



Ministry of Business,
Innovation & Employment



Energy Efficiency and
Conservation Authority
Te Tari Tiaki Pūngao

Guide for retrofitting wall insulation (Blanket, segment, rigid and semi-rigid sheet type insulation only)



Guide for retrofitting wall insulation

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1.0 Introduction



This guide provides best practice guidelines for retrofitting the most common types of wall insulation (blanket, segment, rigid and semi-rigid sheet¹) into framed external walls of existing houses.

This guide is aimed at experienced insulation installers who are familiar with the principles of Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency – Installing insulation in residential buildings².

This guide does not set mandatory minimum Building Code requirements. Insulation products, wall constructions and installation methods not covered in this guide may also be appropriate and compliant.

1. For definitions refer to Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency - Installing insulation in residential buildings. In addition, semi-rigid insulation must be self-supporting and dimensionally stable. Injected or sprayed foam insulation, loose fill insulation and foil insulation are outside the scope of this guide.
2. NZS 4246 can be viewed online free of charge on EECA's website www.eeca.govt.nz (search "4246").

2.0 Choosing a wall insulation product

- Check the insulation product complies with Standard AS/NZS 4859: 2002 Materials for the thermal insulation of buildings - General criteria and technical provisions.
- Ensure the product is fit for purpose and designed for insulating walls.
- If the insulation is to be installed from the inside, check the installation guidelines below for further insulation product requirements specific to:
 - walls with wall underlay
 - walls without wall underlay and with direct fixed cladding
 - walls without wall underlay and with drained/veneer cavities
- Insulation that is installed around recessed luminaires in a wall should comply with the needle flame test in AS/NZS 60695.11.5 (applying the flame for 30-seconds duration).
- In a wall that will remain unlined (i.e. where the insulation will remain exposed to the interior space) do not use foamed plastic or combustible insulation.³
- Foamed plastic insulation installed in lined walls must comply with the flame propagation criteria as specified in AS 1366.



3. Foamed plastics include expanded or extruded polystyrene foams, urea formaldehyde foams and polyurethane foams. Criteria for determining if insulation is combustible are given in AS 1530.1 clause 3.4. Alternatively, if insulation (including foamed plastics or combustible insulation) achieves a Group Number of 3 when tested in accordance with ISO 9705 it can be installed into walls that are to remain unlined (i.e. the insulation will be exposed to the interior). Foamed plastic insulation installed into unlined walls must also comply with the flame propagation criteria as specified in AS 1366. If in doubt contact the insulation manufacturer or supplier for confirmation.

3.0 Building consent

Retrofitting wall insulation needs a building consent unless the local building consent authority has granted an exemption for this type of work under Schedule 1 of the Building Act. Either way, the work must comply with the Building Code. Check local building consent requirements with the building services or building planning department of the appropriate local council.

Christchurch and Canterbury

- Building Consent Authorities (local councils) involved in the Canterbury earthquake recovery regularly review schedules of 'exempt work'. Check with them to find out the latest requirements.
- Christchurch City Council has exempted the installation of segment type thermal insulation in external wall cavities from requiring a building consent with the following limitations:
 - Foam injected or loose fill insulation are outside the scope of this exemption
 - Fire resistance rated walls are outside the scope of this exemption
 - Building wrap or breather-type building paper is required to be in place behind the existing exterior cladding system
 - Timber framing to have a moisture content in accordance with NZS3602:2003 (below 18% moisture content)
- For more information, contact the appropriate local council:
 - Christchurch City Council: Ph (03) 941 8999
www.ccc.govt.nz/homeliving/buildingplanning/index.aspx
 - Selwyn District Council: Ph (03) 347 2800
www.selwyn.govt.nz/services/building
 - Waimakariri District Council: Ph (03) 311 8900
www.waimakariri.govt.nz/services/building_services.aspx

4.0 Inspections before installation

The following checks must be done by the insulation installer. Alternatively the insulation installer must confirm that these checks have been done.

