Approved Document O Overheating 2021 (England) Due to take effect 15 <sup>th</sup> June 2022.
21 <sup>st</sup> July 2022 – 12:00pm - Session time approx. 30 mins. Remote access via Zoom.
A look at the forthcoming changes to new-build residential applications and how this might affect glass design and product selection.
Consideration on the two compliance routes (Simplified versus Dynamic)
A bite-sized training session (non-RIBA approved) aimed at anyone with design responsibility for new building proposals within the residential / domestic sectors.
Delivered via Zoom by Pilkington Technical Advisory Service Manager Phil Brown
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Thanks for joining this bite size session looking at the new Approved Document O in England, which will affect future project designs for domestic new builds in terms of limiting solar heat, and we'll be looking at how this might play out with windows and other relative product selections.



Before we kick off (and I'm aware it's not a long session), so I'll whiz through a quick introduction and visual trip in terms of the who we are and what we do, as not everyone knows who Pilkington are.

<Read slide.>

Pilkington was established in 1826 and became part of the NSG Group in 2006. The company is synonymous with innovation in the glass industry, the most famous being the development of the float glass process which revolutionised the way in which glass was manufactured. We were also the first manufacturer to commercialise self-cleaning glass. More recently, as we march towards decarbonisation, we became the world's first flat glass manufacturer to fire its furnace on 100% biofuel, as part of an industry trial to find sustainable alternatives to natural gas. And that trial took place here in the UK.



Our two main market sectors are architectural and automotive, for the latter supplying many leading car brands with glass windscreens and side panels, including Jaguar Land Rover. We have a large R&D facility in Lathom in West Lancashire and manufacturing operations in 28 countries worldwide with over 27,000 employees and sales in over 100 countries. We have major manufacturing operations in the UK that enable us to produce float glass, including extra clear low iron glass, and high performance low emissivity and solar control coated glass – not to mention glass for high tech applications such as touch screens, digital displays and heated glass.



So onto the main topic – The New Approved Document O for overheating 2021 – England. In case you are not aware, each country of the UK is responsible for setting its own building regulations. Although this webinar is focused on England, we will also provide a summary for Wales and Scotland, highlighting any differences compared with England. We are not aware of any plans for Northern Ireland to introduce corresponding regulations on overheating in residential properties.



What is Approved Document O? What is Part O? Often these terms are interchanged – and I do so myself - but they have distinct purposes. The building regulations in England are divided up into different parts, with different letters assigned – such as Part B for fire safety and Part L for conservation of fuel and power. These parts usually set out the 'high level' functional requirements of the building regulations. Approved Documents provide ways in which compliance with the functional requirements can be met. Guidance in the Approved Documents is not mandatory – it is possible to demonstrate compliance by other routes – but are the most commonly taken routes to compliance.

So, we have Part O of the building regulations which introduces the requirements to mitigate overheating in new dwellings through limiting unwanted solar gains in the summer and providing means to remove heat from indoor environments. Approved Document O sets out ways in which this can be achieved.



So, Approved Document O was published just before Christmas last year and entered into force on June the  $15^{th}$  this year.



The introduction of Part O of the Building Regulations and its supporting Approved Document has been prompted by climate change research that forecasts large parts of the UK will have significant overheating occurrences in most housing types within a decade.

There have also been numerous media reports of occupants experiencing thermal discomfort, including negative impacts on sleep quality, in new homes, particularly flats and apartments.



One area in which the government has tightened up on with the latest building regulations is transitional arrangements. For this year's regulations, including Part O, transitional arrangements have been limited to 12 months and based on individual buildings rather than whole developments.

As identified in the original consultation, there were reports of housing developments being built to old requirements introduced in 2010 and even 2006.

PILKINGTON	Scope	
<ul> <li>New residential b</li> <li>Applies to parts of</li> </ul>	ouildings only of mixed-use buildings that are for residential purposes	only
Table 0.1 Residential	I buildings within the scope of this approved document Purpose for which the building is intended to be used	
Residential (dwellings)	Dwellings, which includes both dwellinghouses and flats.	
Residential (institutional)	Home, school or other similar establishment, where people sleep on the pre The building may be living accommodation for the care or maintenance of a following.	mises. ny of the
Residential (institutional)	Home, school or other similar establishment, where people sleep on the pre The building may be living accommodation for the care or maintenance of a following. a. Older and disabled people, due to illness or other physical or mental cor	mises. ny of the ndition.
Residential (institutional)	<ul> <li>Home, school or other similar establishment, where people sleep on the pre The building may be living accommodation for the care or maintenance of ar following.</li> <li>a. Older and disabled people, due to illness or other physical or mental cor</li> <li>b. People under the age of 5 years.</li> </ul>	mises. ny of the ndition.

