New Zealand
School Property Agency

Designing Quality Learning Spaces (DQLS)

Frequently Asked Questions (FAQ) V. 2.0 - July2023

The DQLS series covers the four main indoor environmental quality factors: lighting and visual comfort, acoustics, indoor air quality and thermal comfort requirements and form part of a set of documents for Designing Schools in Aotearoa New Zealand – School Property Design Standards (DSNZ). DSNZ is the principal document in our suite of design standards for school/kura property.

DQLS and Indoor Environmental Quality (IEQ) Report FAQs

1. What is the purpose of the DQLS requirements?

The purpose of the DQLS is to provide quality indoor environments to support teaching and equitable learning and the wellbeing of school building users.

The DQLS requirements are based upon: Lessons learned from design reviews; the latest research, current industry trends; our responses to a wide range of technical queries; Post-Occupancy Evaluations (POEs); and modelling of typical school buildings.

2. What is the difference between our DQLS requirements and the NZ Building Code (Code)?

The DQLS requirements provide for educational need where the New Zealand Building Code (NZBC) is silent. The DQLS requirements also interprets NZBC functional requirements into standards that are fit-for-purpose in the context of schools/kura and their specific use. For

example, the NZBC is mostly concerned about safe movement for lighting rather than its functional use, and the NZBC doesn't say anything about noise management within spaces.

3. What projects do the DQLS requirements apply to?

These standards apply to all new builds and refurbishments of existing school buildings, for both NZSPA and school-led projects. Refurbishments and retrofits should provide tangible and practicable, value-for-money benefits and any changes pertaining to the use of the space.

4. What is the Indoor Environment Quality (IEQ) Design Report?

The IEQ Design Report is a tool to encourage good design, organise information coherently and demonstrate compliance with our DQLS requirements.

5. Why is the IEQ Design Report valuable?

The IEQ Design Report:

- Demonstrates how a design will achieve our quality indoor environment objectives
- Provides a single coherent report for assessing the four main indoor environmental quality factors
- Highlights the key IEQ risks and trade-offs that have informed the design
- Assists with post-occupancy evaluations (POE), and
- Promotes integrated collaborative design between architects and engineers to support well informed decisions.

6. When are Design Teams expected to provide us a completed IEQ Design Report?

Design Teams are required to submit a completed draft report, with any supporting information, at 100% Preliminary Design review. We do not expect separate duplicated reports from consultants.

An updated report is to be provided at Developed Design review submission to capture design progression (Refer to the design assurance deliverables checklist for more information).

7. When will our DQLS documents be updated?

We plan to rename and update our DQLS documents in early 2024. The updates will align with DSNZ, incorporate learnings from projects, and further reinforce our whole of life cost and carbon requirements.

Daylighting FAQs

8. Why do we prefer maximising good daylighting design in schools?

Daylight offers health and learning performance benefits, such as: Supporting and adjusting the circadian rhythms that influence people's physiological and psychological state; suppress melatonin production to improve alertness; and enhance the accurate perception of colour.[1]

Good daylighting is also closely related to quality outlook from learning spaces. Outlook to the natural environment combined with daylight can promote wellbeing and mood.

To reduce reliance on the use of artificial lighting, minimise glare, and to save energy.

9. What about the use of artificial lighting?

We don't preclude the use of artificial lighting to supplement daylight when necessary (for example, during the early mornings and on days with overcast sky conditions).

10. What is a simple building form?

Simple building forms are defined as follows:

- Buildings with window-to-wall ratios in the range of 30-50%, with spaces that are either:
- Less than 7m with windows on one or more sides, or
- Less than 14m (between walls with windows) with a reasonably even distribution of windows on at least two opposite sides.

11. What is a Simple Building Form Daylight Calculator Tool?

This is an Excel tool to support Design Teams in achieving compliance with our daylight requirements.

The Tool is designed based on the Four Step Daylight Design Sequence proposed by Reinhart & Lo Verso, (2010), it is easy to use and is available on the NZSPA's website.

12. What is a Complex Building Form, and Climate Based Daylight Modelling (CBDM)?

Complex building forms are all buildings that don't meet the simple building form criteria.

CBDM uses realistic sun and sky conditions derived from standardised weather data to predict the quality and quantity of daylight distribution within a space through the seasons of a year.

13. When is a CBDM assessment required?

Design Teams are to carry out a CBDM assessment for complex building forms during the Preliminary Design stage, in accordance with the daylight modelling requirements and guidelines set out in Section 1.1.2 of DQLS – Lighting.

14. Why is NZSPA's Daylighting Useful Daylight Illuminance (UDI) 300 to 2000 lux for 80% of school hours across more than 50% of the usable floor level?

