



Department of
Building and Housing
Te Tari Kaupapa Whare

Consultation on changes to the NZBC H1 Compliance Document for hot water systems and HVAC systems

Closing date for comments: **8 October 2008**

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PO Box 10-729
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This document is available on the Department's website:
www.dbh.govt.nz/energy-efficiency



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Request for comment

The Department of Building and Housing seeks feedback on the proposed changes to the H1 Compliance Document for hot water and HVAC energy efficiency.

Proposals to improve the energy efficiency of HVAC systems in commercial buildings and to improve the energy efficiency of hot water systems in houses were consulted on in May 2007. These involved amendments to the New Zealand Building Code (NZBC) and amendments to the H1 Compliance Document. Changes to the NZBC clause H1 have now been made and come into force on 1 February 2009.

The proposed changes to the H1 Compliance Document have been further modified to take into account feedback received from the 2007 consultation. The Department is seeking final comments on the draft Compliance Document before it is published in October 2008. All submissions received by the Department will be carefully considered before the Compliance Document is finalised.

The hot water amendments and the HVAC amendments have been packaged together into one consultation document rather than releasing the proposed amendments individually. Comments can be submitted on individual topic areas.

How to comment

Please submit your comments in writing. Typed comments are preferred, but clear handwriting will be accepted.

The closing date for submitting comments on the proposed changes is **8 October 2008**

They need to be sent or couriered to:

Consultation Feedback – Energy Efficiency
Department of Building and Housing
Building Standards
Level 6, 86 Customhouse Quay
PO Box 10-729
Wellington

or emailed to comments@dbh.govt.nz; please put 'Consultation Feedback – Energy Efficiency' in the subject line

or faxed to (04) 494 0290.

Important note

Please note that all responses will be public information. Responses may be the subject of requests for information under the Official Information Act 1982 (OIA). The OIA specifies that information is to be made available to requesters unless there are sufficient grounds for withholding it, as set out in the OIA. Submitters may wish to indicate grounds for withholding specific information contained in their submission, such as that the information is commercially sensitive or that they wish personal information to be withheld. Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

1 Summary of changes from the 2007 proposals¹

1.1 Hot water systems in houses

- The **NZBC Clause H1 Energy Efficiency** has been amended and will from 1 February 2009 include a new Performance H1.3.4(c), which requires hot water systems to facilitate the efficient use of hot water in houses. The NZBC Performance H1.3.4(b) has also been amended to require heat losses from distribution systems connected to instant water heaters to be energy efficient, as well as those connected to storage systems.
- A proposed **hot water energy efficiency calculator** has been refined and minor modification made to its functionality and rating targets. The calculator is currently being developed into an online compliance tool that will be freely available. The calculation tool will be a Verification Method for the new NZBC Performance H1.3.4(c).
- A **new Acceptable Solution** has been drafted that describes a limited number of hot water systems that are deemed to comply with the new NZBC Performance H1.3.4(c). The Acceptable Solution provides a simple ‘tick-box’ compliance option, but is typically conservative as a consequence.
- The current Acceptable Solution (H1/AS1 Paragraph 5.0) has been modified to require **all new hot water pipes must be insulated** (as per the 2007 proposal¹).

1.2 HVAC systems in commercial buildings

- The **NZBC Clause H1 Energy Efficiency** has been amended to require HVAC systems in commercial buildings to be energy efficient. These amendments take effect on 1 February 2009 as well. The amendments are:
 - i. the limitation on the Functional Requirement H1.2(a) for “plant and equipment provided to modify temperature, humidity, or both” has been removed,
 - ii. a new Functional Requirement H1.2(d) for the energy efficiency of ventilation has been added,
 - iii. a new Performances criterion H1.3.6 has been added that requires HVAC systems to be energy efficient and be able to be maintained to continue to be energy efficient.
- A new **Verification Method** been drafted that modifies the current modelling method in NZS 4243.1:2007.
- The proposed **Acceptable Solution** has been refined and minor modification made to its requirements.
- The proposal for metering energy use in buildings with HVAC systems has been dropped. A number of problems were highlighted for buildings with multiple tenancies and energy suppliers. In addition, the value of metering energy use without requiring the consumption to be reported is questionable. Mandatory energy reporting will be investigated as part of the New Zealand Energy Efficiency and Conservation Strategy (NZECS).

