

## NZSS 1900 Model Building By-law: a planned evolution

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**ABSTRACT:** Twenty-five years after its publication, NZSS 95:1935 "Model Building By-law" was starting to show its age. The 1961 City Engineers conference requested it be reorganised to put general requirements first and design requirements later. The NZ Standards Institute's (NZSI) Bylaw Sectional Committee thought this a good idea, although to avoid confusion changed the designation of the new series to NZSS 1900. From late 1963 to mid-1964, NZSS 95 was reissued as NZSS 1900. The 14 parts of NZSS 95 became 11 chapters of NZSS 1900, initially by reprinting with new covers. Over the next 20 years the chapters were modified, revised, split, or amalgamated.

On 1 April 1966 NZSI became the Standards Association of New Zealand (SANZ), and 'New Zealand Standard Specifications' (NZSS) became "New Zealand Standards" (NZS). By late-1966 the revision and publication of NZS 1900 was nearly complete. For the future a five yearly review cycle was planned. However, storm clouds were ahead. NZS 1900 had a mixture of: legal requirements; design and construction requirements; quantitative requirements; and codes of practice. The resultant documents were considered to be hard to: use; inspect on site; and revise. In late 1969 the Standards Council was looking forward to a revision separating *requirements* (fixed, unchanging and rarely alternative) from *solutions* (changing as technology develops, often with alternatives). The "means of compliance" could be provided for the majority of users, while other solutions were available as desired or required. This set the scene for the Building Act 1991 and New Zealand Building Code. The paper reviews the development of NZS 1900, exploring the similarities and differences to NZSS 95. As an example of the process, the evolution of the requirement for windows for ventilation will be examined.

### Introduction

New Zealand has a long history of building controls. This paper briefly reviews these controls from 1840 to 1964, then explores the development of NZSS 1900 Model Building By-law. As an example of the process of the development of building controls, the evolution of the requirement for windows for ventilation will be investigated.

### Early Building Controls 1840-1935

Soon after the signing of Te Tiriti o Waitangi (Treaty of Waitangi) European construction in populous areas was able to be controlled by the Raupo House Ordinance 1842 which limited the use of highly flammable natural

building materials. The Ordinance was applied in Auckland, Wellington, Dunedin, Port Chalmers, Lyttelton and Christchurch. It was the first New Zealand legislation used to control building construction, bringing industry and customer responses that would not be surprising today – a general reluctance to spend any more than the minimum on the creation of new buildings.<sup>1</sup>

The Provincial Governments' legislation which followed was also concerned with controlling construction in their large cities – Auckland, New Plymouth, Dunedin, and Christchurch. The passing of the Municipal

Corporations Act 1867 provided a wider range of councils with building control powers, but it was not until the Municipal Corporations 1876 that buildings were explicitly included in the by-law coverage. Following the dissolution of the provinces in 1876, Auckland, Christchurch and Dunedin building or fire legislation were explicitly continued by the Provincial Ordinances Act 1892. The Statutes Repeal Act 1907 repealed the Auckland and Christchurch legislation but for Dunedin repeal was not until the Building Amendment Act 1993.<sup>2</sup>

The local government building controls put in

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<sup>1</sup> Isaacs "Foundations of Control" pp 35-41.

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<sup>2</sup> Isaacs "Building Legislation 1840-1870" p 179.

place during this time were developed by the city/borough engineer or surveyor, although often based on by-laws from other locations or countries. Modified to suit local conditions, they were as comprehensive as required. They covered what many still consider to be the central issues of building controls: fire, structural safety, ventilation, management of water and the management of construction. Safety of users, access and subfloor ventilation do not appear in building controls until the beginning of the twentieth century. Although an issue of structural safety, earthquake specific design first appears after the 1906 San Francisco, USA earthquake.<sup>3</sup>

### **NZSS 95 "New Zealand Standard Model Building By-Law"**

Following the 1931 Napier Earthquake the New Zealand government appointed a "Building Regulations Committee" to improve "the standard of building-construction in the Dominion in relation to earthquake-resistance." Its recommendations included the preparation of a "Uniform Building Code."<sup>4</sup>

The recently created New Zealand Standards

<sup>3</sup> Isaacs "Building Controls in New Zealand" p 498.

<sup>4</sup> Building Regulations Committee "H-21 Report of Building Regulations Committee" pp 2-4.