The definition of a well-daylit space includes good average light levels (>300 lux) as well as low glare (<2000 lux) across work surfaces (i.e., light between a minimum and maximum level).[2 3 4]

While UDIs can differ depending on activity, in school buildings, 300 lux is commonly used as the minimum target illuminance in most classroom spaces. "The minimum would indicate if there is an area which is not really benefitting from access to daylight. The percentage of the area would indicate if the low levels of daylight are only in a small area of the space or beginning to dominate the space".[5]

15. Why not NZBC 30 lux or Green Star 160 lux recommendation or 100 lux, which could be supplemented with artificial lighting?

The intention with the current targets is to encourage fit-for-purpose daylighting in schools.

A daylight illuminance value of 30 lux is a NZBC Clause G7 requirement. This is a minimum requirement and does not represent good practice for a learning environment.

Daylight values of 100 to 160 lux are recommended for general work areas.

Greenstar uses Daylight Autonomy (DA), which is the number of annual daytime hours a space

exceeds a target illuminance level (160 lux) on the working plane. DA does not show whether a space underperforms during particular times, such as during morning hours or over the winter period and doesn't account for glare issues from excess light.

16. How can we achieve the DQLS daylighting requirements?

We encourage designers to consider daylighting from the initial building concept stage and to use daylight modelling as an interactive design tool to optimise the building design rather than as just a verification tool. By using this approach, the

extent of "non-compliance" will be minimised. Any remaining areas of non-compliance may be justified to NZSPA as being unavoidable due to site and building briefing constraints. In other words, provide the optimum design for a project given its particular circumstances.

Ensure that you follow our DQLS guidance on integrated daylight design in Section 3 (pages 32 to 47).

As a starter, consider the impact of: Spaces that are too internal; deep exterior overhangs that

overshade windows; building orientation; dark walls; and oversized, undersized or unevenly distributed windows.

Note that daylighting requirements are more relaxed for specialist spaces (for example, workshop and technology spaces, circulation and admin / utility areas). Follow the guidance provided on pages 51 to 64 of DQLS – Lighting.

Acoustics FAQs

17. How do the acoustic requirements consider ākonga with sensory impairments and neuro- diversity?

Our DQLS – Acoustics document sets requirements to recognise the influence of acoustics on learning and wellbeing for students with sensory impairment or neuro-diversity.

DQLS also provides design guidance for learning support facilities, including general guidance for specific learning support needs

18. Is there a rain noise acoustic requirement?

The DQLS – Acoustics doesn't set a rain noise criterion but has a reference design-based requirement. That is, we have three reference design solutions for roofs (p. 16 and 17) to cater for areas of high, medium, and low rainfall intensity.

The general principle for you to consider is whether rain noise would be detrimental to learning or building use.

The likelihood of high rain intensity varies throughout Aotearoa/New Zealand, a school's roof design should be appropriate for its regional rainfall intensity.

19. Is the acoustic requirement for connected spaces different?

It is important to identify whether adjacent spaces are connected or not. The Sound Transmission Class (STC) ratings for connected spaces are lower and less costly.

As per DQLS – Acoustics, page 14, connected spaces are rooms that are physically connected to each other by a door, corridor or opening (i.e., you can walk between spaces without going outside), and are part of the same general space in which learning activities are coordinated.

In the IEQ Design report, connected learning spaces should be clearly grouped and labelled in design drawings.

Indoor Air Quality and Thermal Comfort FAQs

20. What is NZSPA's ventilation, heating and cooling requirement?

Our preference is for natural or mixed-mode ventilation (depending on the climate zone). For operational cost, maintenance and useability reasons, full mechanical ventilation systems are a last resort and must be supported through modelling and analysis.

Demonstrate (in the IEQ Design Report) that passive design was maximised before including additional mechanical solutions. Ensure robust decision making and optioneering is presented.

Life cycle cost analysis (LCCA) is required to support the selection of heating, ventilation and cooling solutions. Use the NZSPA's Life Cycle Cost Analysis Calculator Tool to prepare the Options Report.

We acknowledge that there is no 'one size fits all' ventilation strategy, and that the limits and opportunities of the project will determine which ventilation strategy is best.

21. Should swing and slider doors be considered as opening when modelling for ventilation?

We do not encourage the use of swing doors for ventilation modelling as they can either be closed or open. Slider doors could be considered on a case-by-case basis depending on project specific constraints.

Generally, reliance on opening doors as the predominant means of natural ventilation should be minimised.

22. Is CO2 concentration modelling required if full mechanical ventilation systems (capable of meeting NZBC outside air requirements) are being proposed?

No, as per page 64 of DQLS – IAQ&TC. A design statement (not CO_2 modelling) supported by documentation is sufficient to demonstrate that the design is compliant with our requirements set out in Section 1.1.1.

