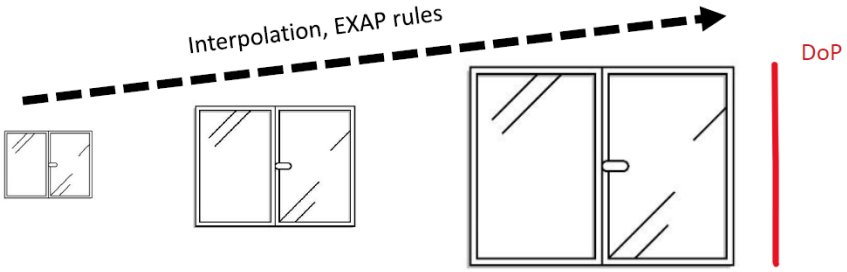
Pros:

- This corresponds to the present legally requested procedure by some MS
- Simple and cost-effective
- Fulfilling Article 5 1. of new CPR
- Low demands on notified body action
- Easy comparison of product solutions against legal requirements and for market surveillance
- Technical accuracy for reference size is high
- Complies to design process and building permit where only a single U value is used for all sizes

Con:

- Without scaling tool will it not fulfil some current design schemes, because small windows may have worse values for actual size although larger windows usually provide better values
- Need further elaboration to reduce the number of configurations if this is deemed necessary

2 Option 2 - Assessment of multiple representatives for product groups



Background:

The idea of Option 2 is to declare more than one reference size and to have the possibility of interpolation to align the actual size of the window to the nearest applicable reference size.
We believe this follows the concept of the EXAP (EXtended APplications) rules known in fire testing limiting the number of tests required by implementing methods to determine the fire classification of a range of products. For products where CE marking is mandatory, the extended Field of Application is also used as input for the declaration.

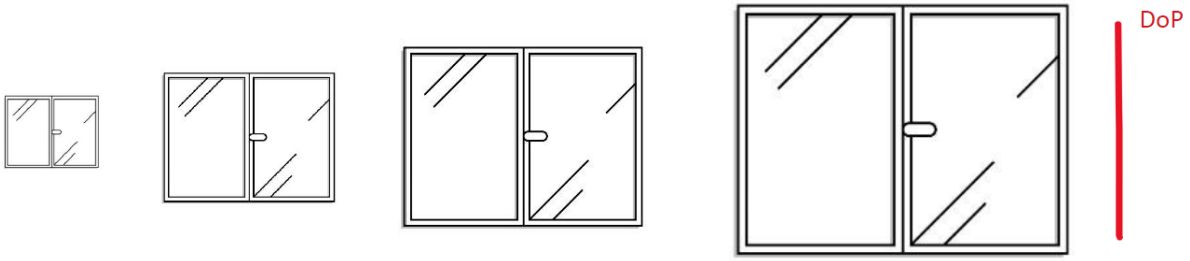
Pros:

- Technically adequate
- Flexibility in terms of product line segmentation
- More accurate values for small and large sizes

Con:

- Multiple representatives will create confusion for Member States and open room for misinterpretations (market surveillance)
- Difficult comparison of products (no reference)
- More costly for adaptation and does not fulfil detailed MS requirements
- More costly product assessment
- New regulatory requirements need to be clearer and more detailed
- A scaling tool cannot be used

3 Option 3 - Assessment of every single size



Background:

The general principle introduced by Option 3 aims at assessing and certifying every single size and configuration of a window. Because of the huge number of different windows this approach would lead to a clear discrimination of SMEs on the market and besides overstrain the big companies in order to calculate their various, unlimited product types.

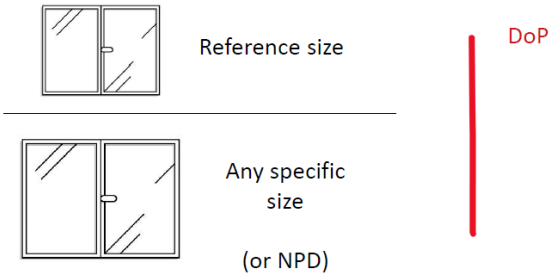
Pros:

- Exact calculation e.g. of building envelope
- Accurate values for actual window

Con:

- Lack of capacity of Notified Bodies in AVS 3
- Very complex for manufacturers and costly for customers due to uncounted number of product variations
- Market access barrier for SMEs
- Unclear on how to handle imported products
- Difficult comparison of products
- Exclusion of reference test method and tabulated values
- As possibly the sizes could even vary to the last minute before manufacturing, the assessment must be easy and fast adjustable during the production.
- Regulatory requirements need to be extremely complex to address different sizes
- More exact than necessary on building level

