PROVISIONAL
NEW ZEALAND STANDARD

MINIMUM THERMAL INSULATION REQUIREMENTS FOR RESIDENTIAL BUILDINGS

Metric units

metric standard

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697:11:699.86

SANZ STANDARDS ASSOCIATION OF NEW ZEALAND

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SPECIAL NOTE

Provisional Standards are published to enable standards to be issued, in special circumstances, for use at the *earliest possible moment.* Where the issue of a final declared standard may be precluded because of incompleteness, the need for experiment, the lack of facilities for detailed checking, or for other reasons, a provisional standard is drawn up as a temporary measure.

This provisional standard is to be reviewed within 6 months of publication, when a decision will be made as to whether it will be declared (with any necessary revision or amendment) as a New Zealand Standard, or possibly continued as a provisional standard for a further limited period, or withdrawn.

It is therefore issued for immediate use, but users are asked to regard it as being on trial and to SEND SUGGESTIONS FOR THE FINAL DOCUMENT to:

The Director,
Standards Association of New Zealand,
Private Bag,
WELLINGTON.

AMENDMENTS

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Metric units

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COMMITTEE REPRESENTATION

This standard was prepared under the supervision of the Building and Civil Engineering Sectional Committee (38/–) for the Standards Council, established under the Standards Act 1965. The Building and Civil Engineering Sectional Committee consisted of representatives of the following:

Building Research Association of New Zealand
Department of Scientific and Industrial Research
Housing Corporation of New Zealand
Ministry of Works and Development
Municipal Association of New Zealand
New Zealand Contractors Federation
New Zealand Counties Association
New Zealand Institute of Architects
New Zealand Institution of Engineers
New Zealand Manufacturers Federation
New Zealand Master Builders Federation

The Thermal Insulation of Residential Buildings Committee (42/5) was responsible for the preparation of this standard.

RELATED DOCUMENTS

In this standard reference is made to the following:

NEW ZEALAND STANDARDS		*Clause reference herein*
NZS 1900:	*Model building bylaw:*	1.4
	Chapter 4: *Residential buildings*	1.1
	Chapter 6.1: *Timber*	2.2 Note
	Chapter 6.2: *Masonry*	2.2 Note
NZS 4214	*Methods of determining the total thermal resistances of parts of buildings*	2.1 2.4
MP 3801	*A guide to the adoption of the model building bylaw (NZS 1900) by local authorities*	1.3 Note

FOREWORD

This provisional standard states requirements for thermal insulation of residential buildings that are believed to represent the best practicable means of reducing heat losses within current building methods and techniques.

Two broad types of construction (called "type A" and "type B") have been recognized because there are significantly different problems involved in improving the thermal performance of, for example, light timber frame construction on the one hand and single-skin masonry construction on the other. It is recognized that there might be some difficulties in deciding whether some of the less widely used forms of construction should be assigned to type A or type B, and this may necessitate some change in the provisional standard after a period of experience in its use.

In the long run, however, it is envisaged that the two types will merge as the minimum requirements for type B construction are progressively raised to the type A levels, which themselves might also have to be adjusted in future. Such movement appears inevitable unless there is some major unforeseen improvement in New Zealand's energy situation.

Research and development work aimed at improving the thermal performance of New Zealand buildings is being actively pursued, and will be reflected in future changes in this provisional standard.

PROVISIONAL
NEW ZEALAND STANDARD

MINIMUM THERMAL INSULATION REQUIREMENTS FOR RESIDENTIAL BUILDINGS

1 SCOPE AND INTERPRETATION

1.1 This standard lays down minimum thermal insulation requirements for residential buildings and is approved as a means of compliance with the relevant requirements of NZS 1900: Chapter 4*.

1.2 In this standard the word "shall" indicates a requirement that is to be adopted in order to comply with the standard whereas the word "should" indicates a recommended practice.