- All cavities and materials must be dry and cleaned of any contaminants, including mould.
- Check the entire wall area and cavity for signs of moisture ingress (e.g. through leaking pipes or window flashings), moisture damage (e.g. rot or mould) or borer.
- Where cladding is not being replaced, look for potential leakage areas such as cracks and gaps in the cladding, split or rotten weatherboards, and missing, corroded or ill-fitting flashings. Any such issues must be remedied by a licensed building practitioner (LBP) before installing wall insulation.
- If greenish-black mould is found when opening the wall cavity, stop work immediately. Take a small sample (on a strip of clear adhesive tape) and send it to a testing lab⁴ to determine what the mould is. Cover the opened area with plastic. If toxic mould (stachybotrys) is identified then specific removal procedures by a specialist contractor need to be followed.
- Non-toxic mould can be removed by thoroughly cleaning the surfaces with either a proprietary mould remover or a household bleach solution (1 ½ cups of bleach to 4 litres of water). Surfaces should be allowed to dry thoroughly. For further information on mould clean-up procedures refer to the Mould information sheet available on www.dbh.govt.nz/ws-mould-info-sheet.
- All incidences of rot or borer should be referred to the homeowner and earthquake repair contractor for appropriate remediation before installing insulation.
- The moisture content of timber framing should be 20% or less before insulation is installed (check the bottom plate in particular).⁵
- Where cladding is not being replaced, check the presence and condition of wall underlay behind the cladding.
- Confirm that an electrician has inspected all wiring inside the wall cavities and has confirmed that all wiring is in good condition and suitable for being surrounded by thermal insulation. Rewiring or installation of circuit breakers may be necessary where wiring is inadequately rated.
- Identify areas where insulation clearances from hot surfaces such as flues and behind ovens and space heating appliances will be necessary (detailed clearance requirements are provided in the following sections).

4. Examples include Plantwise Services Ltd (www.plantwise.co.nz), Biodet Services Ltd (www.biodet.co.nz), or Airlab Ltd (www.airlab.co.nz)

5. Building Code acceptable solutions B2/AS1 and E2/AS1 require a maximum moisture content of 20% for the timber framing of external walls. Christchurch City Council specifies 18% moisture content as a condition of exempting wall insulation from building consent, which is different to the minimum requirements of the Building Code.

5.0 Installing wall insulation from the outside

- All insulation products (new and existing) must be protected from the weather before, during and after installation. Fitted insulation must be undamaged and dry.
- Ensure the newly installed insulation is protected from the weather by either installing it immediately before the new cladding system is installed, or by providing other suitable protection such as temporary tarpaulins.
- Confirm with the cladding installer that they are aware of the requirement to keep the insulation dry.⁶
- Insulation should be sized to fill the cavity space, without undue compression of the product. Insulation must not be thicker than the width of the framing or protrude beyond the outside of timber framing. Note that some insulation products can take time to reach full loft – check the nominal insulation thickness on the product label.⁷
- Follow manufacturer's installation instructions where provided.
- Install insulation to the Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency – Installing insulation in residential buildings – in particular Sections 5.3 (for blanket and segment-type insulation) and 6.5 (for rigid and semi-rigid sheets)⁸

6. The new cladding system must meet Building Code requirements and should wherever possible meet industry best practice, including correct installation of wall underlay and flashings.

7. Insulation must never push wall underlay against the exterior cladding. Drainage cavities must not be impeded.

8. NZS 4246 section 6.5 step 4 only applies to rigid sheet insulation.

- Minimum clearances from hot equipment/appliances:
 - Recessed light fittings: leave clearances from recessed light fittings in walls as specified in manufacturers instructions (from both light fitting and insulation manufacturer – make sure these are specifically for installations in walls, not ceilings). If manufacturer’s instructions are not known, confirm clearance requirements with a registered electrician. Failing all this, install insulation in the affected wall cavity (bounded by the nearest framing members above, below and to each side of the recessed light fitting) to no higher than 100mm below the recessed light fitting. Leave the remainder of the affected wall cavity above this line uninsulated.
 - Solid fuel appliances: leave clearances of 600mm from built in solid fuel burners. Leave clearances from the flue of any solid fuel burner (that penetrates a wall) of 600mm or four times the flue diameter, whichever is greater.⁹ A guard must be provided to maintain these clearances.
 - Gas appliances: leave clearances of 200mm from the exposed flame of gas appliances (e.g. gas hobs and radiant heaters) and leave clearances of 75mm from the flues of gas appliances (stoves, water heaters and space heaters).¹⁰ For clearances from uncommon gas appliances such as pottery kilns and pool heaters refer to AS/NZS 5601.1.
 - Oil-fired appliances: leave clearances of 230mm from the flues of oil-fired appliances.¹¹
 - Open fires: leave clearances of 50mm from brick chimneys and leave clearances of 200mm from the fireplace opening.¹²
- Insulation will need to be held in place in walls that remain unlined by stapling taut plastic strapping to edges of studs.
- Installers must adhere to all relevant safety requirements (refer to the Health and Safety in Employment Act 1992 (HSE Act), relevant manufacturer’s instructions and NZS 4246 Appendix B).