Institution was charged with this task, and immediately appointed a "Building Regulations Review Committee." The Committee, which first met on 25 August 1934, commenced with structural requirements, leaving health and other by-laws for later.<sup>5</sup>

In December 1935 NZS 95 "New Zealand Standard Model Building By-Law" was published as ten sections in a single volume: (I) Preliminary; (II) General Design and Construction; (III) General Basis of Design and Floor-Loads; (IV) Masonry Buildings of Bearing Wall Construction; (V) Walls in Framed Structures; (VI) Reinforced Concrete; (VII) Steelwork; (VIII) Plain Concrete and Pressures on Concrete; Brickwork and Stonework; (IX) Chimneys; and (X) Offences.<sup>6</sup> In 1939 NZSS 95 was divided into "Parts" rather than "Sections" in a mixture of combined and separate volumes. Revisions and updating continued for the rest of its life. NZSS 95 played a critical role in the development of national standards. In 1937 all standards adopted in New Zealand were of British origin except for NZSS 95.<sup>7</sup> In the same

<sup>5</sup> NZSI NZSS 95: 1935 p 5.

<sup>6</sup> NZSI NZSS 95: 1935 pp 7-10.

<sup>7</sup> DSIR "Department of Scientific and Industrial Research

year the "New Zealand Standards Organisation" (NZSO) moved to the Department of Scientific and Industrial Research (DSIR), becoming the "New Zealand Standards Institute" (NZSI).<sup>8</sup>

Not all councils immediately adopted NZSS 95. Dunedin adopted it in 1936<sup>9</sup> but by 1941 it had been adopted by 47 local authorities, including Auckland, Wellington and Christchurch, covering in total more than two-thirds of the urban population.<sup>10</sup> The Statutes Amendment Act 1947 extended the power to County Councils to make earthquake by-laws.<sup>11</sup> In 1950, 62 cities and boroughs and four counties had adopted Parts I to IX, with a further 30 local authorities having code adoption under consideration.<sup>12</sup>

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(Eleventh Annual Report) Annual Report for the Year 1936-37" p 36.

<sup>8</sup> DIC "Department of Industries and Commerce (Twentieth Annual Report) Annual Report for the Year 1936-37" p 35.

<sup>9</sup> Isaacs "Building Controls in New Zealand" p 495.

<sup>10</sup> NZSI "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for the Year 1940-41" p 4.

<sup>11</sup> NZSI "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for the Year 1947-48" p 12.

<sup>12</sup> NZSI "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for

NZSS 95 Part	NZS1900 Chapter	NZS 1900 Chapter/Section Title (at September 1963)
I	1	Preliminary
II	2	Building permits
XIV	3	General requirements
VIII	4	Residential buildings
VII	5	Fire resisting construction and means of egress
		Construction requirements for buildings not requiring specific design:
IX	6.1	Section 6.1 Timber
X	6.2	Section 6.2 Masonry
V	6.3	Section 6.3 Concrete (added ??)
XII	7	Small Chimneys and Appliance Installation
III & IV	8	Basic design loads
		Design and Construction:
New	9.1	Section 9.1 Timber
X	9.2	Section 9.2 Masonry
V	9.3	Section 9.3 Concrete (planned but not created)
XI	9.4	Design and Construction – Steel
VI	10	Non-structural external wallings
		Special structures.
XIII	11.1	Section 11.1 Concrete Structures for the storage of liquids
New	11.2	Section 11.2 Farm buildings
New	12	Foundations (planned but not created)

Table 1: NZSS 1900 compared to NZSS 95

By 1963 NZSS 95 had been adopted by the majority of municipalities but only half of county councils. This was of unfortunate practical consequence as urban areas grew but

the Year 1949-50" p 8.

buildings were not uniform. One reported example was where chimneys on one side of a street were required to be reinforced but not those on the other side.<sup>13</sup>

<sup>13</sup> Building Research Bureau of New Zealand *The Model*

### NZSS 1900

Twenty-five years after its original publication, NZSS 95:1935 "Model Building By-law" was starting to show its age. A City Engineers' conference in 1961 requested it be reorganised to put general requirements first and design requirements later. The NZSI Bylaw Sectional Committee thought this a good idea, so with the endorsement of the Standards Council this change took effect from 30 September 1963. To avoid confusion, the new series was designated NZSS 1900 and divided it into chapters and sections.<sup>14</sup> Table 1 lists the initial NZS 1900 chapter titles, match to the former NZSS 95 parts. From the beginning, each NZSS 1900 chapter and section were published as separate documents.<sup>15</sup>

As a first step, the nine parts of NZSS 95 which had been revised plus the design section of Part V and the existing Part XII were reprinted as NZSS 1900. NZSS 95 Part III was repealed, and clauses not covered elsewhere were incorporated in the new NZSS 1900 Chapter 8. Through the creation of such

*Building Bylaw (NZSS 1900)* p 1.

