

Downlights

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The problem with downlights

Downlights create a hole in your ceiling which reduces the effectiveness of your insulation. Downlights used in lower storeys are fine, but when there is only roof space above the ceiling, they penetrate the insulating bubble (often called the thermal envelope) that surrounds your home. This is made worse by the need to leave a safety gap between the downlight and any insulation in the ceiling. Because the incandescent or halogen bulbs used in downlights run very hot, fire is a very real possibility. Safety regulations mandate a 150mm un-insulated gap around the downlights, and downlight cans should never be covered.

The upshot is that your warm heated air is drawn up into the colder roof-space and your ceiling insulation cannot work as well as it should. This is shown in a 2006 Standard for the installation of insulation: *NZS4246 (Energy Efficiency – Installing insulation in residential buildings: 2006)*. It includes a table which quantifies the effect on R-values of the number of downlights in a ceiling. To meet the Building Code, new homes in the South Island, for example, are required to have ceiling insulation rated at R3.3. Downlights installed every 3 square metres would reduce your insulation effectiveness by R0.6 bringing your insulation rating down to R2.7. In most of the North Island, new homes should have ceiling insulation rated at R2.9. Install downlights every 5 square metres, and your insulation effectiveness is reduced by 10% to R2.6.

Additionally, downlights in wet areas, like bathrooms and kitchens, can allow moist air into roof spaces and around concealed framing, resulting in condensation and possible moisture damage.



Case studies show downlights reduce the performance of insulation


Beacon renovated and then monitored the performance of nine homes in Papakowhai, Porirua. One case study home had 38 downlights penetrating the ceiling of the living, kitchen and dining areas, approximately one downlight per 1.6m². Each had a 150-200mm-diameter un-insulated circle around it, significantly compromising the ceiling's effective R-value. Although ceiling insulation was upgraded to R5.2 in the living areas, the number of downlights meant effectively that 7.6m² of the ceiling would be un-insulated. The actual R value of the insulation in the living areas would have been more like R2.5, less than the current Building Code minimum. This was reflected in the low temperature improvements for this house, which raised indoor living room temperatures by only 1.1°C to a chilly average of 14.7°C.





As another example, another home had 47 downlights throughout the house, equating to 1 downlight per 1.2m² and 6.1m² of un-insulated ceiling. Although the ceiling insulation was designed to reach R4, the number of downlights meant that it effectively reached only R2.2.

New downlight standards

As of May 2012, new rules were introduced for downlights (recessed luminaires). These introduced new classes of recessed downlights that eliminate clearances and ensure safer installation with surrounding thermal insulation. The standard aims to ensure that downlights “will not be unsafe if thermal insulation, which is specified as safe to use with downlights, is installed incorrectly over it.”

All new products manufactured or imported into NZ must be now be in one of five new classes, of which four may be used in residential buildings. Residential class downlights must be safe if accidentally covered with building insulation. Downlight manufacturers must state what building/thermal insulation is safe and compatible to use with the downlight.

Classification	Description	Label
NON-IC	Not allowed to have any insulation within 100mm and cannot be installed in residential buildings	

CA135	Type CA 135, closed abutted, recessed luminaire where fixed, building insulating material that can safely be exposed continuously to temperatures up to 150°C must not cover but may closely abut the sides of the luminaire. The symbol shall be permanently marked on the back of the fitting, be clearly visible, at least 20 mm high and clearly legible.	
CA80	Type CA 80, closed abutted, recessed luminaire where fixed, building insulating material that can safely be exposed continuously to temperatures up to 90°C must not cover but may closely abut the sides of the luminaire. The symbol shall be permanently marked on the back of the fitting, be clearly visible, at least 20 mm high and clearly legible.	
IC	Type IC recessed luminaire where building insulation that can safely be exposed continuously to temperatures up to 90°C may abut and cover the luminaire. The symbol shall be permanently marked on the back of the fitting, be clearly visible, at least 20 mm high and clearly legible.	
IC-F	Type IC-F recessed luminaire where building insulation that can safely be exposed continuously to 90°C may abut or cover the luminaire. The symbol shall be permanently marked on the back of the fitting, be clearly visible, at least 20 mm high and clearly legible. Resistant to ingress of external matter.	

What can you do?

The best options: To get the most benefit from your ceiling insulation, replace your downlights with non-downlight fittings and fill in the hole in the insulation. You may be able to source a surface-mounted or pendant fitting which will cover and seal the downlight hole, or if you are undertaking major renovations, re-do your ceiling plasterboard.

Alternatively replace your downlights with new IC rated lights which can have insulation abutting and covering the lights.

Until you can renovate: Replace your old downlights with ‘CA-rated’ downlights. These downlights allow insulation to be butted directly up to them (‘closed abutted’ or ‘CA-rated’). They have an enclosed canister to stop the insulation being exposed to the heat from the bulb. However, you still cannot fit insulation (such as a blanket) over the top of the downlights. As well as changing your downlights, you should consider upgrading your ceiling insulation to compensate for the lost warmth. There is a range of CA-rated downlights available on the market. If you are not sure of the type you need, check with a registered electrical contractor.

For more information:

- See Fact sheet on ‘Energy efficient lighting’
- Further advice on alternative lighting options is available from www.rightlight.govt.nz .
- Consumer NZ have also recently reported on the downside of downlights – you can access their report at: www.consumer.org.nz/reports/recessed-downlights/introduction