¹ The consultation document describing the original energy efficiency proposals for hot water and HVAC systems can be downloaded from the Departments website, www.dbh.govt.nz/may-2007-energy-efficiency

2 Hot water systems in houses

The original proposal for the hot water energy efficiency amendments can be downloaded at, www.dbh.govt.nz/may-2007-energy-efficiency.

The 2007 consultation document is called,

Energy efficiency of buildings (domestic hot water and commercial heating, ventilation and air-conditioning systems). Consultation on energy efficiency revisions to the New Zealand Building Code and Compliance Documents (Part 2)

The following section outlines the changes that have been made to the original proposal.

2.1 Building Code amendments

Amendments have been made to the New Zealand Building Code Clause H1, in relation to the performance of hot water energy efficiency as given below. A copy of the regulations, Building (Building Code: Energy Efficiency of Domestic Hot Water Systems) Amendment Regulations 2008 (SR 2008/256), can be downloaded at www.dbh.govt.nz/energy-efficiency.

Performance

H1.3.4 Systems for the heating, storage, or distribution of hot water to and from sanitary fixtures or sanitary appliances must, having regard to the energy source used,—

- (a) limit the energy lost in the heating process; and
- (b) be constructed to limit heat losses from storage vessels and from distribution systems; and
- (c) be constructed to facilitate the efficient use of hot water.

Limits on application

Performance H1.3.4(b) does not apply to individual storage vessels that are greater than 700 litres in capacity.

Performance H1.3.4(c) applies only to housing.

2.2 H1 Compliance Document amendments

2.2.1 Hot water calculator as a Verification Method

The design rating for hot water systems previously consulted on has been turned into an on-line calculator that will be made available on the Department’s website. The efficiency rating of a hot water system and the target efficiency required for compliance with H1.3.4(c) will be able to be easily saved or printed for later use when a building consent is application is made.

For this consultation an Excel spreadsheet is provided that reproduces the functionality of the on-line calculator. The spreadsheet is called **hot-water-calculator.xls** and can be downloaded at **www.dbh.govt.nz/energy-efficiency**

Changes to the spreadsheet from that consulted on previously are as follows:

- additional types of water heating have been included, i.e. geothermal and solid fuel
- performance data for solar and heat pump water heaters that have been assessed using AS/NZS 4234:2008 can be entered
- a bonus for electric storage cylinders that can readily have solar, heat-pump or wet-back water heating retrofitted has been added
- start up losses of instantaneous gas water heaters has been added
- the required target efficiencies have been adjusted

2.2.2 Proposed wording of hot water systems in Verification Method, H1/VM1

Current text	Proposed changes
	<p>2.0 Hot Water Systems</p> <p>2.1 A hot water system that achieves an efficiency rating, calculated using the Hot Water Calculator, and that meets the targets specified in the Hot Water Calculator satisfies the requirements of NZBC H1.3.4(c).</p> <p>COMMENT:</p> <ol style="list-style-type: none"> 1. The Hot Water Calculator is an on-line tool that is available at, www.dbh.govt.nz/hot-water-calculator 2. The rating inputs, the performance and the efficiency target for the hot water system can be saved to an electronic file (PDF format) or printed out from the Calculator.

2.2.2 Hot water system Acceptable Solution

A new section of the Acceptable Solution (H1/AS1) for the new Building Code Performance H1.3.4(c) has been drafted that lists a number of different types of water heating systems and gives restrictions on the components of the systems for compliance. This Acceptable Solution (H1/AS Paragraph 5.2) will provide a simple means of compliance for those who do not wish to use the on-line calculator. It should be noted that the Acceptable Solution is generally conservative as it must allow for the worst case scenario where the simplified description of a

hot water system does not fully specified its performance (e.g. an instant gas heater is assumed to be 75% efficient as specified in NZS4305:1996, but more efficient heaters are readily available).

H1/AS1 Paragraph 5.2 also allows for the repair, replacement or extension of an existing hot water system. The hot water energy efficiency calculator cannot be applied to a single component or part of a system and so is unsuitable for application to repairs, replacements or extensions to existing hot water systems. Repairs, the parts that are replaced, or the extensions to an existing hot water system will satisfy the requirements of the Code Clause H1.3.4(c) provided that any such alteration must not make a hot water system less efficient (refer Section 112(1)(b) of the Building Act). Therefore any component that is replaced/added to an existing hot water system cannot be less efficient than that of the existing system. For example, if a shower head and mixer is replaced, then the new shower head and mixer must have a flow rate no greater than the original unit.