<sup>14</sup> Macdonald to Cooney "A History of the New Zealand Standard Model Building Bylaw" (May 1966) p 1.

<sup>15</sup> NZSI "Reorganization of the Model Building Bylaw" p 15.

model bylaws, it was expected that smaller as well as larger councils would be able to benefit from the talents of a wide range of specialists.

The 1963 vision for the new NZSS 1900 was clear:

A Model building bylaw should endeavour to obtain uniformity and improvement, and to lay down requirements which are economic minima. If there is to be a model it is a mistake for it to perpetuate inadequacies even though the improvement may upset traditional practice.<sup>16</sup>

On 1 April 1966 NZSI became the Standards Association of New Zealand (SANZ), and 'New Zealand Standard Specifications' (NZSS) became "New Zealand Standards" (NZS). By late-1966 the revision and publication of NZS 1900 was nearly complete. For the future a five yearly review cycle was planned. However, storm clouds were ahead.

In 1969 the SANZ Chief Technical Advisor argued that NZS 1900 had a mixture of: legal requirements, design and construction requirements, quantitative requirements, and codes of practice. The documents were

<sup>16</sup> NZSI "Reorganization of the Model Building Bylaw" p 15.

considered to be hard to use, their use hard to inspect on site, and they were hard to revise. Later that year the Standards Council had approved a revision of the Model Bylaw separating *requirements* (fixed, unchanging and rarely alternative) from *solutions* (changing as technology develops, often with alternatives). The "means of compliance" could be provided for the majority of users, while other solutions would be available as desired or required. The Model Building Bylaw could be reduced to:

- (a) Legal Requirements
- (b) Fixed Standards of Duty
- (c) Quantitative Requirements
- (d) Named Acceptable Solutions<sup>17</sup>

This change was also implemented for other standards, separating codes of practice from basic design and construction requirements.<sup>18</sup>

The need for standards to cover all aspects of common constructions had been recognised in NZSS 95 Part IX:1944 "Light Timber Construction." During WWII, the

<sup>17</sup> Hitchcock "A New Look at NZS 1900" pp 10-11; Hitchcock "A Note About N.Z.S. 1900 Building Codes and Changes" p 273.

<sup>18</sup> SANZ "Special Note for Members of All Standards" p 14.

comprehensive NZSS E.163:1945 "Dwelling House Construction" was issued. This single document provided a "comprehensive code of practice" covering general requirements, leaving the architect to provide detailed drawings and special provisions.<sup>19</sup> In 1978 NZS 3604 "Construction Methods for timber buildings not requiring specific design" replaced NZS 1900 6.1,<sup>20</sup> and in 1986 NZS 4229 "Code of Practice for concrete masonry buildings not requiring specific design" replaced NZS 1900 6.2. The "Foreword" of the new NZS 1900 6:1986 "Construction Requirements for Buildings Not Requiring Specific Design" showed how the push for a performance code had developed, explaining that the model building by-law consisted for three sets of documents: (a) the by-law (NZS 1900 chapter or section), (b) the incorporated Standards, and (c) Standards used as 'Means of Compliance.'<sup>21</sup> Chapter 6:1986 now included all performance requirements and means of compliance (Standards) on a single page.<sup>22</sup>

<sup>19</sup> NZSI *War Emergency NZSS E.163* p 2.

<sup>20</sup> Shelton *The Engineering Basis of NZS 3604* p 1.

<sup>21</sup> SANZ *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 6* p 3.

<sup>22</sup> SANZ *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 6* p 5.

As well codes of practice, NZS 1900 continued to be expanded and revised, although at times the political world also set requirements. For example, the Municipal Corporations Amendment Act 1977 (sec 2) and the Counties Amendment Act 1977 (sec 3) required local authorities to implement by-laws "for the purpose of preventing or reducing heat losses in residential buildings as an energy conservation measure" specifying minimum acceptable R-values.

Looking to the future, this separation of performance requirements from implementable solutions was setting the scene for the Building Act 1991 and New Zealand Building Code.<sup>23</sup>

### Windows for Light and Ventilation

To illustrate how NZSS 1900 built on previous building controls and in turn supported future developments, the requirements for openable windows provide a useful case study.