23. If thermal modelling determines that mechanical cooling is required for a space, what outdoor conditions and indoor temperature setpoint should the system be sized for?

Where a mechanical system is required for cooling, and agreed by NZSPA, then the system is to be sized to operate with set points 2°C below the NIWA 1% summer dry bulb design temperature (i.e., if the NIWA 1% summer design temperature is 27°C, the system is to be designed and operated to maintain 25°C).

24. What is NZSPA's policy on coal and gas boilers?

The installation of new fossil fuel (gas, diesel, oil or coal) boilers is not permitted due to Aotearoa New Zealand's commitment to carbon reduction.

25. What is NZSPA's plan for the phase out of refrigerants for schools?

Refrigerant usage and leakage is a significant life-cycle source of greenhouse gas emissions and is therefore an important consideration within our commitment to carbon reduction.

Following the Kigali Amendment to the Montreal Protocol, the use of some hydrofluorocarbon (HFC) refrigerants that are commonly present in commercial heat pump units are being phased out.

The protocol requires a 10% reduction in use by 2019 and an 85% reduction by 2036.

Based on this, Design teams are to ensure that heat pump selection considers the implications of HFC refrigerants being phased out under the Kigali Amendment (i.e., the continued availability of HFC refrigerants and their short to medium term replacement needs to be considered in the selection of heat pump systems).

Approaches to reducing refrigerant charge use include maximising the extent of passive design. Also, avoiding the use of systems with a high refrigerant charge such as non-hybrid/all refrigerant VRF/VRV systems.

Where heat pumps are used, selecting them with refrigerants with a lower global warming potential including transitional HFCs such as R-32 and alternatives to HFCs as they become available, is another important consideration.

For more guidance on refrigerants, refer to pages 17 and 22 in DQLS – IAQ&TC. Our advice for small and medium kura is that central chilled/heating water systems would only be provided on a case-by-case basis as it depends on factors such as cost, fuel source, economic life and type of project, etc., which a life cycle cost analysis should address.

26. For thermal modelling purposes, how are larger building forms >600m2 Gross Floor Area (GFA) measured?

GFA is the sum of a building's floor areas measured to the external walls. For example, if a building has two floors of 320 m2 each, the sum of both floors is 640 m2 GFA. This is a large building form because it is greater than 600 m2 GFA.

Internal Environmental Monitoring Devices (IEMs)

27. Where can I source IEMs?

Project Teams are to source IEMs from NZSPA. Contact your NZSPA Delivery Manager or Property Advisor for the ordering process.

28. Are IEMs required in mechanically ventilated spaces?

Yes, because we are also looking at collecting real-time evidence based internal environmental data for all learning spaces irrespective of the type of ventilation system This will inform our long-term asset management objectives of providing quality learning environments.

These devices are also useful to provide real-time readings and feedback for occupants of the space.

General

29. If a project is looking to achieve a Green Star rating, does it have to meet DQLS requirements?

Projects must meet both DQLS and Green Star requirements. Often the easiest way to achieve compliance with both requirements is to use the Green Star* performance pathways for demonstrating compliance.

At times, there will be different compliance requirements for meeting both standards, ensure both are met. If there is conflict or a potentially poor outcome, please discuss these points with NZSPA's School Design Team or through your School Design Review advisor.

Note* that as of 1 April 2023, achieving a 5 Star Green Star rating is applicable to buildings with a capital value of $9m or greater. NZSPA will evaluate whether a project must meet Green Star standards, and advise the Project Team directly.

30. Do you have an email address for answering IEQ and other property related queries?

The School Design team can be reached by emailing: school.design@schoolproperty.govt.nz

References

[1]Ackley, A., M. Donn, and G. Thomas. 2017. The Influence of Indoor Environmental Quality in Schools - A Systematic Literature Review. In The Next 50 Years, (51st International Conference of the Architectural Science Association (ANZAScA)), edited by M. Schnabel, 625–634. Wellington: Architectural Science Association.

[2] Costanzo, V., Evola, G., & Marletta, L. (2017a). A Review of Daylighting Strategies in Schools: State of the Art and Expected Future Trends. Buildings, 7(2), 41. https://doi.org/10.3390/buildings7020041.

[3]Costanzo, V., Evola, G., & Marletta, L. (2017b). Static and dynamic strategies for improving daylight use in side-lit classrooms a case study.

[4] Piderit Moreno, M., & Labarca, C. (2015). Methodology for Assessing Daylighting Design Strategies in Classroom with a Climate-Based Method. Sustainability, 7(1), 880–897. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su7010880.

[5] EFA (2014). Daylight Design Guide. Education Funding Agency, United Kingdom. Retrieved from: https://www.gov.uk/government/publications/efa-daylight-design-guide.