The current Acceptable Solution has also been modified to require all hot water pipes to be insulated.

2.2.3 Proposed wording of hot water Acceptable Solution, H1/AS1

Current text	Proposed changes
<p>5.0 Hot Water Systems</p>	<p>5.0 Hot Water Systems</p>
<p>5.0.1 Hot water systems complying with NZS 4305 satisfy the requirements of NZBC H1.3.4 for the provision of hot water to <i>sanitary fixtures and sanitary appliances</i>.</p>	<p>5.0.1 Hot water systems complying with NZS 4305:1996 as modified in Paragraph 5.1 satisfy the requirements of NZBC H1.3.4(a) and H1.3.4(b).</p>
<p>COMMENT:</p> <ol style="list-style-type: none"> NZS 4305 deals with domestic type electrical and gas systems having a storage water heater capacity of up to 700 litres. Larger systems and their associated piping are not controlled by the NZBC. The manufacture and sale of hot water cylinders is covered by the Energy Efficiency (Energy Using Products) Regulations 2002. 	<p><i>Existing comment deleted</i></p>
	<p>5.1 Modifications to NZS 4305</p> <p>5.1.1 The following note is added to Clause 2.2.3, of NZS 4305, “Note: AG 102:1976 has been superseded by AS 4552—2005 Gas fired water heaters for hot water supply and/or central heating, which is also an acceptable method of test.”.</p> <p>5.1.2 Clause 3.7.1 in NZS 4305 is replaced with “Hot water distribution pipes shall be thermally insulated.”.</p> <p>5.1.3 Clause 3.7.2 in NZS 4305 is deleted.</p> <p>5.1.4 Clause 3.7.3, in NZS 4305 is deleted.</p>

5.2 System Requirements for Housing Only

5.2.1 Hot water systems that include at least one shower satisfy the requirements of NZBC H1.3.4(c) for *housing* when,

- a) the floor area of the building is less than 150 m², and
- b) no more than three rooms may be used as bedrooms, and
- c) the hot water system complies with one of the following paragraphs i to v,
 - i) an electric storage water heater with a resistance element, and
 - all showers have a maximum flow rate of 7.5 L/min, and
 - the storage cylinder has a maximum capacity of 180 L and is located indoors
 - or,
 - ii) an instantaneous gas water heater, and
 - all showers have a maximum flow rate of 9.0 L/min
 - or,
 - iii) a solar water heater with a minimum collector area of 2 m², and
 - all showers have a maximum flow rate of 9.0 L/min
 - or,
 - iv) an electric heat pump water heater, and
 - all showers have a maximum flow rate of 12 L/min
 - or,
 - v) a gas storage water heater connected to natural gas (reticulated supply) or LPG, and
 - all showers have a maximum flow rate of 6.0 L/min, and
 - the storage cylinder has a maximum capacity of 180 L and is located indoors

5.2.2 Hot water systems that include at least one shower and comply with one of the following paragraphs i to v satisfy the requirements of NZBC H1.3.4(c) for *housing*.

- i) an electric storage water heater with resistance element, and
- all showers have a maximum flow rate of 6.0 L/min, and
 - the storage cylinder has a capacity of at least 180 L and no greater than 315 L, and
 - the storage cylinder has a heat exchange coil fitted that is suitable for connection to a closed loop solar water heater, and
 - the storage cylinder has two heating element positions, one within 150 mm of the bottom of the cylinder and one in the top half of the cylinder.

or,

- ii) an instantaneous gas water heater, and
- all showers have a maximum flow rate of 7.5 L/min

or,

- iii) a solar water heater with a minimum collector area of 4.0 m², and
- all showers have a maximum flow rate of 7.5 L/min

or,

- iv) an electric heat pump water heater, and
- all showers have a maximum flow rate of 12 L/min

or,

- v) a gas storage water heater connected to natural gas (reticulated supply), and
- all showers have a maximum flow rate of 6.0 L/min, and
 - the storage cylinder has a maximum capacity of 310 L and is located indoors

COMMENT:

1. Paragraph 5.2.1 only applies to housing that is less than 150 m² in size and has 3 bedrooms or less.
2. Paragraph 5.2.2 applies to housing of any size, with any number of bedrooms.
3. Hot water systems in *houses* that have a bath, and no shower, must use H1/VM1 for compliance.