4 Option 4 - Two essential characteristics



Background:

The general principle introduced by Option 4 aims at providing a dual system with different essential characteristics to cover the needs for both regulatory thresholds (i.e. the reference size U_W) and energy simulation purpose (i.e. actual size U-value).
From an administrative burden point-of-view, it must be noted that **this solution can only work if the actual size U-value falls under AVS 4**, while only the reference size U_W falls under AVS 3 for use in regulatory thresholds.
Besides, from regulatory point of view, it should be made clear to Member States that only the reference size U_W should be regulated, and that the actual size U-value should only be used for energy calculation purposes.

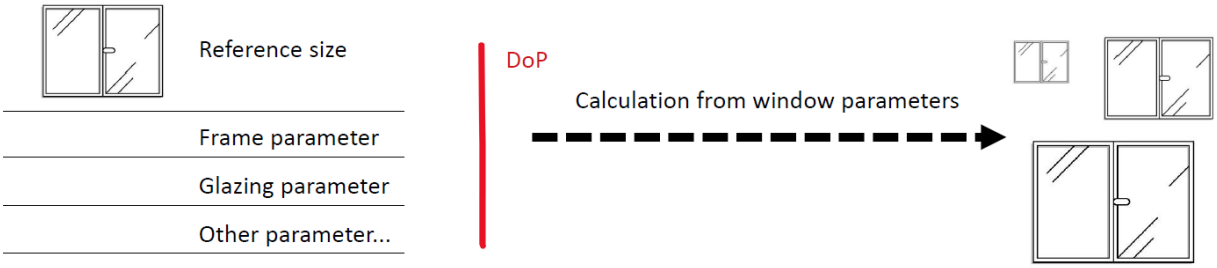
Pros:

- Provide designers (energy consultants, architects…) with data that are directly usable in simulation software tools or energy calculation tools
- Provide authorities U_W value that can be regulated through thresholds, thus securing the continuity of all legal requirements current in force in EU Member States
- Most energy regulations do not need to be adjusted

Con:

- The number of DoPC issued by manufacturers will increase exponentially, which will be difficult to manage, especially with the implementation of Digital Product Passports
- A dual system may cause confusion for Member States and open room for misinterpretations, e.g. compliance with regulatory thresholds through actual size U-value instead of reference size U_W
- A dual system will risk introducing unfair competition, e.g. when communicating on product performances in printed or online documentation: the two characteristics – reference size U_W and actual size U-value – are not comparable but could both be used on commercial documentation, creating a biased comparison of products.
- It does not reduce the number of configurations that shall be declared – if deemed necessary.
- No use of hotbox (reference) test method and tabulated values for actual size U-value

5 Option 5 - Reference sizes and performance of components



Background:

As in Option 1, the idea is to remain with the reference size for U_W-value declaration in the DoPC and leave it to the users in MS to make conversion of the U-value to the specific size if required for calculation of building energy consumption. In addition to the declared U_W value, the thermal properties of the components to come to the U_W value are declared as representative values. These additional component values are not to be used for direct regulatory requirements but only for assessing the U-values of actual windows and configurations when performing building energy performance calculations. The needed standards are already in use for the CE-marking. The U_g-value of the glass is declared by glass-manufacturer in the DoPC of the key part glass.

Thereby the fulfilling of regulatory needs of MS can continue without significant changes to the present practice, the burden to manufacturers (and thereby the product costs) stays almost the same, and the provisions of the CPR are respected.

We like to point out that for simple windows the component values U_f, U_g and Ψ_g are sufficient, but the amount of needed values of components could be high for more complex products:

$$U_W = \frac{\sum(A_{f,i} \cdot U_{f,i}) + \sum(A_{g,i} \cdot U_{g,i}) + \sum(A_{p,i} \cdot U_{p,i}) + \sum(l_{g,i} \cdot \Psi_{g,i}) + \sum(l_{p,i} \cdot \Psi_{p,i}) + \sum(l_{gb,i} \cdot \Psi_{gb,i})}{\sum A_{f,i} + \sum A_{g,i} + \sum A_{p,i}}$$

It should be considered if a window manufacturer could be allowed to give component values outside of the DoPC of a window for the detailed calculation as the components do not fall under the same harmonised Technical Specification.