1.3 Where any other standard named in this standard has been declared or endorsed in terms of the Standards Act 1965, then:

(a) Reference to the named standard shall be taken to include any current amendments declared or endorsed in terms of the Standards Act 1965; *or*

(b) Reference to the named standard shall be read as reference to any standard currently declared or endorsed in terms of the Standards Act 1965 as superseding the named standard, including any current amendments to the superseding standard declared or endorsed in terms of the Standards Act 1965

as appropriate.

NOTE – The date at which amendments or superseding standards are regarded as "current" is a matter of law depending upon the particular method by which this standard becomes legally enforceable in the case concerned. In general, if this is by contract, the relevant date is the date on which the contract is created, but if it is by Act, Regulation, or bylaw then the relevant date is that on which the Act, Regulation, or bylaw is promulgated; for bylaws, promulgation includes updating by the procedure set out in MP 3801*.

1.4 In this standard, unless inconsistent with the context, terms defined in NZS 1900* shall have the same meaning in this standard, and:

HEATED ROOF, WALL, OR FLOOR means any roof, wall, or floor incorporating embedded pipes, electrical cables, or similar means of raising the temperature of the roof, wall, or floor for the purpose of room heating.

ROOF means any roof-ceiling combination where the exterior surface of the building is at an angle of 60^{o} or less to the horizontal and has its upper surface exposed to the outside.

THERMAL ENVELOPE OF A BUILDING means the roof, the wall, and the floor construction enclosing all habitable rooms, bathrooms, kitchens and other rooms in the building excluding those areas such as garages which in the opinion of the Engineer are not likely to require heating.

THERMAL RESISTANCE means the resistance to heat flow.

TOTAL THERMAL RESISTANCE R_T means the resistance to heat flow through unit area of a particular part of a building. It can be determined by measuring the temperature difference between the air on one side and the air on the other side of the part when there is unit heat flow in unit time through unit area (m^2 °C/W).

STANDARD TOTAL THERMAL RESISTANCE means the total thermal resistance when the outside surface thermal resistance is standardized at 0.03 m^2 °C/W and the inside surface thermal resistance is standardized at 0.09 m^2 °C/W.

2 BUILDINGS NOT THE SUBJECT OF SPECIFIC THERMAL DESIGN

2.1 Subject to clauses 2.3 and 2.4, all parts of the thermal envelope of a residential building that has not been the subject of specific thermal design shall be so constructed that the standard total thermal resistance of each part as determined by any of the methods specified in NZS 4214* is not less than the corresponding value in one of the combinations set out in table 1 for type A construction and in table 2 for type B construction, provided that the same column shall apply to all such parts, and provided that table 3 may be used in the same way when both type A and type B construction occur in the same building.

2.2 For the purposes of clause 2.1 any type of construction (other than heated roofs, walls, or floors) shall be regarded as type A construction if, in the opinion of the Engineer, it could comply with the applicable requirements for type A without any alteration other than the addition or insertion of suitable insulating material. Any form

* *See* list of related documents.

of construction (other than heated roofs, walls, or floors) that is not regarded as type A shall be regarded as type B.

NOTE –

Type A includes, but is not limited to:

Light timber frame construction as specified in NZS 1900: Chapter 6.1*.

Certain panel systems that contain a suitable cavity.

Type A does not include:

Single-skin masonry construction as specified in NZS 1900: Chapter 6.2*.

Certain panel systems that do not contain a suitable cavity.

It is possible for a roof or wall to be regarded as type A with respect to one column of table 3 but as type B with respect to another column. However, there are few roofs in common use that cannot be regarded as type A with respect to all columns.

2.3 Clause 2.1 shall not apply to doors, light-transmitting glazing, ventilating louvres, and the like.

2.4 In the case of parts containing embedded heating elements the values given in tables 1 and 2 shall not apply but instead the standard total thermal resistance of any such part shall be not less than:

(a) Heated roofs: 2.0 m^2 °C/W.

(b) Heated walls: 1.7 m^2 °C/W.

(c) Heated floors: 1.7 m^2 °C/W.

NOTE – In the case of a heated part NZS 4214* requires that the resistance be measured between the embedded heating element and the outside.