NZSS 1900 Chapter 4:1964 Residential Buildings" section 4.7 sets out requirements

<sup>23</sup> Helm "Building Code Turns 25" p 58; Klein "Building Controls" p 57.

for "required windows" which play a key role in ventilation. These are defined as facing directly onto a "frontage, court, or inner court or ... to a service room on[sic] to a service court":

4.7.2.1 The aggregate area of the required windows shall not be less than one-tenth of the floor area of the room which is served thereby and one-half at least of such required area shall be so constructed as to open for the admission of air without fixed obstruction other than approved fly-proof netting if such be desired.

4.7.2.2 Unless otherwise approved by the Engineer, the height of required windows shall not be less than 6 ft 6 in. from the floor level to the top of the ventilating portion of the window.<sup>24</sup>

But where did the requirements for the windows to be the one-tenth (10%) of the floor area, one half of this (5%) to be openable and the top of the opening be 6 ft 6 in (2 m), and perhaps more importantly why have any requirement for opening windows? Tracing these requirements through history, the answers result from a combination of a tax and the Industrial Revolution.

The English "Window Tax" was introduced in 1696 to cover revenue lost by the clipping of

<sup>24</sup> NZSI NZSS 1900 *New Zealand Standard Model Building Bylaw: Chapter 4:1964* clause 4.7.

coinage. The cost of the new tax was to be borne by the occupier or tenants of the dwelling house (not the landlord). A dwelling house (excluding cottages) paid a base 2 shillings a year; ten to twenty windows cost an additional 4 shillings a year plus the base; over twenty windows an additional 8 shillings plus the base.<sup>25</sup> While intended initially as a wealth tax, it applied to the building, not the individual households. For example, a building with six apartments each with two windows was taxed at a rate based on 12 windows, making it burdensome on low-income households. One solution was to brick up windows till the number fell below the tax "notch."<sup>26</sup>

Until 1766 the Window Tax applied only to 6 or more windows, but the number of windows per house on which the tax applied increased over time – from 1766 to 1825 it was 7 or more windows, and from 1825 to 1851 it was 8 or more windows. By 1850 this "odious and vexatious tax" generated £1,800,000 per year. The tax applied to any opening in the

<sup>25</sup> Great Britain Parliament House of Commons *William III, 1695-6: An Act for Granting to His Majesty Severall Rates or Duties upon Houses for Making Good the Deficiency of the Clipped Money.*

<sup>26</sup> Schwab and Oates *The Window Tax* pp 1-2.

wall, "unless the air can be admitted without any glimmer of light,"<sup>27</sup> regardless of opening's size. Pressure against the tax grew steadily, proclaiming its inequities,<sup>28</sup> and its deleterious effect on health, described by one physician: "When the sun doesn't go, the doctor does."<sup>29</sup>

The Public Health Act 1848 (11 & 12 Victoria c.63) recognised the negative effects of the tax by requiring any "vault, cellar, or underground room" have an openable external window of "at least nine superficial feet" i.e. 9 square feet (0.8 m<sup>2</sup>) (Section 67), but that if this increased the number of windows from seven to eight the Window Tax, did not apply (Section 151). The Window Tax was repealed three years later by the House Tax Act 1851 (14 & 15 Victoria c.36).

The Local Government Act 1858 (21 & 22 Victoria c.98) replaced the Public Health Act 1848 with respect to local byelaws for: new streets and sewerage, including for buildings: structural stability and prevention of fire, free circulation of air around buildings and ventilation, building drainage and closing of

<sup>27</sup> Forster "The Tax on Light and Air" p 226.

<sup>28</sup> *The Wonder of the Window-Tax*

<sup>29</sup> Butti and Perlin *A Golden Thread* p 160.

buildings unfit for human habitation (Section 34). To support uniformity and reduce the costs to local boards, the Secretary of State for the Home Department in his first report provided suggestions as to model byelaws. These regulated boarding houses, the business and the duties of officers as well byelaws for new streets and buildings, hackney carriages, slaughterhouses, prevention of nuisance, and the cleansing of footpaths, refuse and privies.<sup>30</sup>

For the first time these model byelaws introduced a requirement for the provision of openable windows:<sup>31</sup>

16. Every habitable room shall have at least one window, and the total area of window or windows, clear of the sash-frame, shall be at the least one-tenth of the area of every such room, and the top of one at least of such windows shall be not less than 6 feet 7 inches above the floor, and the upper half at least shall be made to open the full width.<sup>32</sup>

<sup>30</sup> Secretary of State for The Home Department *First Annual Report Presented by the Secretary of State for The Home Department to Parliament* pp 5, 40–55.

