NCC 2019 SECTION J

As of the **1st of May 2020**, the new National Construction Code (NCC) 2019 Section J requirements come into regulatory effect with the end of the twelve-month 'discretionary' transition period.

This revision of Section J introduces a number of enhanced thermal envelope energy efficiency requirements which will influence architectural design. Previously accepted solutions, systems and approaches may no longer be compliant.

TECH NOTE 2 - BUILDING FABRIC

This technical note provides concise information on the changes as related to opaque elements of the thermal envelope. Please note that the following information is generic to building class and climate zone. Some building classes or climate zones may have specific requirements.

ENVELOPE WALLS

The calculation of total system R-value for an envelope wall must now account for the impact of thermal bridging within the construction. A thermal bridge is a localised area of a construction where the heat flow is different (increased) due to higher thermal conductivity compared to surrounding areas, typically associated with differing materials. This represents the path of least resistance in a construction. Thermal bridging presents the net impact of lowering the total system R-value of a construction, therefore requiring more insulation to achieve the same total system R-value as a non-bridged construction. The influence of thermal bridging is illustrated below, comparing a metal-framed and timber-framed external wall.





Timber-framed external wall showing less disturbed isotherms and significantly less influence of thermal bridges.

NCC 2019 Section J now requires a minimum total system R-Value for an envelope wall of between R, 1.0 m²K/W to R, 1.4 m²K/W inclusive of thermal bridging, for non-residential building types. To illustrate this change and the impact on total system R-value calculations, the table below provides a summary of external wall constructions with total system R-values calculated to both NCC 2019 Section J and the legacy 2016 version.

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Construction	Masonry Veneer 50mm Cavity 90mm Timber Studs 13mm Plaster	Light Weight Cladding 35mm Top Hat 92mm Metal Studs 13mm Plasterboard Lining	150mm Cast Concrete 92mm Metal Studs 13mm Plasterboard	190mm Blockwork with Rigid Board Insulation 13mm Plasterboard	
Added Insulation	R _T 2.5 Glasswool	R _M 2.5 Glasswool	R _M 2.5 Glasswool	R _M 2.0 Rigid Board	
Total System R-Value Under NCC 2016	R _T 2.98	R _T 2.93	R _T 2.83	R _T 2.49	
Total System R-Value under NCC 2019	R _T 2.15	R _T 1.35	R _T 1.28	R _T 2.36	

It can be seen that accounting for thermal bridge impacts of the construction results in a substantial difference in the derived total system R-value. This, however more accurately demonstrates the thermal performance of a wall construction. Designers need to be **conscious of these impacts on detailing and wall thicknesses**, and communicating fabric performance to HVAC engineers (for load sizing calculations).

ENVELOPE ROOF & CEILINGS

Minimum total system R-value requirements of NCC 2019 Section J for roof and ceiling constructions are **generally consistent with previous performance requirements**. Calculation of total system R-values must now be completed in accordance with AS/NZS 4859.2:2018. This represents only a minor technical change, not likely to substantially influence design.

However, unlike the previous version, NCC 2019 Section J now defines a **maximum roof Solar Absorptance (SA)** limit for DTS compliance (0.45) for all building classes and climate zones. This SA limit will **restrict the palate of roof finishes** where DTS compliance is sought. The application of roof finishes with higher SA will require performance-based JV3 modelling verification. Reviewing the product range of a large roof cladding supplier indicates that of the roof colours/ products available, only around 30% offer performance compliant with the NCC 2019 Section J DTS provisions.



CONCRETE SLAB ON GROUND FLOORS



Legacy versions of NCC Section J took a **simplistic approach** to the treatment of Concrete Slab-On-Ground (CSOG) floor constructions with insulation requirements limited to applications in alpine regions and/or where in-slab heating systems were present.

NCC 2019 Section J now takes a more technical approach to the determination of total system R-value offered by this floor system. Calculation of total system R-values must be completed in accordance with AS/NZS 4859.2:2018, which includes the thermal resistance offered by the underlying soil in context of ratio of floor area to floor perimeter and wall thicknesses. Pending specific design considerations, insulation may be required for some CSOG floors regardless of climate zone or building class.

Total system R-values for DTS compliance of envelope floors have been harmonised across construction types, generally R_{τ} 2.0 m2K/W (in the absence of a floor heating system).

To illustrate the influence of the new calculation requirements, the table below provides a summary of two different floor areas with various area-to-perimeter ratios. The calculated total system R-values, soil R-value alone and compliance are demonstrated.

Floor Dimension	10m x 20m	14.1m x 14.1m	6m x 33m	25m x 40m	31.5m x 31.5m	16.7m x 60m
Floor Area	≈ 200m²	≈ 200m²	≈ 200m²	≈ 1,000m²	≈ 1,000m²	≈ 1,000m²
Area to Perimeter Ratio	3.33	3.52	2.53	7.69	7.87	6.53
"Soil" R-value per Spec J1.6	1.43 m²K/W	1.5 m²K/W	1.11 m ² K/W	2.87 m²K/W	2.93 m²K/W	2.41 m ² K/W
Construction (air film, tiles, adhesive & 150mm slab)	0.28 m²K/W	0.28 m²K/W	0.28 m²K/W	0.28 m²K/W	0.28 m²K/W	0.28 m²K/W
Total System R-value	1.71 m²K/W	1.78 m²K/W	1.39 m²K/W	3.15 m²K/W	3.21 m²K/W	2.69 m²K/W
Under-Slab Insulation Required?	Yes (0.29 m²K/W) - 25mm	Yes (0.22 m ² K/W) - 25mm	Yes (0.61 m²K/W) - 25mm	No	No	No
Alternative Solution?	JV3 modelling	JV3 modelling	JV3 modelling			

LUCID COMMENTS

- The inclusion of the impact of thermal bridges in the calculation of total system R-values for external walls is a **significant change for the industry**.
- Although thermal bridges need to be accounted for (and generally reduce total R-values), the minimum DTS total system R-values have also been lowered (from R_T 2.3-2.8 to generally R_T 1.0-1.4) such that the **overall impact** is somewhat mitigated. It will be a process of working through standard wall solutions and understanding the impacts.
- These changes will result in more accurate estimation of thermal performance. Previously, ESD and mechanical services consultants would use 'idealised' centre-of-insulation total R-values for load estimation and modelling. These values over-estimated the performance of the thermal envelope. The changes now mean alignment across the industry.
- Limitations of roof palettes for DTS compliant solutions **will come as a shock to most architects**. It is likely that the maintained use of dark roofs for non-residential buildings will necessitate performance-based JV3 modelling as these will not be compliant with solar absorptance requirements.
- The new method of calculating total system R-value provided by slab-on-ground floors will likely indicate that, for some building forms, under slab insulation is required. However, we expect that this will be one area where rationalisation will be desired through performance-based JV3 modelling.
- Overall, consideration of the thermal envelope in a more accurate way **is of benefit to the industry**. The changes sharpen the edges of what was previously a very blunt tool.

FURTHER INFORMATION

Please refer to the full series of Lucid NCC Section J 2019 technical notes for further discussion of the changes. If you require assistance on a specific project or have a general query related to NCC Section J 2019, please contact Lucid Consulting at the following address (NCC2019SectionJ@lucidconsulting.com.au) and a member of our Energy and Sustainability team will be in contact to assist you.