5.2.3 Hot water systems that do not include, or are not connected to, a shower or bath satisfy the requirements of NZBC H1.3.4(c).

COMMENT:

Paragraph 5.2.3 will typically apply to secondary systems that have no shower or bath use.

5.2.4 Repairs, replacements and extensions to parts of a hot water system satisfy the requirements of NZBC H1.3.4(c) provided that the system as a whole performs no worse than it did before the repair or alteration.

COMMENT:

1. Paragraph 5.2.4 only applies to parts of a hot water system. It does not apply to the replacement of a whole hot water system, which must comply with Paragraphs 5.2.1 or 5.2.2, or H1/VM1, or an alternative solution.
2. Note that a hot water system that is altered (including repairs, replacements or extensions) must still comply with NZBC H1.3.4(c) to at least the same extent as before the alteration. This means that a component of lesser performance cannot be substituted into an existing system as part of a repair or replacement, and that after an extension the whole system cannot perform less efficiently than it did before the extension.
3. The hot water rating in H1/VM1 cannot be applied to individual components/parts of a hot water system, making it difficult to apply H1/VM1 to repair, replacement or extension of hot water systems. Paragraph 5.2.4 allows this building work to proceed but does not allow reduction in energy efficiency.

3 HVAC systems in commercial buildings

The original proposal for the HVAC system energy efficiency amendments can be downloaded at, www.dbh.govt.nz/may-2007-energy-efficiency.

The 2007 consultation document is called,

Energy efficiency of buildings (domestic hot water and commercial heating, ventilation and air-conditioning systems). Consultation on energy efficiency revisions to the New Zealand Building Code and Compliance Documents (Part 2)

The following section outlines the major changes that have been made to the original proposal.

3.1 Building Code amendments

Amendments have been made to the New Zealand Building Code Clause A2 and Clause H1, in relation to the performance of HVAC system energy efficiency as given below. These amendments come into force on 1 February 2009. A copy of the regulations, Building (Building Code: Energy Efficiency of Temperature, Humidity, and Ventilation Systems) Amendment Regulations 2008 (SR 2008/97), can be downloaded at www.dbh.govt.nz/energy-efficiency.

Clause A2 Interpretation contains a new definition for HVAC systems as follows:

HVAC system, for the purposes of performance H1.3.6 and in relation to a building, means a mechanical, electrical, or other system for modifying air temperature, modifying air humidity, providing ventilation, or doing all or any of those things, in a space within the building

Clause H1 Energy Efficiency has been modified as follows:

Functional requirement

H1.2 Buildings must be *constructed* to achieve an *adequate* degree of energy efficiency when that energy is used for—

- (a) modifying temperature, modifying humidity, providing ventilation, or doing all or any of those things; or
- (b) providing hot water to and from *sanitary fixtures* or *sanitary appliances*, or both; or
- (c) providing artificial lighting

Limits on application

Requirement H1.2(a) does not apply to assembly service buildings, industrial buildings, outbuildings, or ancillary buildings.

Requirement H1.2(c) applies only to *commercial* buildings and *communal non-residential* buildings whose floor area is greater than 300 m².

Performance

H1.3.6 HVAC systems must be located, constructed, and installed to

- (a) limit energy use, consistent with the *intended use* of space; and
- (b) enable them to be maintained to ensure their use of energy remains limited, consistent with the *intended use* of space.

Limits on application

Performance H1.3.6 applies only to *commercial buildings*.

3.2 H1 Compliance Document amendments

3.2.1 Verification Method H1/VM1 modified to include HVAC systems

The Modelling Method in NZS 4243.1:2007 is currently used as a Verification Method for large building energy efficiency provisions in H1. It covers the performance of the thermal envelope (i.e. H1.3.1(a)) and lighting (H1.3.5). However, the efficiency of HVAC systems is currently excluded from the energy modelling assumptions that are allowed in the standard. It is proposed to modify the wording of the NZS 4243.1, to allow the energy efficiency of HVAC systems to be accounted for within the energy modelling results.