<sup>31</sup> Harper "The Evolution of the English Building Regulations 1840-1914" p 299.

<sup>32</sup> Secretary of State for The Home Department *First Annual Report Presented by the Secretary of State for The Home Department to Parliament* pp 42-43.

The minimum window top of 6 ft 7 in (2 m) is as given, but later byelaws based on this model give it as seven foot six inches (2.3 m),<sup>33</sup> suggesting a typographical error in this document.

The first appearance of these requirements found for New Zealand is in the Wellington City Bylaws of 1891:

#### 34 Ventilation of Buildings

Every building erected for residential purposes shall have a sufficient number of suitable windows to afford effectual means of ventilation by direct communication with the external air, and every habitable room, except as hereafter provided, every such building shall have a window or windows or skylight equal in size (clear of sash frames) to at least one-tenth of the area of the floor of such room; half of such window or skylight shall open, and the opening must extend to the top of the window.<sup>34</sup>

Although the text is slightly modified, as Wellington requirements match so closely to the English requirements suggest they must have benefited from a direct global transport. The minimum height requirement has not been used, although the window opening is

<sup>33</sup> *City of Gloucester Bye Laws for The City of Gloucester Made Under The Public Health Act 1848* sec. 15.

<sup>34</sup> Wellington City Council *Wellington City Council. The Building By-Law 1891.*

required to reach to the top of the window – assuming a sash (rather than casement) window.

In 1912 the Department of Public Health, Hospitals and Charitable Aid sent to local councils "Suggestions for By-Laws Suitable for Adoption in Counties, Town and Road Districts:"<sup>35</sup>

15. Every person who shall erect a dwelling house shall provide that for every living-room therein there shall be a window-space clear of frames equal in area to at least one-eighth of the area of the floor of such room, of which window-space at least one-half shall be made to open.

The recommendation for window area one-eighth (12.5%) of the floor area lasted until 1925 when the Department of Health "Model By-Laws Under the Health Act 1920 Relating to Dwellings and Buildings for Human Habitation" used the one-tenth (10%) requirement for room for human habitation, even allowing for the use of a flyscreen:<sup>36</sup>

10. (1.) No person shall erect or rebuild any building intended for use wholly or in part as a dwellinghouse unless in regard to every room used or intended to be

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<sup>35</sup> Department of Public Health, Hospitals and Charitable Aid *Suggestions for By-Laws Suitable for Adoption* sec. 15.

<sup>36</sup> Department of Health *Model By-Laws Under the Health Act 1920* sec. 10.

used for sleeping purposes there shall be made provision in respect to the following matters, that is to say-

(c) Every room used or intended to be used for sleeping purposes shall have in one wall at the least one or more windows opening directly to the open air.

[NOTE.-The window must be in a wall. The use of skylight is not satisfactory from the point of view of ventilation.]

(d) The aggregate space occupied by such window or windows shall be not less than one-tenth part of the floor area, and one-half at the least of such space shall be so constructed as to open for the admission of air without fixed obstruction other than approved fly-proof netting (if such be desired). In estimating the window-space only such portions as admit of the entrance of light shall be included.

NZSS 95 New Zealand Standard Model Building By-law Part VIII Residential Buildings was not published until 1943, although the wording and requirements were identical to the 1925 model.<sup>37</sup>

808 (b) (i) The aggregate area of such required windows shall not be less than one-tenth part of the floor area of the room which is served thereby, and one-half at least of such required area shall be so constructed as to open for the admission of air without fixed obstruction other than approved fly-proof netting if such be desired.

NZSS 95 Part VIII clause 807(a) sets the

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<sup>37</sup> NZSI NZSS 95 clause 808(b)(i).

minimum room height as 8 ft (2.4 m).<sup>38</sup>

Comparison with the equivalent NZSS 1900 requirements given at the start of this section, shows the 1943 requirements were carried over to 1964, although with the addition of window height. The requirements were unchanged in the 1985 edition of Chapter 4.<sup>39</sup>

The Building Act 1991 created the performance based New Zealand Building Code (NZBC), which replaced NZSS 1900. Clause G4 Ventilation had the objective to "safeguard people from illness or loss of amenity due to lack of fresh air."<sup>40</sup> The Acceptable Solution set out was which were "deemed to comply" (words in italics are defined elsewhere in the NZBC):

1.1.1 The natural ventilation of *occupied spaces*, other than those in commercial and industrial *buildings* where products listed in NZBC Clause G4.3.3 are generated, shall be achieved by providing a net openable area of windows or other openings (excluding doors) of no less than 5% of the floor area

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<sup>38</sup> Isaacs "Standing Tall" p 68.