What is the Scope?

It covers New Residential Buildings only, so does not apply to extensions or conservatories added to residential buildings after they are built.

Residential (dwellings) is dwellings which includes both dwelling houses and flats.

Residential Institutional – examples include care homes and student accommodation.

Hotels don't fall within this scope, as they're not classed as permanent or long-term residential premises.

🔁 PILKINGTON RE	equi	rement O1 of Building Regulations	GROUP
	<mark>(</mark> 1)	Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to—	
		(a) limit unwanted solar gains in summer;	
		(b) provide an adequate means to remove heat from the indoor environment.	
	(2)	In meeting the obligations in paragraph (1)—	
		<ul> <li>(a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and</li> </ul>	
		(b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.	11

What's the requirement? This is text extracted directly from Approved Document 0.

<Read all in green>

	G
<ul> <li>To protect health and welfare of occupants by reducing occurrence of high indoor temperatures</li> </ul>	е
<ul> <li>Both of the following should be achieved:</li> <li>Limit unwanted solar gains in summer</li> <li>Provide adequate means of removing excess heat from indoor environment</li> </ul>	nt
<ul> <li>Two methods for demonstrating compliance:</li> <li>Simplified method</li> <li>Dynamic thermal modelling method</li> </ul>	
<ul> <li>Two risk categories for simplified method:</li> <li>'Moderate risk' location (England, excluding higher risk parts of London)</li> <li>'High risk' location (urban and some suburban parts of London)</li> <li>For some parts of central Manchester, designers may wish to follow guidance for 'high risk' category</li> </ul>	
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What's the intention of Approved Document O? <Read all the of slide>

Urban and suburban areas of London are categorized as 'high risk' locations, with the rest of England considered as 'moderate risk'. Strictly speaking, the minimum standard for Manchester is moderate risk. However, Government has advised designers that they may want to follow the guidance for higher risk locations for buildings in central Manchester – as elevated night-time temperatures may be experienced. In fact, the Approved Document provides a list of postcodes in Manchester for which this may be considered.



If we start by looking at the first method, the so-called simplified method. It's a prescriptive-based approach, although perhaps not as simple as its name suggest.

<b>Pilkington</b>	Limiting	solar gains -	- (1)	GROUP					
<ul> <li>Buildings or parts of buildings <u>with</u> cross-ventilation</li> <li>(Cross ventilation – openings on opposite elevations)</li> </ul>									
Table 1.1 Limiting solar gains for buildings or parts of buildings with cross-ventilation         High risk location       Moderate risk location									
Largest glazed façade orientation	Maximum area of glazing (% floor area)	Maximum area of glazing in the most glazed room (% floor area of room)	Maximum area of glazing (% floor area)	Maximum area of glazing in the most glazed room (% floor area of room					
North	15	37	18	37					
North East	15	37 37	18 18	37 37					
North East South	15 18 15	37 37 22	18 18 15	37 37 30					

Limiting Solar Gains <Read both bullet points>

An example of cross ventilation would be two opposite external walls with openings at both ends.

The exact definition within Approved Document O for Cross Ventilation is as follows:- "*The ability to ventilate using openings on opposite façades of a dwelling. Having openings on façades that are not opposite is not allowing cross-ventilation, e.g. in a corner flat.*"

So, there are different maximum limits dependent upon if the building is in a high or moderate risk location.

🔁 Pilkington	Limiting	solar gains -	- (2)	GROUP						
<ul> <li>Buildings or parts of buildings <u>without</u> cross-ventilation</li> </ul>										
Table 1.2 Limiti	ng solar gains for	buildings or parts of I	buildings without	cross-ventilation <sup>(1)</sup>						
2	High ris	k location	Moderate	risk location						
Largest glazed façade orientation	Maximum area of glazing (% floor area)	Maximum area of glazing in the most glazed room (% floor area of room)	Maximum area of glazing (% floor area)	Maximum area of glazing in the most glazed room (% floor area of room						
North	15	26	18	26						
East	11	18	18	26						
South	11	11	15	15						

<Read title and subtitle>

(Without cross ventilation), which means for example opening windows on one wall only... or indeed more than one wall (but not on opposite external elevation walls).