3.2.2 Proposed changes to wording of Verification Method, H1/VM1

Current text	Proposed changes
<p>1.3 Modelling of large buildings other than housing</p> <p>1.3.1 The modelling method described in NZS 4243.1 Section 4.4 is a Verification Method for NZBC Clause H1.3.1(a) for <i>buildings</i> other than HOUSING having a net lettable area greater than 300 m².</p> <p>COMMENT:</p> <p>1. If artificial lighting is included when applying the modelling method of NZS 4243.1 Section 4.4 there is no need to comply separately with NZS 4243.2 Section 3.3 or 3.4.</p> <p>2. Note the limits on application to NZBC Clause H1.2(a) and H1.2(c).</p>	<p>1.3 Modelling of large buildings other than housing</p> <p>1.3.1 The modelling method described in NZS 4243.1 Section 4.4 is a Verification Method for NZBC Clause H1.3.1(a) for <i>buildings</i> other than HOUSING having a net lettable area greater than 300 m².</p> <p>COMMENT:</p> <p>Note the limits on application to NZBC Clause H1.2(a).</p> <p>1.3.2 The modelling method described in NZS 4243.1 Section 4.4 is a Verification Method for NZBC Clause H1.3.5.</p> <p>COMMENT:</p> <p>Note the limits on application to NZBC Clause H1.2(c).</p>

1.3.3 The modelling method described in NZS 4243.1 Section 4.4, modified as in Paragraph 1.3.4 below, is a Verification Method for NZBC Clause H1.3.6(a).

COMMENT:

Note the limits on application to NZBC Clause H1.2(a) and H1.3.6.

1.3.4 Modifications to NZS4243

When used as a Verification Method for H1.3.6(a) NZS 4243.1 shall be modified as follows,

- i) replace Paragraph 4.4.3 with “**4.4.3** The computer modelling and calculation (simulation) method used shall be tested according to ANSI/ASHRAE Standard 140 and the results shall be furnished by the software provider.”
- ii) delete the words “(sizing only)” in Paragraph C1.3.2(f)
- iii) delete Paragraph C1.4.3(j)
- iv) replace Paragraph C5.1, with “**C5.1** The heating, cooling and ventilation plant in the proposed building shall be modelled as shown.”
- v) replace Paragraph C5.2 with, “**C5.2** The load from heating, cooling and ventilation plant not covered by the Acceptable Solution H1/AS1 7.0 shall be modelled the same in proposed building and the reference building.”
- vi) replace Paragraph C5.3 with, “**C5.3** The heating, cooling and ventilation load in the reference building shall be modelled as the HVAC load permitted in the Acceptable Solution H1/AS1 7.0. Alternatively, the HVAC load of the proposed building may be used if this is less than the load permitted by the Acceptable Solution H1/AS1 7.0.”
- vii) replace Paragraph C5.4 with “**C5.4** The internal conditions shall be the same for both the proposed building and the reference building”
- viii) replace Paragraph C5.5 with “**C5.5** The occupancy schedules for commercial buildings shall be 10 hours per day, 5 days per week, or as shown in the relevant part of table C2, unless a different schedule can be justified as a likely schedule for the foreseeable life of the building.”
- viii) delete paragraph C5.6

ix) delete Paragraph C5.6

3.2.3 Proposed wording of HVAC Acceptable Solution, H1/AS1

The original proposal for the additions to the Acceptable Solution for energy efficiency of HVAC systems has been modified to incorporate feedback received from the 2007 consultation. The amended wording is as follows.

7.0 Mechanical Heating, Cooling, Ventilation or Air-conditioning systems

HVAC systems that comply with the design limits set out in Paragraphs 7.1 to 7.5 satisfies NZBC Clause H1.3.6(a)

7.1 Controls

Systems shall be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use. In normal circumstances, the following features would be appropriate for mechanical heating, cooling, ventilation or air-conditioning system controls:

7.1.1 The systems shall be sub-divided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, or pattern, or type of use; and

7.1.2 Each separate control zone shall be capable of independent temperature control, and independent control of ventilation and recirculation rate where the HVAC design provides the ability for such independent control without significant additional control hardware; and

7.1.3 The provision of the service shall respond to the requirements of the space it serves. If both heating and cooling are provided to an individual control zone, they should be controlled so as not to operate simultaneously within that zone; and

7.1.4 Central plant shall only operate as and when the zone systems require it, except that where non-communicating controls are used, central plant may be controlled by time schedule and outdoor air temperature such as to minimise plant operation when not needed to satisfy zone requirements. The default condition should be off.

7.1.5 In addition to these general control provisions, the systems shall meet specific control and efficiency standards as set out in the paragraphs below.

