



# Indoor Air Quality and Thermal Comfort

**Version 2.0**  
**February 2022**

---

**Good Indoor Air Quality and Thermal Comfort (IAQ&TC) is very important to people's health and wellbeing and has a direct impact on the usability of a space and on learning outcomes. This overview provides a summary of NZSPA's new IAQ&TC requirements for creating quality learning environments that are fit for purpose. The requirements form part of NZSPA's Designing Quality Learning Spaces (DQLS) suite of documents. This overview covers the target audience, mandatory requirements, and key design concepts.**

---

The target audience for the new IAQ&TC requirements is designers and engineers involved in the design of NZSPA's school buildings.

It is to be used for new builds, including extensions, pre-fabricated and any new contracts for modular buildings, and refurbishment of existing school buildings, including significant alterations.

It covers four key areas:

- The importance of good IAQ&TC for learning
- Mandatory air quality and thermal comfort requirements (refer to the tables below)
- Design guidance and recommendations for specialist learning and ancillary spaces
- IAQ&TC monitoring and verification methodologies

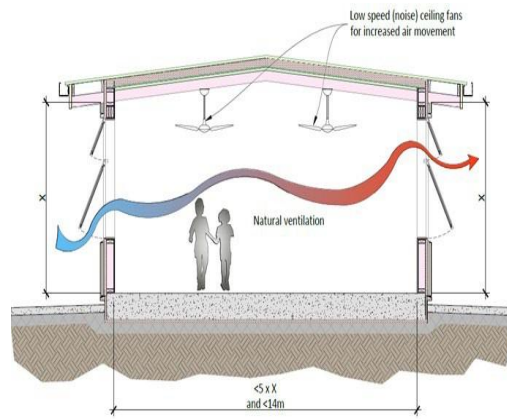
| Description                           | Mandatory Requirements (New Build and Refurbishments)                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                               | <ul style="list-style-type: none"> <li>• The climate-based heating, ventilation &amp; cooling requirements &amp; recommendations in Table 5, Page 37 of DQLS - IAQ&amp;TC document must be followed</li> </ul>                                                                                                                                                                                                                                                                   |
| Air Quality                           | <ul style="list-style-type: none"> <li>• CO2 concentrations in occupied spaces should average 800 –1250 ppm</li> <li>• New buildings must be unoccupied for a minimum of one week ‘bake off’ period after completion, to allow for the dissipation of VOCs</li> </ul>                                                                                                                                                                                                            |
| Temperature                           | <ul style="list-style-type: none"> <li>• Temperature design goal levels in learning spaces must be maintained between 18-25 °C, with limited time that temperatures above this range are allowed in summer months</li> <li>• Window area should be between 25% to 35% of the total external wall area</li> </ul>                                                                                                                                                                 |
| Thermal Insulation                    | <ul style="list-style-type: none"> <li>• Warm roof construction is required in specific Climate Zones</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 |
| Ventilation                           | <ul style="list-style-type: none"> <li>• NZSPA prefers natural, or mixed-mode ventilation (depending on the climate zone), with full mechanical ventilation systems as a last resort only (refer to Figures 1 to 3 below)</li> </ul>                                                                                                                                                                                                                                             |
| Systems and Components                | <ul style="list-style-type: none"> <li>• The installation of new gas, diesel, oil or coal boilers is prohibited, due to NZSPA’s commitment to carbon abatement</li> <li>• The selection of heating, cooling and ventilation systems must be in accordance with NZSPA’s Life Cycle Analysis Calculator Tool</li> </ul>                                                                                                                                                            |
| Internal Environment Monitoring (IEM) | <ul style="list-style-type: none"> <li>• IEM monitors that measure CO2, temperature, relative humidity, lighting, and sound levels must be provided in a central location in each teaching space</li> <li>• The IEM monitor must have a direct reading display, plus the ability to store and download accumulated data</li> <li>• Project Teams must source all IEM devices from NZSPA</li> </ul>                                                                               |
| Design Verification                   | <ul style="list-style-type: none"> <li>• For small (&lt; 600 m2 GFA), less complex building forms, a design statement must be provided, with supporting calculations, confirming that the thermal and air quality requirements are met</li> <li>• For larger (&gt; 600 m2 GFA), more complex building forms, the Project Team must demonstrate that the design will comply with the overheating criteria and air quality requirements through Climate Based modelling</li> </ul> |