9. These default clearances may be reduced when non heat-sensitive (i.e. allowable service temperature is greater than 150°C as determined in accordance with AS/NZS 2918) insulation material is used and/or when heat shields are installed. Clearance details are given in AS/NZS 2918 or as per heating appliance manufacturer’s instructions.

10. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS/NZS 5601.1 for detailed requirements for clearances from gas appliances or use heating appliance manufacturer’s instructions.

11. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS 1691 for detailed requirements for clearances from oil fired appliances or use heating appliance manufacturer’s instructions.

12. These default clearances may be reduced when non combustible insulation is used. Refer to the Building Code Acceptable Solution for Protection from Fire, C/AS1 for detailed requirements.

6.0 Installing wall insulation from the inside

6.1 Walls WITH wall underlay

Where there is a wall underlay in place and in good condition (i.e. provides a continuous barrier to liquid moisture), insulation can be installed as follows. (Where the wall underlay is not in good condition follow the guidelines in the section Walls with Direct-fixed Claddings WITHOUT Wall Underlay.)

- Rigid or semi-rigid sheet insulation is recommended to minimise the risk of contact between the insulation/wall underlay and cladding.
- All insulation products must be protected from the weather before, during and after installation. Fitted insulation must be undamaged and dry.
- Insulation should be sized to fill the framed cavity space, without undue compression of the product. Insulation must not be thicker than the width of the framing. Note that some insulation products can take time to reach full loft – check the nominal insulation thickness on the product label.
- Follow manufacturer's installation instructions where provided.
- Install insulation to the Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency – Installing insulation in residential buildings – in particular Sections 5.3 (for blanket and segment-type insulation) and 6.5 (for rigid and semi-rigid sheets).¹³
- Deviating from NZS 4246 section 6.5 step 3, fit the insulation flush with the internal side of the frame.

13. NZS 4246 section 6.5 step 4 only applies to rigid sheet insulation.

- Minimum clearances from hot equipment/appliances:
 - Recessed light fittings: leave clearances from recessed light fittings in walls as specified in manufacturers instructions (from both light fitting and insulation manufacturer – make sure these are specifically for installations in walls, not ceilings). If manufacturer’s instructions are not known, confirm clearance requirements with a registered electrician. Failing all this, install insulation in the affected wall cavity (bounded by the nearest framing members above, below and to each side of the recessed light fitting) to no higher than 100mm below the recessed light fitting. Leave the remainder of the affected wall cavity above this line uninsulated.
 - Solid fuel appliances: leave clearances of 600mm from built in solid fuel burners. Leave clearances from the flue of any solid fuel burner (that penetrates a wall) of 600mm or 4 times the flue diameter, which ever is greater.¹⁴ A guard must be provided to maintain these clearances.
 - Gas appliances: leave clearances of 200mm from the exposed flame of gas appliances (e.g. gas hobs and radiant heaters) and leave clearances of 75mm from the flues of gas appliances (stoves, water heaters and space heaters).¹⁵ For clearances from uncommon gas appliances such as pottery kilns and pool heaters refer to AS/NZS 5601.1.
 - Oil-fired appliances: leave clearances of 230mm from the flues of oil-fired appliances.¹⁶
 - Open fires: leave clearances of 50mm from brick chimneys and leave clearances of 200mm from the fireplace opening.¹⁷
- Insulation will need to be held in place in walls that remain unlined by stapling taut plastic strapping to edges of studs.
- Installers must adhere to all relevant safety requirements (refer to the Health and Safety in Employment Act 1992 (HSE Act), relevant manufacturer’s instructions and NZS 4246 Appendix B).

14. These default clearances may be reduced when non heat-sensitive (i.e. allowable service temperature is greater than 150°C as determined in accordance with AS/NZS 2918) insulation material is used and/or when heat shields are installed. Clearance details are given in AS/NZS 2918 or as per heating appliance manufacturer’s instructions.

15. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS/NZS 5601.1 for detailed requirements for clearances from gas appliances or use heating appliance manufacturer’s instructions

16. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS 1691 for detailed requirements for clearances from oil fired appliances or use heating appliance manufacturer’s instructions.

17. These default clearances may be reduced when non combustible insulation is used. Refer to the Building Code Acceptable Solution for Protection from Fire, C/AS1 for detailed requirements.

6.2 Walls with direct-fixed claddings WITHOUT wall underlay

Where there is no wall underlay or where the existing wall underlay is in poor condition, install rigid or semi-rigid sheet insulation only, as follows.

- All insulation products must be protected from the weather before, during and after installation. Fitted insulation must be undamaged and dry.
- Follow manufacturer's installation instructions where provided.
- Install insulation to the Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency – Installing insulation in residential buildings – in particular Section 6.5 (for rigid and semi-rigid sheets).¹⁸
- Deviating from NZS 4246 section 3.11, a wall underlay need not be retrofitted from the inside.
- Deviating from NZS 4246 section 6.5 step 3, fit the insulation flush with the internal side of the frame.
- A gap between the insulation and the back of the cladding must be maintained. The gap is to ensure that the drainage path on the back of the cladding is maintained.
- In the absence of manufacturer's instructions on how to maintain this gap, use the following procedure:
 - Use insulation that is at least 20mm thinner than the framing width (e.g. for walls with 90mm framing the insulation product must be no thicker than 70mm). This will allow leaving a gap of at least 20mm between the insulation and the external cladding. Note that some insulation products can take time to reach full loft – check the nominal insulation thickness on the product label.
 - Before fitting the insulation, install strapping horizontally at intervals no greater than 300mm centres by stapling into the sides of the wall studs.
 - The strapping must be installed in a way that prevents the insulation moving towards the cladding and ensures a 20mm minimum gap between the insulation and cladding will be maintained.
 - Alternatively, where rigid insulation is used, rigid plastic/metal angle may be fixed to the wall framing in a way that prevents the insulation moving towards the cladding and ensures a 20mm minimum gap between the insulation and cladding will be maintained.

18. NZS 4246 section 6.5 step 4 only applies to rigid sheet insulation.

- Minimum clearances from hot equipment/appliances:
 - Recessed light fittings: leave clearances from recessed light fittings in walls as specified in manufacturers instructions (from both light fitting and insulation manufacturer – make sure these are specifically for installations in walls, not ceilings). If manufacturer’s instructions are not known, confirm clearance requirements with a registered electrician. Failing all this, install insulation in the affected wall cavity (bounded by the nearest framing members above, below and to each side of the recessed light fitting) to no higher than 100mm below the recessed light fitting. Leave the remainder of the affected wall cavity above this line uninsulated.
 - Solid fuel appliances: leave clearances of 600mm from built in solid fuel burners. Leave clearances from the flue of any solid fuel burner (that penetrates a wall) of 600mm or 4 times the flue diameter, which ever is greater.¹⁹ A guard must be provided to maintain these clearances.
 - Gas appliances: leave clearances of 200mm from the exposed flame of gas appliances (e.g. gas hobs and radiant heaters) and leave clearances of 75mm from the flues of gas appliances (stoves, water heaters and space heaters).²⁰ For clearances from uncommon gas appliances such as pottery kilns and pool heaters refer to AS/NZS 5601.1.
 - Oil-fired appliances: leave clearances of 230mm from the flues of oil-fired appliances.²¹
 - Open fires: leave clearances of 50mm from brick chimneys and leave clearances of 200mm from the fireplace opening.²²
- Insulation will need to be held in place in walls that remain unlined by stapling taut plastic strapping to edges of studs.
- Installers must adhere to all relevant safety requirements (refer to the Health and Safety in Employment Act 1992 (HSE Act), relevant manufacturer’s instructions and NZS 4246 Appendix B).

19. These default clearances may be reduced when non heat-sensitive (i.e. allowable service temperature is greater than 150°C as determined in accordance with AS/NZS 2918) insulation material is used and/or when heat shields are installed. Clearance details are given in AS/NZS 2918 or as per heating appliance manufacturer’s instructions.

20. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS/NZS 5601.1 for detailed requirements for clearances from gas appliances or use heating appliance manufacturer’s instructions

21. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS 1691 for detailed requirements for clearances from oil fired appliances or use heating appliance manufacturer’s instructions.