7.2 Air-conditioning and ventilation systems

7.2.1 Mechanical heating, cooling, ventilation or air-conditioning systems shall be constructed and maintained in accordance with the NZBC G4 Ventilation.

7.2.2 An air-conditioning unit or system must—

- (i) be capable of, where the air-conditioning unit or system has motorised outside air and return dampers, closing the dampers when the air-conditioning unit or system is inactivated,
- (ii) have all conditioned supply air ductwork passing through an external area, unconditioned space, or zone which is not the final intended destination shall be

insulated in accordance with **Specification H1.1** if the temperature difference between the ambient air and the supply air is greater than ± 5 degrees Celsius at any time, and

- (iii) have an outdoor air economy cycle when the unit capacity is over 50 kW_r, and
- (iv) when the air flow rate is greater than 1000 L/s, be designed so that the total motor shaft power of the fans in the system does not exceed—
 - (a) 12 W/m² for a building of not more than 500 m² floor area adjusted by 1.15 W/(L/s) for each increase of 1 (L/s)/m² in air flow rate above 10 (L/s)/m², and
 - (b) 15 W/m² for a building of more than 500 m² floor area adjusted by 1.7 W/(L/s) for each increase of 1 (L/s)/m² in air flow rate above 9 (L/s)/m², and
- (v) the requirements of (iv) do not apply to—
 - (a) fans in package air-conditioning plant complying with Paragraph **7.4.3**, and
 - (b) the input power for an energy reclaiming system that preconditions *outdoor air*, and
 - (c) the input power for process related components such as high efficiency particulate air filters,
- (vi) when serving a conditioned space, not provide mechanical ventilation in excess of the minimum quantity required by NZBC **G4** by more than 50% other than where there is—
 - (a) additional outside air supplied—
 - to provide free cooling, or
 - to balance required exhaust ventilation such as toilet exhaust, or
 - to balance process exhaust such as from a health-care building or laboratory, or
 - (b) additional exhaust ventilation needed to balance the required mechanical ventilation; or
 - (c) an energy reclaiming system that preconditions outside air.

7.3 Smoke and ventilation

The requirements of Paragraphs 7.1 and 7.2 must not inhibit—

- (i) the smoke hazard management operation of air-conditioning and mechanical ventilation systems; and
- (ii) essential ventilation such as for a garbage room, lift motor room, gas meter enclosure or gas regulator enclosure or the like.

7.4 Heating and chilling systems

7.4.1 Systems that provide heating or chilling for air-conditioning systems must—

- (i) have any piping, vessels, heat exchangers or tanks containing heated or chilled fluid insulated in accordance with **Specification H1.2**, except those whose insulation levels are covered by Minimum Energy Performance Standards (MEPS), and
- (ii) where water is circulated by pumping at greater than 2 L/s—
 - (a) be designed so that the total of the motor shaft power does not exceed—
 - 3 W/m² for a building of not more than 500 m² floor area adjusted by 330 W/(L/s) for each increase of 1 (L/s)/m² in water flow rate above 8.6 (L/s)/1,000m²; and
 - 4 W/m² for a building of more than 500 m² floor area adjusted by 470 W/(L/s) for each increase of 1 (L/s)/m² in water flow rate above 10 (L/s)/1,000m²; and
 - (b) except where the pump is required to run at full speed for safe or efficient operation, have the pump capable of varying its speed when it is—
 - operating for more than 3,500 hours per year; or

– is more than 11 kW of motor shaft power; and

- (iii) if the system contains more than one each of a water heater, chiller or coil used for heating or cooling the building, be capable of stopping the flow of water to non-operating heaters, chillers or coils.

7.4.2

- (i) A water heater, such as a boiler in a heating system for a building, must achieve a minimum thermal efficiency of 80% when gas fired and 78% when oil fired when tested in accordance with BS 7190 or BS 845.
- (ii) A boiler with capacity equal or greater than 500 kW is to be fitted with a modulating burner.

7.4.3 Package air-conditioning equipment, including a split unit and a heat pump, must have an energy efficiency ratio complying with **Table 7.4.3** when tested in accordance with AS/NZS 3823.1.2:1998 at test condition T1.

Table 7.4.3 Minimum energy efficiency ratio for packaged air-conditioning equipment

Equipment capacity	65 kW _r to 95 kW _r	More than 95 kW _r to 125 kW _r
	Minimum energy efficiency ratio	
Air-conditioner — cooling	2.7	2.8
Heat pump — cooling	2.6	2.7

7.4.4 A refrigerant chiller over 125 kW_r capacity must have an energy efficiency ratio complying with **Table 7.4.4** when determined in accordance with ARI 550/590.