Table 1

PERMITTED COMBINATIONS FOR TYPE A CONSTRUCTION

Part of thermal envelope	*Combinations of minimum standard total thermal resistances (m^2 °C/W)*		
Roofs	1.9	2.6	3.0
Walls	1.5	1.2	1.0
Floors	0.9	0.9	0.9

Table 2

PERMITTED COMBINATIONS FOR TYPE B CONSTRUCTION

Part of thermal envelope	*Combinations of minimum standard total thermal resistances (m^2 °C/W)*		
Roofs	1.5	2.0	3.0
Walls	0.8	0.7	0.6
Floors	0.9	0.9	0.9

* *See* list of related documents.

Table 3

PERMITTED COMBINATIONS WHERE TYPE A CONSTRUCTION AND TYPE B CONSTRUCTION OCCUR IN THE SAME BUILDING

(Tables 1 and 2 are repeated in this table)

Part of thermal envelope	*Combinations of minimum standard total thermal resistances (m^2 °C/W)*					
Type A roofs	1.9	2.6	3.0			
Type A walls	1.5	1.2	1.0			
Floors	0.9	0.9	0.9			
Type A roofs				1.9	2.6	3.0
Type B walls				0.8	0.7	0.6
Floors				0.9	0.9	0.9
Type B roofs				1.5	2.0	3.0
Type A walls				1.5	1.2	1.0
Floors				0.9	0.9	0.9
Type B roofs						1.5 2.0 3.0
Type B walls						0.8 0.7 0.6
Floors						0.9 0.9 0.9

3 SPECIFIC THERMAL DESIGN

3.1 A residential building that has been the subject of specific thermal design need not comply with clause 2 but instead:

$$Q \text{ shall not exceed } [\,(13.8/V^{\frac{1}{3}}) + 2\,]$$

where:

Q = space-averaged requirement for heating that utilizes energy from a public electricity supply, from any fuel, or from any other depletable energy sources, expressed as watts per square metre of total floor area within the thermal envelope per degree Celsius difference between indoor and outdoor temperatures (W/m^2 °C).

V = total volume within the thermal envelope (m^3).

NOTE – The limiting value of Q given above is based on the average value to be expected for buildings of type A construction that comply with clause 2, are of reasonably optimized shape and have a ventilation rate of 1 air change per hour.

3.2 "Specific thermal design" shall mean comprehensive calculation or testing that gives proper regard to all relevant factors including:

(a) Dynamic (i.e. time varying) effects of temperature, solar radiation, humidity, and wind for the particular site(s) under consideration taking into account thermal storage and window effects relating to the particular building(s) under consideration.

(b) Heat generated by occupants and appliances other than appliances specifically for heating.

(c) A reasonable representation of actual ventilation rates to be expected.

(d) An assumed indoor temperature maintained at 20 °C or higher.

3.3 The assumptions and procedures of any specific thermal design shall be subject to the approval of the Engineer, who may require that they be supported by the

written recommendation of a recognized independent authority.

NOTE – For example, for a double-unit dwelling unit consisting of two dwellings each 100 m^2 floor area, the total volume will be approximately 480 m^3. The maximum permissible value of Q is given by –

$$Q = [\,(13.8/480^{\frac{1}{3}}) + 2\,]$$

$$= 3.77\ W/m^2\ ^oC.$$

In a submission intending to take advantage of clause 3.3 the designer would have to show by specific thermal design that this condition was satisfied.

In practice, the specific thermal design would probably be based on actual meteorological records over a number of years to produce a printout of calculated heating demands at appropriate times over that period. For this example, clause 3.3 would be satisfied if the heating demand per square metre at a particular time divided by (20 ^oC minus the actual outside temperature at that time) never exceeded 3.77 $W/m^2\ ^oC$.

4 CONSTRUCTION REQUIREMENTS

4.1 The following construction requirements shall apply to the thermal envelope of a residential building:

(a) Insulating material, if used, shall be not less than the minimum thickness determined to be necessary in terms of clause 2 or clause 3 as applicable and shall extend the full distance between all studs, dwangs, joists, and the like.

(b) Draughts of air shall be prevented from passing through the insulation system.

NZS 4218P:1977