Pros:

- This corresponds to the present legally requested procedure by some MS
- Simple and cost-effective
- Low demands on notified body action
- Easy comparison of product solutions against legal requirements and for market surveillance
- Technical accuracy for reference size is high
- Complies to design process and building permit where only a single U value is used for all sizes
- Accurate values can be easily calculated for building energy performance calculation
- Solves all regulatory needs
- Not in conflict with new CPR and fulfilling Article 5 1. of new CPR
- Use of hotbox (reference) test method and tabulated values is possible
- Groups of products can be declared in a single DoPC

Con:

- More costly than Option 1
- Risk that MS set requirements on component level

6 Conclusion

EuroWindoor appreciates that the issue is addressed by the Commission early in the process but identified still some problems which are not completely solved by any of the proposed options. While the intent of the regulation is understood, the proposed approaches create complexities that undermine their feasibility, particularly for SME, and place undue burdens on Notified Bodies.

The solution must work not just for variations in size, but also for the large number of similar configurations which are increasing the amount of product types for each individual project. EuroWindoor underscores the necessity of a solution that aligns legislative objectives with practicality, cost-effectiveness and level playing field for the industry. Without addressing these core issues, the regulation risks becoming unmanageable and making products too expensive.

In the opinion of EuroWindoor Option 3 (Assessment of every single size) is not acceptable at all for the industry, because the burden and problems are far to high. Also Option 2 (Assessment of multiple representatives for product groups) seems to cause problems for implementation which exclude it from a solution.

We expect Option 1 (Reference sizes only) to be the one with the lowest burden and easiest to manage. It is an acceptable option if the concept of "reference windows" is followed to get sufficient accurate values for different configurations. Option 1 might not meet all the existing regulatory procedures.

Option 5 (Reference sizes and performance of components) will also be an acceptable option when the given concerns are adequately solved. Option 4 (Two essential characteristics) would be a possible acceptable alternative if and only if the given concerns are adequately solved. However, Option 4 will create much more DoPC in MS requesting actual U values than Option 1 and Option 5.

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About EuroWindoor AISBL – EuroWindoor AISBL was founded as an international non-profit Association, in order to represent the interests of the European window, door and facade (curtain walling) sector. Our 19 national associations speak for European window, door and facade manufacturers that are in direct contact with consumers, and thereby having large insights on consumers' demands and expectations. We are at the forefront interacting with dealers, installers and consumers buying windows and doors, and the companies behind the associations cover selling all over Europe.

EuroWindoor AISBL
Schuman Business Center, 40, Rue Breydel, 1040 Bruxelles / Belgium
or
Walter-Kolb-Str. 1-7, 60594 Frankfurt am Main / Germany
Internet: www.EuroWindoor.eu

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ANNEX I: Comparison of U values of detailed calculation vs. the use of scaling tool for different window types

Principle of scaling tool:

In the DoPC, the U_W is declared based on a known reference size along with the center-of-glass U_g-value and the 'Frame area fraction' (F_f) [1]. From these key data, and the information of the reference size, the U-value of a window with the same frame and sash system can be derived with an acceptable accuracy for any size and – if relevant – also deal with specific window configurations, e.g. the inclusion of mullions/transoms and glazing bars.

The heat flow through the reference size window is split into two parts:

1. One part through the glazing, (represented by the U_g and the $A_g = A_W \times (1-F_f)$)
2. Another part going through the frame/sash/mullions/glazing bars (called framing members) and through the cold-bridge between glazing elements and the framing members. This part is expressed through a 'corresponding 2-Dimensional thermal conductance' L^{2D} [W/mK] of framing members and glazing cold bridge and the 'corresponding perimeter length' l [m] of the framing system. $L^{2D} \times l$ equals thereby the specific heat flow [W/K] through the framing parts and the linear thermal transmittances between the glazing parts and framing parts. This equals $U_f \times A_f + y \times l_{\text{glazing perimeter}}$.