Acceptable Shading Solutions <read top bullet point>

<read bullet points 1 and 3>

Ventilated shutters meaning louvred rather than solid wood panel shutters

Overhangs – Brise Soleil or awnings that cut out the sun when it's 50° or higher in the sky from a horizontal perpendicular line from the window.

<read bullet point 2>

Explain g value (total amount of solar energy passing through the glass). Can be expressed on scale of 0 to 1, or as %.

Glass manufacturers have solutions, for example Pilkington **Suncool™** 70/35.

PILKINGTON NCI	noving excess ned	
('Free area' – geom	etric open area of venti	lation opening)
Table 1.3 Minimum free area	as for buildings or parts of buildin	gs with cross-ventilation
	High risk location	Moderate risk location
Total minimum free area <sup>(1)</sup>	The greater of the following: a. 6% of the floor area <sup>(2)</sup> b. 70% of the glazing area <sup>(3)</sup>	The greater of the following: a. 9% of the floor area <sup>(2)</sup> b. 55% of the glazing area <sup>(3)</sup>
Bedroom minimum free area	13% of the floor area of the room <sup>(4)</sup>	4% of the floor area of the room <sup>(4)</sup>
Table 1.4 Minimum free are	as for buildings or parts of buildir	ogs without cross-ventilation
Total minimum free area <sup>(1)</sup>	The greater of the following: a. 10% of the floor area <sup>(2)</sup> b. 95% of the glazing area <sup>(3)</sup>	The greater of the following: a. 12% of the floor area <sup>(2)</sup> b. 80% of the glazing area <sup>(3)</sup>

Removing any resulting excess heat through ventilation, with the term 'free area' *meaning the geometric open area of the ventilation opening.* 

Similar to previous so called 'simplified method' calculations for limiting solar gains, this sum also works by percentages and maximum allowances.

Appendix D of Approved Document O contains a whole section, including look up tables, describing how you can calculate the equivalent free area in a window opening.

😯 Pilkington	Hi	gh r	isk	area	s (b	у ро	stcc	de)			NSG GROUP
Central M	1anch	nester	:: M1	M2 M	13 M	5 M15	5 M16	5 M50			
• London:											
CR4	E17	EC3R	KT6	N22	SE8	SE27	SW11	TW10	W1F	W12	
CR7	E18	EC3V	KT7	NWI	SE9	SE28	SW12	TWII	WIG	W13	
El	E20	EC4A	KT8	NW2	SE10	SW1A	SW13	TW12	WIH	W14	
EIW	EC1A	EC4M	IGII	NW3	SEIT	SWIE	SW14	TW13	WIJ	WCIA	
E2	ECIM	EC4N	NI	NW5	SE12	SW1H	SW15	TW14	WIK	WCIB	
E3	ECIN	EC4R	NIC	NW6	SE13	SW1P	SW16	TW15	W1S	WCIE	
E4	EC1R	EC4V	N2	NW8	SE14	SWIV	SW17	TW19	WIT	WCIH	
ES	EC1V	EC4Y	N4	NW10	SE15	SWIW	SW18	UB1	WIU	WCIN	
E6	EC1Y	HAO	N5	NWII	SE16	SW1X	SW19	UB2	WTW	WCIR	
E7	EC2A	HA9	N6	RM8	SE17	SW1Y	SW 20	UB3	W2	WCTV	
E8	EC2M	IGI	N7	RM9	SE18	SW2	TW1	UB4	W3	WCIX	
E9	EC2N	IG2	N8	RM10	SE19	SW3	TW2	UB5	W4	WC2A	
EIO	EC2P	IG3	N9	SE1	SE20	SW4	TW3	UB6	W5	WC2B	
Ell	EC2R	IG4	N13	SE2	SE21	SW5	TW4	UB7	W6	WC2E	
E12	EC2V	КП	N15	SE3	SE22	SW6	TW5	UB8	W7	WC2H	
E13	EC2Y	KT2	N16	SE4	SE23	SW7	TW6	UBII	W8	WC2N	
E14	EC3A	КТ3	N17	SE5	SE24	SW8	TW7	W1B	W9	WC2R	
E15	EC3M	KT4	N18	SE6	SE25	SW9	TW8	WIC	W10		
E16	EC3N	KT5	N19	SE7	SE26	SW10	TW9	WID	wn		18

These are the high risk postcodes of London, as laid out in Approved Document O. As mentioned earlier, the document also provides the postcodes of central Manchester for which the government has advised that the guidance for high risk locations may be followed.