<sup>39</sup> New Zealand Standards Institute, *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 4:1985* sec. 4.7.

<sup>40</sup> Government of New Zealand *Building Regulations 1992* First Schedule.

The requirements relating to the provision of natural light had been removed, leaving only the 5% of the floor area being openable windows.

The NZBC and supporting documents are subject to regular revision and updating. The current (2019) requirements are:

**1.2.1** Where natural ventilation is available via adjacent spaces, specific ventilation is not required to small spaces such as hallways and lobbies in *household units*.

**1.2.2** Natural ventilation of *occupied spaces* must be achieved by providing a *net openable area* of windows or other openings to the outside of no less than 5% of the floor area.

The 5% floor area requirement does not apply to:

- (a) *occupied spaces* in Commercial and Industrial buildings where products listed in NZBC Clause G4.3.3 are generated (mechanical ventilation of these spaces is required), and
- (b) *household units* and accommodation units where there is only one external wall with opening windows (refer to Paragraph 1.3 for additional requirements if natural ventilation is used).

**1.2.3** Openable *building elements* shall be constructed in a way that allows them to remain fixed in the open position as a means of ventilation during normal occupancy of the *building*.<sup>41</sup>

Thus the 1858 model byelaw requirements for

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<sup>41</sup> MBIE *Acceptable Solutions and Verification Methods* sec. 1.2.

windows equal in area to one-tenth (10%) of the floor area of which one half of the area were openable (5%) and the top of the opening be no less than 6 ft 7 in would appear to be the direct ancestor of the modern requirement. However, no evidence has been found to suggest the original requirement was anything more than a codification of the then current best practice. The numbers were not and would not appear to be currently, supported by empirical evidence. Even so, the current GA Acceptable Solution G4/AS1 includes a number of newly defined terms to better ensure these requirements are correctly (and precisely) met.

### Conclusion

This paper has reviewed the development of NZS 1900, exploring the similarities and differences to its predecessor, NZSS 95. As an example of the process, the evolution of the requirement for windows for light and ventilation was examined.

Firmly based in the post-1931 Napier earthquake NZSS 95, the 1964 NZSS 1900 (later NZS 1900) was designed to be easier to use, easier to inspect and easier to revise. This approach was in use by 1986, resulting in a bylaw document of little more than the formal

history, explanatory notes, foreword and a single page of requirements and associated Standards. Even so, just a few years later the push to replace NZS 1900 by a performance-based code had formally begun. This was to come to fruition in 1992 with the issuing of the New Zealand Building Code.

The evolution of light and ventilation requirements provides another example of the lack of empirical research evidence to support modern building controls.<sup>42</sup> The identified link from New Zealand 1964 requirements to the 1859 model byelaws made under the British Local Government Act 1858 was not expected. However, the evolution of the requirements to include more tightly defined terms would not appear to be supported by the original Victorian era requirements, or by modern twenty-first century research.

The apparent link between the 1858 model byelaws and the 1851 repeal of the Window Tax remains to be further explored.

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<sup>42</sup> e.g. Isaacs "Evolution of Sub-Floor Moisture Management Requirements" p 386; Isaacs "Standing Tall" p 71.