Table 7.4.4 Minimum energy efficiency ratio for refrigerant chillers

Minimum energy efficiency ratio	Full load	Part load
Water cooled chiller		
More than 125 kW _r but not more than 525 kW _r	4.2	5.2
More than 525 kW _r but not more than 1000 kW _r	4.5	5.6
More than 1000 kW _r	5.5	6.1
Air cooled or evaporatively cooled chiller		
More than 125 kW _r but not more than 525 kW _r	2.2	3.0
More than 525 kW _r	2.5	3.1

7.4.5 An air cooled condenser fan motor, other than one that is part of package air-conditioning equipment in Paragraph 7.4.3, must not use more than ~~45~~ 40 W of motor shaft power for each kW of heat rejected from the refrigerant when determined in accordance with ARI 460.

7.4.6 The fan of a cooling tower must not use more than—

- (i) if a propeller or axial fan, 310 W of motor shaft power for each L/s of cooling water circulated, and
- (ii) if a centrifugal fan, 590 W of motor shaft power for each L/s of cooling water circulated.

7.4.7 The fan of a closed circuit cooler must not use more than—

- (i) if a propeller or axial fan, 500 W of motor shaft power for each L/s of cooled fluid circulated; and
- (ii) if a centrifugal fan, 670 W of motor shaft power for each L/s of cooled fluid circulated.

7.4.8 The fan of a evaporative condenser must not use more than—

- (i) if a propeller or axial fan, 18 W of motor shaft power for each kW of heat rejected, and
- (ii) if a centrifugal fan, 22 W of motor shaft power for each kW of heat rejected.

7.4.9 The spray water pump of a closed circuit cooler or evaporative condenser must not use more than 150 W of pump motor shaft power for each L/s of spray water circulated.

7.5 Miscellaneous exhaust systems

7.5.1 A miscellaneous exhaust system with an air flow rate of more than 1000 L/s, that is associated with equipment having a variable demand such as a stove in a commercial kitchen or a chemical bath in a factory, must—

- (i) have the means for the operator to—
 - (a) reduce the energy used, such as by a variable speed fan, and
 - (b) stop the motor when the system is not needed, and
- (ii) be designed to minimise the exhausting of conditioned air.

7.5.2 The requirements of Paragraph 7.5.1 do not apply

- (i) where additional exhaust ventilation is needed to balance the *required* outside air for ventilation, or
- (ii) where air flow must be maintained for safe operation.

8 Access for maintenance

8.1 The requirements of NZBC Clause H1.3.6(b) are satisfied if:

At the design and construction stages regard is given to all requirements of space, position, access and repair (or replacement) in order to commission and maintain the equipment in an efficient operating condition, without undue difficulty, when using normally accepted maintenance procedures.

SPECIFICATION H1.1 DUCTWORK INSULATION AND SEALING

1. Scope

This Specification contains the requirements for the sealing and the insulating of supply and return ductwork used in a system that heats or cools a building.

2. Ductwork sealing

- (a) Heating or cooling ductwork and fittings must be sealed against air loss—
 - (i) by closing all openings in the surface, joints and seams of ductwork with adhesives, mastics, sealants or gaskets in accordance with the duct sealing requirements of AS 4254:2002 for the static pressure in the system, or
 - (ii) for flexible ductwork at an operating static pressure of less than 500 Pa, with a sealant and draw band encased with adhesive tape.

3. Ductwork insulation

- (a) Ductwork and fittings for heating or cooling must be thermally insulated with insulation complying with AS/NZS 4859.1:2002 to—
 - (i) achieve the Total R-Value specified in **Tables 3a** and **3b**, or
 - (ii) achieve a minimum Total R-Value of 1.0 for flexible ductwork of not more than 3 m in length from an outlet or the like.
- (b) Insulation on ductwork conveying cold air must be protected by—
 - (i) a vapour barrier on the outside of the insulation, and
 - (ii) overlapping adjoining sheets of the membrane by 50 mm and bonding or taping the sheets together where the vapour barrier is a membrane.
- (c) Ductwork insulation must—
 - (i) be protected against the effects of weather and sunlight, and
 - (ii) abut adjoining insulation to form a continuous barrier, and
 - (iii) be installed so that it maintains its position and thickness, other than at flanges and supports.
- (d) The requirements of Paragraph 3(a) do not apply to heating and cooling ductwork and fittings located within the last conditioned space served.