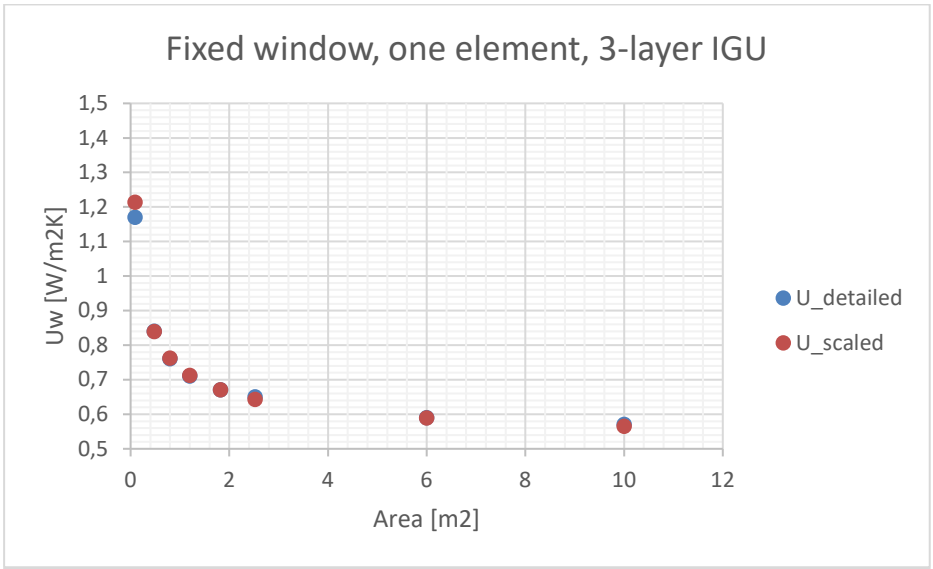
Based on the F_f and the dimensions of the reference size, the 'corresponding perimeter' l is assessed.

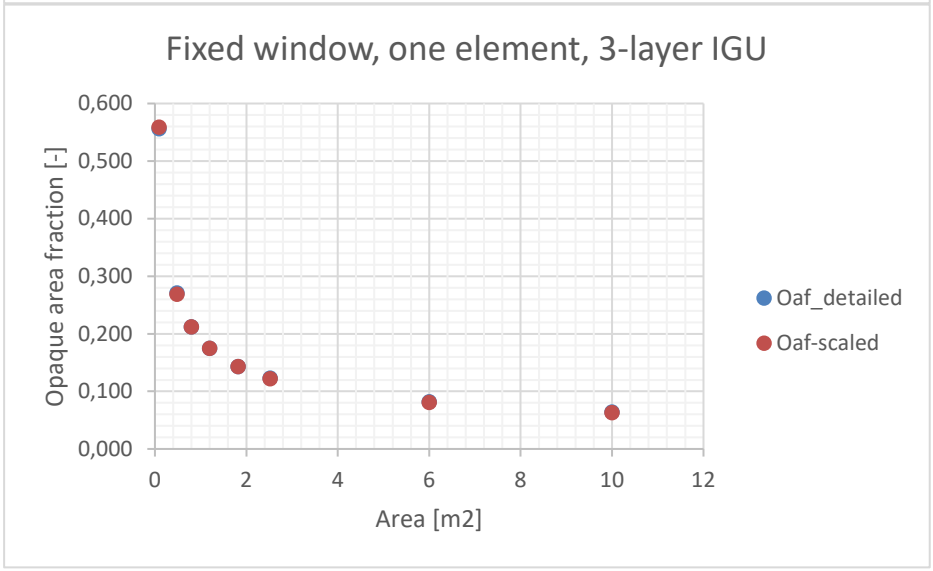
By changing the size of the window to the specific size, the specific l is assessed and the resulting window U-value and F_f for the specific area are determined.
L^{2D} is an average of all the framing members and all the linear thermal transmittances in the window construction. U_g may also be a mean value in case different infills are used. By scaling to different sizes some deviations will occur compared to detailed calculations, but the expectation is that the approximation is good enough for energy performance calculations.

[1] Note that at present the draft RS includes 'Opaque area fraction' (Oaf) instead of Ff. Oaf includes also the area of opaque infill panels if any. We suggest to replace Oaf with Fr going forward and deal with effect of opaque panels in the g-value and light transmittance data of the infills.