## REFERENCES

- Building Regulations Committee "H-21 Report of Building Regulations Committee" *Appendices to the Journals of the House of Representatives: 1931 Session I-II* Wellington, N.Z.: Government Printer, 1931. II  
<https://paperspast.natlib.govt.nz/parliamentary/AJHR1931-I-II.2.2.6.24>
- Building Research Bureau of New Zealand *The Model Building Bylaw (NZSS 1900)*, Building Information Bulletin 50. Wellington N.Z.: Building Research Bureau of New Zealand (Inc.), 1963.
- Butti, Ken and John Perlin *A Golden Thread: 2500 Years of Solar Architecture and Technology* Palo Alto New York: Cheshire Books; Van Nostrand Reinhold, 1980.
- City of Gloucester *Bye Laws for The City of Gloucester Made Under The Public Health Act 1848 And The Local Government Act 1858 And Other Statutes In Force Throughout The City To Which Are Appended Extracts From The Towns Police Clauses Act 1847 And The Towns Improvement Clauses Act 1847* Gloucester: E. Nest, City Printer, 1863.  
[https://www.google.co.nz/books/edition/Bye\\_laws/YREHAAAQAAJ](https://www.google.co.nz/books/edition/Bye_laws/YREHAAAQAAJ)
- Department of Health *Model By-Laws Under the Health Act 1920 Relating to Dwellings and Buildings for Human Habitation* (Wellington N.Z.: Government Printer, 1925), Auckland Council Archives, TRB 005/45 Department of Health, 1924-1928
- Department of Public Health, Hospitals and Charitable Aid *Suggestions for By-Laws Suitable for Adoption in Counties, Town and Road Districts* (Wellington N.Z.: Government Printer, 1912), Alexander Turnbull Library, MS-Papers-1293-047/1
- Department of Industries and Commerce (DIC) "Department of Industries and Commerce (Twentieth Annual Report) Annual Report for the Year 1936-37" H-44 *Appendices of the Journal of the House of Representatives* Wellington N.Z., 1937.  
<https://paperspast.natlib.govt.nz/parliamentary/AJHR1933-I.2.3.2.30>
- Department of Scientific and Industrial Research (DSIR) "Department of Scientific and Industrial Research (Eleventh Annual Report) Annual Report for the Year 1936-37" H-34 *Appendices to the Journal of the House of Representatives* Wellington N.Z., 1937.  
<https://paperspast.natlib.govt.nz/parliamentary/AJHR1933-I.2.3.2.30>
- Government of New Zealand *Building Regulations 1992*, 1992  
<http://www.legislation.govt.nz/regulation/public/1992/0150/latest/DLM162570.html>
- Great Britain Parliament House of Commons *William III, 1695-6: An Act for Granting to His Majesty Severall Rates or Duties upon Houses for Making Good the Deficiency of the Clipped Money.* [Chapter XVIII. Rot. Parl. 7&8 Gul. III. p 5, n 4] <https://www.british-history.ac.uk/statutes-realm/vol7/pp86-94#s1>
- Harper, Roger Henley "The Evolution of the English Building Regulations 1840-1914" (unpublished PhD thesis, University of Sheffield, 1978) <http://etheses.whiterose.ac.uk/10303/>
- Helm, Nick "Building Code Turns 25" *BUILD* (2017) 161: 58.
- Hitchcock, E.H. "A New Look at NZS 1900: The Model Building Code" *Standards Bulletin* (October 1969): 10-13.
- Hitchcock, E.H. "A Note About N.Z.S. 1900 Building Codes and Changes [Code Feature Section]" *NZ Society for Earthquake Engineering Bulletin*, 2.3 (1969): 271-276.
- Isaacs, Nigel P. "Building Controls in New Zealand: a Brief History 1870 to the 1930s" *History of Construction Cultures* ed. João Mascarenhas-Mateus, Ana Paula Pires, Manuel Marques Caiado, and Ivo Veiga *Seventh International Congress on Construction History (7ICCH)* [Building Knowledge, Constructing Histories] Lisbon, Portugal: CRC/Balkema, 2021 II:493-99 <https://doi.org/10.1201/9781003173434>