Moving on to the Dynamic thermal modelling method....



<Read slide>

CIBSE TM59 is the design method for overheating risk in homes. Giving more freedom and flexibility to design, with possible off-setting one area against another within the complete scope of the building.

Based on the enquiries we have received since the publication of the Approved Document, the self-build market – which generally likes to make use of large glazed areas (which you will recognize if you're a regular viewer of Grand Designs) – is tending towards the dynamic thermal method to demonstrate compliance as it allows greater design flexibility.

This is also where high performance solar control glass can help dwellings meet the requirements.



If it's not obvious, it's worth reminding ourselves that compliance with Part O of the building regulations cannot be considered in isolation and requirements of other regulations need to be taken into account. In some cases, there can be apparent conflicts in meeting different parts of the building regulations.

<Pick out a couple of statements >



When we first devised this webinar, only the requirements for England had been published. However, since then, the corresponding requirements in Wales and Scotland have been published so we wanted to provide a summary of them today.

First, a few words about the corresponding requirements in Wales. The Welsh Government published its Approved Document O, taking effect on 23rd November 2022. Although broadly similar to the requirements for England, there are some differences. For example, there is no categorising of locations into moderate and high risk locations – the same requirements apply to the whole of Wales.

In terms of glazing solutions, a glass with a maximum g value of 0.40 is recognised in the simplified method but – unlike for England – there is no minimum light transmittance.

•	Pilkington	Simplified	method	G P
	Mitigation approach	Minimising summer solar gains	Heat removal (openable windows and ventilation louvres)	
	Single aspe	ct residential buildings		
	<b>S1</b>	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area	
	S2	Maximum glazed area of 20% of floor area Glazing with maximum g value of 0.40	Minimum free area of 10% of floor area	
	<b>Dual aspect</b>	t residential buildings		
	D1	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area	
	D2	Maximum glazed area of 35% of floor area Glazing with maximum g value of 0.40	Minimum free area of 12% of floor area	
	D3	Maximum glazing area of 35% of floor area. External shutters with means of ventilation on all facades. Overhangs with 50° altitude cut-off can be used instead of external shutters on South facades	Minimum free area of 12% of floor area	
		(i.e. walls with South East to South West facing orientation)	225	23

<Reference S2 and D2 for glazing>

A single aspect residential building is where there are windows in one direction only. Dual aspect is where windows are facing two or more directions (including corner flats).



New requirements to mitigate overheating in new residential buildings in Scotland have been published, taking effect on 1st December. Overheating in buildings has been highlighted as a key risk for health and productivity in the context of increasing global temperatures and hot weather events. Although overheating risk is generally considered an issue for southern regions of UK, studies have identified occurrence of overheating in wide range of new dwelling types in Scotland. As for England and Wales, compliance in Scotland can be demonstrated via a simple (*not simplified – semantics*) method and dynamic thermal analysis modelling, the latter particularly for complex designs and those with large glazed areas.

For glazed areas greater than 20% of floor area, then shading such as louvres or external shutters should be used or the default g value (0.60) be decreased to reduce solar gains in proportion to the increase in glazed area.



This is summarised in the table on this slide. If the glazed area is doubled, then the glazing g value should be halved. As you can from this table, this is a different approach to solar control glass as a shading solution than adopted in England and Wales.

Note also the recommendation to achieve a light transmittance of 0.70 or better to minimize the adverse effect on daylighting – where practicable. This will not be possible where a low g value is needed.



<Read bullet points>

It will be interesting to see which route housebuilders and developers will follow: simplified method (no cost, but restrictions e.g. on max glazed area) or dynamic method (cost / time implications but more flexibility).



<Reference to Part L hub for information on all regulatory changes related to glass and glazing in E, S, W, NI and RoI>