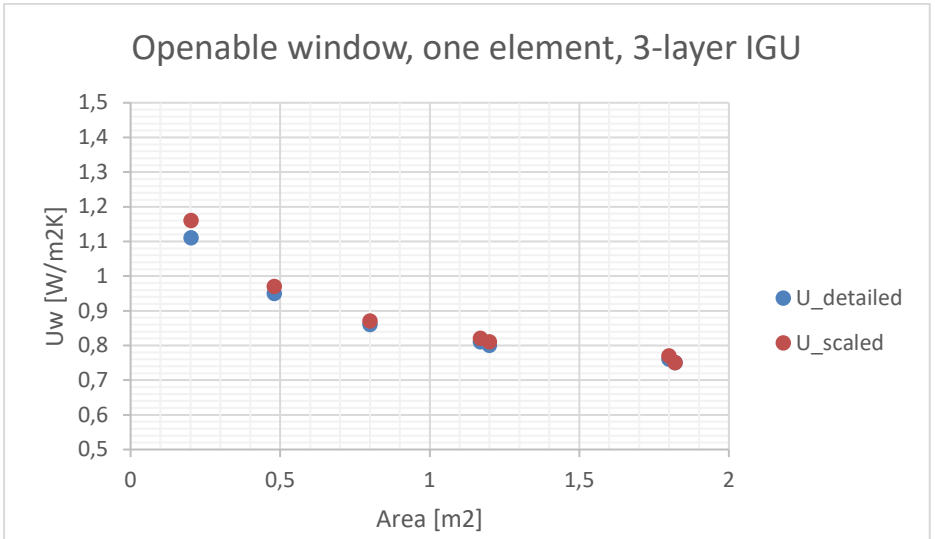
Comparison for different window types:

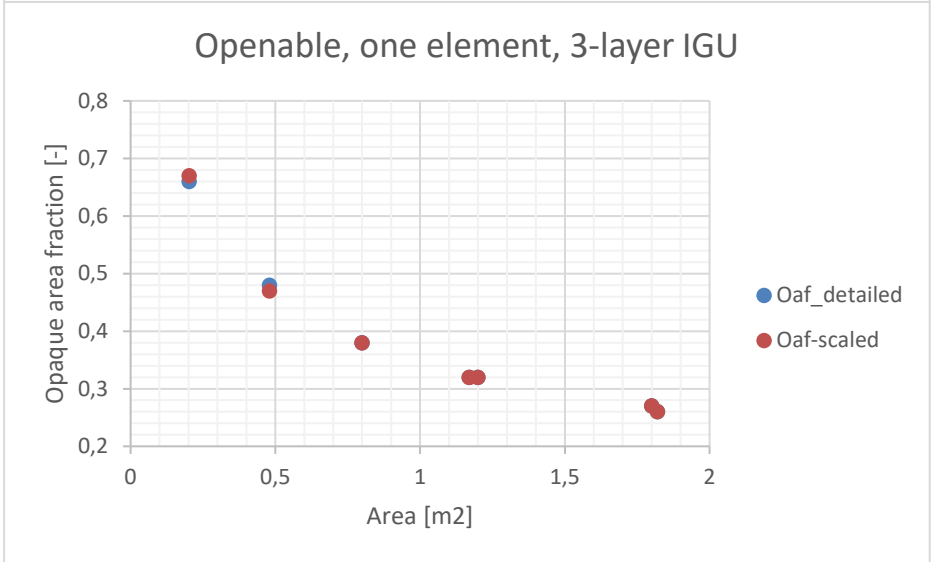
	A [m²]	U_detailed	U_scaled	Oaf_detailed	Oaf-scaled
Fixed window	0,09	1,17	1,213	0,556	0,559
One element	0,48	0,84	0,839	0,271	0,269
3-layer IGU	0,8	0,76	0,762	0,212	0,212
	1,2	0,71	0,712	0,175	0,175
	1,82	0,67	0,67	0,143	0,143
	2,52	0,65	0,643	0,123	0,122
	6	0,59	0,589	0,082	0,081
	10	0,57	0,565	0,064	0,063