22. These default clearances may be reduced when non combustible insulation is used. Refer to the Acceptable Solution for Protection from Fire, C/AS1 for detailed requirements.

6.3 Walls with drained/veneer cavities WITHOUT wall underlay

Where there is no wall underlay or where the existing wall underlay is in poor condition, install rigid or semi-rigid sheet insulation only, as follows.

- Choose a rigid or semi-rigid sheet insulation product that is no thicker than the structural wall framing (i.e. usually 90-100mm). Note that some insulation products can take time to reach full loft – check the nominal insulation thickness on the product label.
- All insulation products must be protected from the weather before, during and after installation. Fitted insulation must be undamaged and dry.
- Follow manufacturer's installation instructions where provided.
- Install insulation to the Standard NZS 4246: 2006 (incorporating Amendment No. 1) Energy efficiency – Installing insulation in residential buildings – in particular Section 6.5 (for rigid and semi-rigid sheets).²³
- Deviating from NZS 4246 section 3.11, a wall underlay need not be retrofitted from the inside.
- Deviating from NZS 4246 section 6.5 step 3, fit the insulation flush with the internal side of the frame.
- Insulation must not protrude beyond the outside of the wall framing into the drained/veneer cavity.
- In the absence of manufacturer's instructions on how to prevent the insulation protruding beyond the outside of the wall framing into the drained/veneer cavity use the following procedure:
 - Before fitting the insulation, install strapping horizontally at intervals no greater than 300mm centres by stapling into the sides of the wall studs.
 - The strapping must be installed in a way that prevents the insulation from protruding beyond the outside of the wall framing into the drained/veneer cavity.
 - Where rigid insulation is used, alternatively rigid plastic/metal angle may be fixed to the wall framing in a way that prevents the insulation from protruding beyond the outside of the wall framing into the drained/veneer cavity.

23. NZS 4246 section 6.5 step 4 only applies to rigid sheet insulation.

- Minimum clearances from hot equipment / appliances:
 - Recessed light fittings: leave clearances from recessed light fittings in walls as specified in manufacturers instructions (from both light fitting and insulation manufacturer – make sure these are specifically for installations in walls, not ceilings). If manufacturer’s instructions are not known, confirm clearance requirements with a registered electrician. Failing all this, install insulation in the affected wall cavity (bounded by the nearest framing members above, below and to each side of the recessed light fitting) to no higher than 100mm below the recessed light fitting. Leave the remainder of the affected wall cavity above this line uninsulated.
 - Solid fuel appliances: leave clearances of 600mm from built in solid fuel burners. Leave clearances from the flue of any solid fuel burner (that penetrates a wall) of 600mm or 4 times the flue diameter, which ever is greater.²⁴ A guard must be provided to maintain these clearances.
 - Gas appliances: leave clearances of 200mm from the exposed flame of gas appliances (e.g. gas hobs and radiant heaters) and leave clearances of 75mm from the flues of gas appliances (stoves, water heaters and space heaters).²⁵ For clearances from uncommon gas appliances such as pottery kilns and pool heaters refer to AS/NZS 5601.1.
 - Oil-fired appliances: leave clearances of 230mm from the flues of oil-fired appliances.²⁶
 - Open fires: leave clearances of 50mm from brick chimneys and leave clearances of 200mm from the fireplace opening.²⁷
- Insulation will need to be held in place in walls that remain unlined by stapling taut plastic strapping to edges of studs.
- Installers must adhere to all relevant safety requirements (refer to the Health and Safety in Employment Act 1992 (HSE Act), relevant manufacturer’s instructions and NZS 4246 Appendix B).

24. These default clearances may be reduced when non heat-sensitive (i.e. allowable service temperature is greater than 150°C as determined in accordance with AS/NZS 2918) insulation material is used and/or when heat shields are installed. Clearance details are given in AS/NZS 2918 or as per heating appliance manufacturer’s instructions.

25. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS/NZS 5601.1 for detailed requirements for clearances from gas appliances or use heating appliance manufacturer’s instructions

26. These default clearances may be reduced when non combustible insulation is used and/or when fire resistant material protects the wall being insulated. Refer to AS 1691 for detailed requirements for clearances from oil fired appliances or use heating appliance manufacturer’s instructions.

27. These default clearances may be reduced when non combustible insulation is used. Refer to the Acceptable Solution for Protection from Fire, C/AS1 for detailed requirements.



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