Table 3a DUCTWORK - MINIMUM TOTAL R-VALUE
(For systems of no more than 65 kW_r and 65 kW_{heating} capacity)

Ductwork element	Minimum Total R-Value for ductwork and fittings		
	Evaporative cooling system	Heating-only system or refrigerated cooling system	Combined heating and refrigerated cooling system
Ductwork.	0.6	1.0	1.5 (see note)
Fittings	0.4		
<p>Note:</p> <p>The minimum Total R-Value required may be reduced by R0.5 for combined heating and refrigerated cooling systems if the ducts are-</p> <ul style="list-style-type: none"> (a) under a suspended floor with an enclosed perimeter; or (b) in a roof space that has insulation of not less than R0.5 directly beneath the roofing. 			

Table 3b DUCTWORK - MINIMUM TOTAL R-VALUE
(For systems greater than 65 kW_r and 65 kW_{heating} capacity)

Location of ductwork and fittings	Minimum Total R-Value for ductwork and fittings	
	Evaporative cooling system	Heating system or refrigerated cooling system
Within a conditioned space other than where the space is the only or last space served.	Nil	1.3
All other locations	0.9	1.8

SPECIFICATION H1.2 INSULATING PIPING, VESSELS, HEAT EXCHANGERS AND TANKS

1. Scope

This Specification contains the requirements for the insulating of piping, vessels, heat exchangers and tanks containing heated or chilled fluid.

2. Insulation

- (a) Insulation must—
 - (i) be protected against the effects of weather and sunlight, and
 - (ii) be able to withstand the temperatures within the piping, and
 - (iii) for piping, achieve the Total R-Value in **Table 2**, and
 - (iv) for vessels, heat exchangers and tanks, achieve a minimum Total R-Value of—
 - (A) 2.5 if the content is low temperature brine or glycol, or
 - (B) 1.8 if the content is chilled water, or
 - (C) 1.3 if the content is heated water, or
 - (D) 2.5 if the content is steam.
- (b) Insulation on piping, vessels, heat exchangers and tanks containing chilled fluid must be protected by a vapour barrier on the outside of the insulation.
- (c) The requirements of Paragraph (a) do not apply to heating water piping—
 - (i) located within the space being heated where the piping is to provide the heating to that space, or
 - (ii) encased within a concrete floor slab which is part of a floor heating system.

Table 2 PIPING - MINIMUM TOTAL R-VALUE

Location	Minimum Total R-Value
1. Heating water piping for systems of no more than 65 kW_{heating} capacity	
(a) Located internally	0.2
(b) Located within a wall space, an enclosed sub-floor area or an enclosed roof space	0.45
(c) Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	0.6
2. Heating water piping for systems of more than 65 kW_{heating} capacity	
(a) Located internally	0.6
(b) Located within a wall space, an enclosed sub-floor area or an enclosed roof space	0.7
(c) Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	0.8
3. Cooling water piping for systems of more than 65 kW capacity but less than 250 kW_r capacity	
(a) Located internally	0.9
(b) Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.0
(c) Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.1
4. Cooling water piping for systems of more than 250 kW_r capacity	
(a) Located internally	1.2
(b) Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.3
(c) Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.4
Note: Piping to be insulated includes flow and return piping, cold water supply piping and pressure relief piping within 500 mm of the connection to the heating or cooling system.	

4 Transitional arrangements

The Building Code amendments for the hot water and HVAC energy efficiency will come into force on the 1 February 2009.

The amended H1 Compliance Document will be published at the end of October 2008 and will take effect from 1 February 2009.

The new Building Code requirements will apply to building consent applications submitted on or after 1 February 2009. The current Building Code requirements for hot water and HVAC will apply to building consent applications submitted before 1 February 2009, irrespective of when the building consent is subsequently granted.

Building consent applications submitted before 1 February 2009 must either:

- use Acceptable Solution H1/AS1 as it stands before the proposed amendment, or
- use the provisions of the proposed amendment as the basis for an alternative solution proposal, or
- be based on another alternative solution.

Building consent applications submitted on or after 1 February must either:

- use the amended Acceptable Solution H1/AS1 or
- be based on an alternative solution.