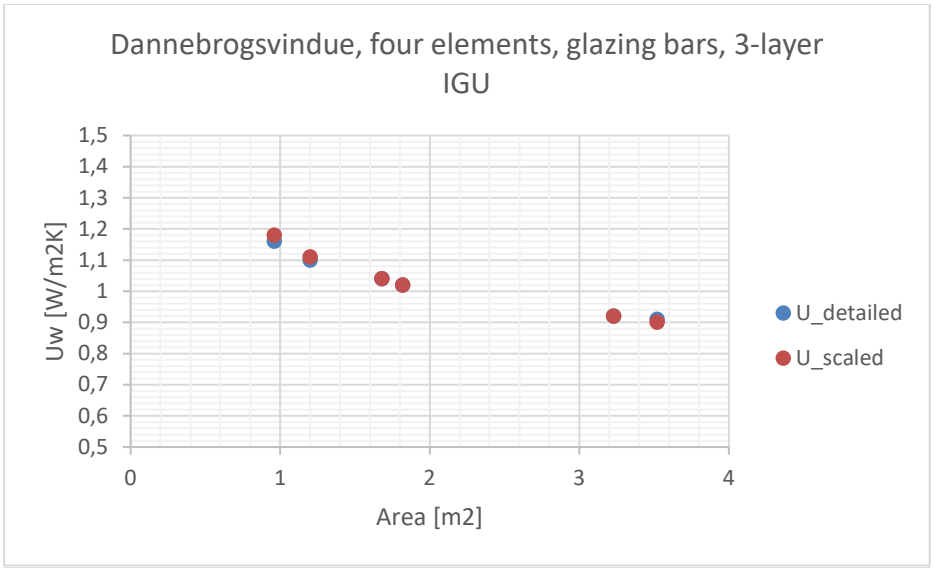


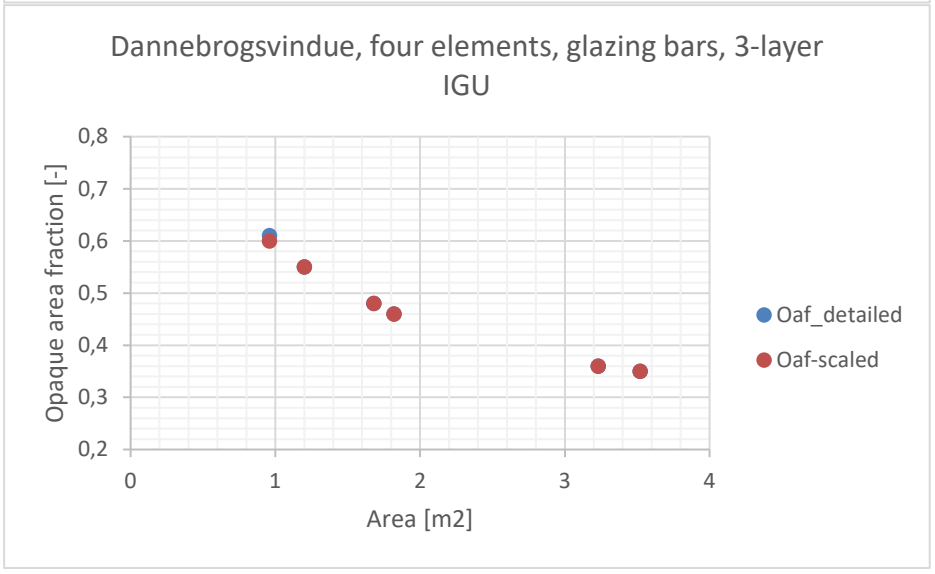
	A [m²]	U_detailed	U_scaled	Oaf_detailed	Oaf-scaled
Openable window	0,2025	1,11	1,16	0,66	0,67
One element	0,48	0,95	0,97	0,48	0,47
3-layer IGU	0,8	0,86	0,87	0,38	0,38
	1,17	0,81	0,82	0,32	0,32
	1,2	0,8	0,81	0,32	0,32
	1,8	0,76	0,77	0,27	0,27
	1,8204	0,75	0,75	0,26	0,26

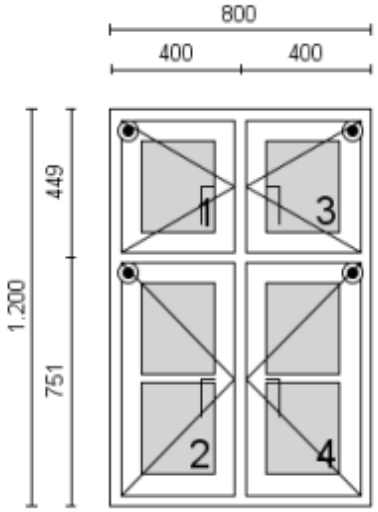




	A [m²]	U_detailed	U_scaled	Oaf_detailed	Oaf-scaled
Dannebrogsvindue	0,96	1,16	1,18	0,61	0,6
four elements	1,2	1,1	1,11	0,55	0,55
glazing bars	1,68	1,04	1,04	0,48	0,48
3-layer IGU	3,52	0,91	0,9	0,35	0,35
	1,82	1,02	1,02	0,46	0,46
	3,23	0,92	0,92	0,36	0,36







	A [m²]	U_detailed	U_scaled	Oaf_detailed	Oaf-scaled
Dannebrogsvindue	0,96	1,44	1,46	0,61	0,6
four elements	1,2	1,42	1,42	0,55	0,55
glazing bars	1,68	1,39	1,39	0,48	0,48
2-layer IGU	3,52	1,34	1,33	0,35	0,35
	1,82	1,38	1,38	0,46	0,46
	3,23	1,35	1,34	0,36	0,36