| Summary of Ministry thermal requirements and climate based heating and ventilation recommendations |              |                                                                                                                                                           |                                 |                                   |               |               |                                    |             |                                    |                                      |                                   |                         |                             |                                               |
|----------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|---------------|---------------|------------------------------------|-------------|------------------------------------|--------------------------------------|-----------------------------------|-------------------------|-----------------------------|-----------------------------------------------|
| Climate Zone                                                                                       |              | Districts                                                                                                                                                 | % School Population (2020 data) | Building Envelope Requirements*** |               |               |                                    |             | Heating Options Recommendations ** |                                      |                                   |                         | Ventilation Recommendations |                                               |
|                                                                                                    |              |                                                                                                                                                           |                                 | R-Value Roof                      | R-Value Walls | R-Value Floor | R-Value Glazing (Except Skylights) | WWR Range * | Small Projects #                   |                                      | Large Projects #                  |                         | Natural Ventilation Only    | Mixed Mode (Natural/Mechanical Heat Recovery) |
|                                                                                                    |              |                                                                                                                                                           |                                 |                                   |               |               |                                    |             | Electric Radiant Heating ****      | Split or Multi-Split Heat Pumps **** | Water Heat Pumps & Fan Coils **** | Wood Chip/Pellet Boiler |                             |                                               |
| 1                                                                                                  | Warmest<br>↑ | Far North, Whangārei, Kaipara, Auckland, Thames Coromandel, Western BoP, Tauranga, Whakatāne, Kawerau, Ōpōtiki                                            | 44%                             | 3.5                               | 2.2           | 2.2           | 0.33                               | 25-35%      | ✓                                  | ✓                                    | ✓                                 |                         | ✓                           |                                               |
| 2                                                                                                  |              | Hauraki, Waikato, Hamilton, Waitomo, Gisborne, Hastings, Napier, Central Hawke's Bay, New Plymouth, Stratford, South Taranaki, Whanganui                  | 15%                             | 4.0                               | 2.4           | 2.2           | 0.33                               | 25-35%      | ✓                                  | ✓                                    | ✓                                 |                         | ✓                           |                                               |
| 3                                                                                                  |              | Manawātū, Palmerston North, Kāpiti, Horowhenua, Rangitikei South, Porirua, Lower Hutt, Wellington, Tasman, Nelson, Marlborough, Kāikōura, Chatham Islands | 15%                             | 5.0                               | 2.7           | 2.2           | 0.37                               | 25-35%      |                                    |                                      | ✓                                 | ✓                       | ✓                           |                                               |
| Total                                                                                              |              |                                                                                                                                                           | 74%                             |                                   |               |               |                                    |             |                                    |                                      |                                   |                         |                             |                                               |
| 4                                                                                                  | Coldest<br>↓ | Taupō, Rotorua, Ruapehu, Rangitikei North, Taranaki, Upper Hutt, Masterton, Carterton, South Wairarapa, Buller, Grey, Westland                            | 6%                              | 5.4                               | 3.0           | 2.4           | 0.37                               | 25-35%      |                                    |                                      | ✓                                 | ✓                       |                             | ✓                                             |
| 5                                                                                                  |              | Hurunui, Waimakariri, Christchurch, Selwyn, Ashburton, Timarua, Waimate, Dunedin, Clutha, Waitaki East                                                    | 14%                             | 6.0                               | 3.0           | 2.5           | 0.40                               | 25-35%      |                                    |                                      | ✓                                 | ✓                       |                             | ✓                                             |
| 6                                                                                                  |              | Mackenzie, Central Otago, Queenstown Lakes, Southland, Gore, Invercargill, Waitaki West                                                                   | 4%                              | 7.0                               | 3.2           | 2.6           | 0.42                               | 25-35%      |                                    |                                      | ✓                                 | ✓                       |                             | ✓                                             |
| Total                                                                                              |              |                                                                                                                                                           | 26%                             |                                   |               |               |                                    |             |                                    |                                      |                                   |                         |                             |                                               |

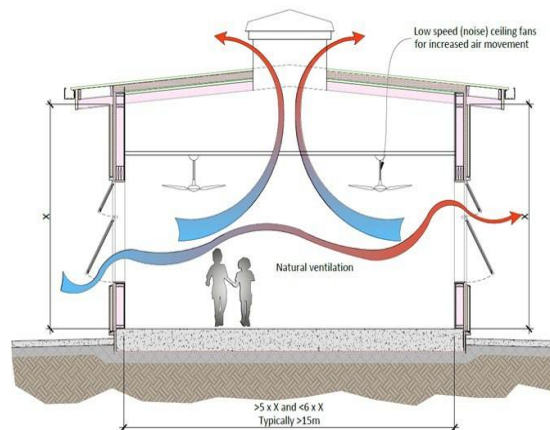
- \* Optimise by a combination of thermal and climate-based daylight modelling
- \*\* Use life cycle costing tool to present options given to NZSPA for approval as part of the design review process
- \*\*\* Based on NZBC Clause H1/AS2. Refer also to NZSPA's [Weathertightness Design Requirements](#) for details of thermal bridging, vapour retarding layers & airtightness
- \*\*\*\* Active Cooling/Air conditioning will only be sanctioned by NZSPA where justified in situations described by this DQLS With respect to the heating recommendations, small projects < 1,200 m2 GFA; large projects > 1,200 m2 GFA

## Refurbishment Recommendations

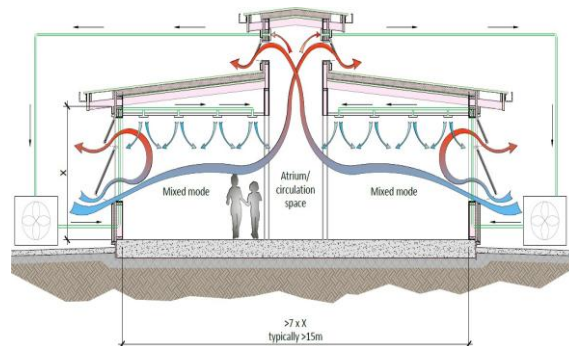
- In general terms, IAQ&TC strategies for upgrade projects are much the same as for new buildings because there is generally room for some improvement in IAQ&TC as part of any upgrade
- If there are significant changes to layout, occupancy levels, activity types and/or there are significant problems with the existing IAQ&TC provisions, then the requirements set out in Section 1 of DQLS – IAQ&TC should be followed as far as is reasonably practicable
- Any change to walls, windows, floors, ceilings, roofs, doors and partitions should be investigated to determine its effect on the IAQ&TC of the spaces



**Figure 1: Shallow plan cross ventilation**



**Figure 2: Medium plan cross ventilation/mixed mode strategy**



**Figure 3: Deep plan mixed mode ventilation strategy**

This is a brief overview of the [IAQ&TC](#) requirements. NZSPA's full requirements for IAQ&TC in schools is available on NZSPA's website. Other documents in the DQLS series that form part of NZSPA's guidelines are: [Acoustics](#) and [Lighting and Visual Comfort](#)