- Isaacs, Nigel P. "Building Legislation 1840-1870" *New Zealand Law Journal*, 11 June (2012):179-184.
- Isaacs, Nigel P. "Evolution of Sub-Floor Moisture Management Requirements in UK, USA and New Zealand 1600s to 1969" *International Journal of Building Pathology and Adaptation* (2019) 37(4): 366-394 <https://doi.org/10.1108/IJBPA-06-2018-0052>
- Isaacs, Nigel P. "Foundations of Control: New Zealand Building Legislation in the 1840s" *Architectural History Aotearoa* (2014) 11: 35-41. <https://doi.org/10.26686/aha.v11i.7414>
- Isaacs, Nigel P. "Standing Tall: The Evolution of Habitable Room Height Limits in New Zealand Building Controls" *Architectural History Aotearoa* (2021) 18:66-73 <https://doi.org/10.26686/aha.v18i.7369>
- Klein, Bruce "Building Controls: Past and Future" *BUILD* (2020) 181: 56-58.
- Macdonald, Neil. Source: Letter Dec 1978 to Russell C. Cooney, "A History of the New Zealand Standard Model Building Bylaw" (May 1966) (private collection).
- Ministry of Business, Innovation and Employment (MBIE) *Acceptable Solutions and Verification Methods For New Zealand Building Code Clause G4 Ventilation*, 4th Ed. Wellington N.Z.: Ministry of Business, Innovation and Employment, 2019 <https://www.building.govt.nz>
- New Zealand Standards Institute (NZSI) *NZSS 95: 1935. New Zealand Standard Model Building By-Law. Sections I-X*, 1st edn. Wellington N.Z.: New Zealand Standards Institution, 1935, Archives NZ Wellington, AEKP 19032 1/1 (R17701687) [https://ndhadeliver.natlib.govt.nz/delivery/DeliveryManagerServlet?dps\\_pid=IE73131355](https://ndhadeliver.natlib.govt.nz/delivery/DeliveryManagerServlet?dps_pid=IE73131355)
- New Zealand Standards Institute (NZSI) *NZSS 95 New Zealand Standard Code of Building By-Laws. Part VIII. - Residential Buildings*, 1st edn Wellington N.Z.: New Zealand Standards Institute, 1943.
- New Zealand Standards Institute (NZSI) *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 4:1964 Residential Buildings. Incorporating Amendments No. 1 and No. 2 (Superseding NZSS 95, Part VIII)* Wellington N.Z.: New Zealand Standards Institute, 1973.
- New Zealand Standards Institute (NZSI) *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 4:1985 Residential Buildings (Metric Units)* (Wellington N.Z.: New Zealand Standards Institute, 1985)
- New Zealand Standards Institute (NZSI) "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for the Year 1940-41" *Appendices to the Journal of the House of Representatives* Wellington N.Z., 1941. <https://paperspast.natlib.govt.nz/parliamentary>
- New Zealand Standards Institute (NZSI) "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for the Year 1947-48" *Appendices of the Journal to the House of Representatives* Wellington N.Z., 1948. <https://paperspast.natlib.govt.nz/parliamentary>
- New Zealand Standards Institute (NZSI) "New Zealand Standards Institute (Department of Scientific and Industrial Research) Annual Report for the Year 1949-50" *Appendices to the Journal of the House of Representatives* Wellington N.Z., 1950. <https://paperspast.natlib.govt.nz/parliamentary>
- New Zealand Standards Institute (NZSI) "Reorganization of the Model Building Bylaw" *New Zealand Standards Bulletin* (June 1963):14-15.
- New Zealand Standards Institute (NZSI) *War Emergency NZSS E.163 New Zealand Emergency Standard Specification for Dwellinghouse Construction* (Wellington N.Z.: New Zealand Standards Institute, 1945), Auckland Council Archives, ACC 219/43-121 Standards Institute of N.Z. 1943-1947, Part 1.

- Schwab, Robert M., and Wallace E. Oates *The Window Tax: A Case Study in Excess Burden* Cambridge, MA: Lincoln Institute of Land Policy, 2014. <http://www.jstor.org/stable/resrep18445>
- Secretary of State for The Home Department *First Annual Report Presented by the Secretary of State for The Home Department to Parliament, on the Execution of The Local Government Act, 1858. Presented to Both Houses of Parliament Pursuant to Act 21 & 22 Vict. Cap. 98*, House of Commons Parliamentary Papers. London: His Majesty's Stationary Office, 10 August 1859.
- Shelton, Roger *The Engineering Basis of NZS 3604*, Study Report. Porirua N.Z.: BRANZ Ltd, 2007.
- Standards Association New Zealand (SANZ) *NZSS 1900 New Zealand Standard Model Building Bylaw: Chapter 6:1986 Construction Requirements for Buildings Not Requiring Specific Design - Timber and Masonry* Wellington N.Z.: SANZ, 1986.
- Standards Association New Zealand (SANZ) "Special Note for Members of All Standards Committees" *Standards Bulletin* (October 1969) 14.
- Forster, John "The Tax on Light and Air" *The Examiner* (1850) 2202: 226-227.
- Wellington City Council *Wellington City Council. The Building By-Law 1891 (Passed 7th January 1892)* Wellington N.Z.: Wellington City Council, 1892.
- The Wonder of the Window-Tax* Bridgwater: John Clark, 1848. [http://archive.org/details/ldpd\\_6418498\\_000](http://archive.org/details/ldpd_6418498_000)