Fire Safety Engineering Design Review for Development Application (DA)

German International School – Science Centre and Administration

scientific fire services
consulting engineers
education & training

Sydney
Melbourne
Hong Kong
Muscat

creating intelligent fire safety solutions

Date:	**17 November 2021**
Document ref:	**283621**
Issue No:	**2-0**
Author:	**Russell Kilmartin**

1. Fire Safety Engineering Review

1.1 General

Scientific Fire Services has undertaken a preliminary review and assessment of the architectural drawings and design concepts for the proposed development known as the German International School project located at Myoora Road, Terrey Hills, NSW. The Preliminary DA architectural drawings reviewed have been prepared by betti&knut architecture and are referenced in Appendix A. The following provides a summary of the fire safety risk engineering aspects and 'in-principle' support for the proposed DA design.

The pending report and the proposed Performance Solution are not intended to be a fait accompli. The purpose of this document is to inform stakeholders who shall make decisions with respect to the identified design issues and trial design being part of the DA submission. This document outlines the broad fire safety engineering scope of work for the ensuing fire safety engineering analysis to be undertaken.

The identified design issues shall be addressed through a combination of qualitative and quantitative assessment methodologies. The methodologies will rely upon a combination of enhanced passive and/or active fire safety measures specific to each issue or be rationalised through a holistic approach.

1.2 The Project

The development includes the erection of a new two (2) storey Science Centre and minor alterations/extensions to an existing Administration building. The buildings are within the existing grounds of the German International school in Terrey Hills NSW.

The administration building is an existing building with an extension proposed while the proposed science centre shall be a newly constructed building. The administration building shall contain Class 5 school offices and the Science Centre shall contain Class 9 classrooms and laboratories. Both buildings shall have a rise in storeys of two (2) with an effective height of less than 12m.

The administration building extension shall be constructed in accordance with Type C construction while the Science Centre shall be constructed in accordance with Type B fire resisting construction. Fire Resistance Levels (FRL) shall be achieved (to the degree necessary) which will ensure that the overall building meets an accord with the relevant Performance Requirements from Volume One of the BCA.

The new Science Centre building is positioned toward the front of the site (eastern side) near the school entrance at Myoora Rd. The predominant form of construction of the new Science Centre is the use of mass timber construction methods and materials in the form of Cross Laminated Timber (CLT) of which a significant portion of the timber will be exposed to highlight the natural aesthetic of the timber material.

The Science Centre structure will consist of the following:

- The Ground Floor will be constructed of a traditional reinforced concrete floor slab with external and internal walls being constructed of CLT mass timber panels.

- The floor structure of the First Floor will adopt CLT mass timber floor panels supported on the loadbearing CLT walls and Glulam structural columns and beams running in the north-south orientation.
- The lift shaft and bounding construction of the internal stair enclosures shall be constructed of CLT mass timber panels.
- The roof structure also adopts CLT mass timber methods and materials in a sawtooth profile supported by Glulam Beams with extensive green roof over a PVC membrane.

The Administration building is proposed to have minor alterations/extensions at the eastern side of the existing administration block and will also adopt mass timber construction methods in the form of CLT wall and floor panels.

From an occupant egress perspective, each building shall be served by a single internal open stairway. The science building is also served by an additional external stair located on the eastern side of the building. Finally, reliable active fire protection systems are also proposed. In this instance, it is proposed to design and install an appropriate automatic sprinkler system as well as a fire detection and alarm system throughout both buildings.

The proposed development shall broadly encompass the building characteristics detailed in Table 1.1 and Table 1.2.

Table 1.1: BCA building description of Administration Building

Summary of Building/Tenancy	Administration Building Extension
Building Classification(s):	Class 5 (Office)
Number of Storeys Contained:	Two (2)
Rise in Storeys:	Two (2)
Effective Building Height:	Less than 12m
Required Type of Construction:	Type C Construction

Table 1.2: BCA building description of Science Centre

Summary of Building/Tenancy	Science Centre
Building Classification(s):	Class 9b (School)
Number of Storeys Contained:	Two (2)
Rise in Storeys:	Two (2)
Effective Building Height:	Less than 12m
Required Type of Construction:	Type B Construction

Figure 1.1 below depict the overall development and illustrates the general building arrangement and site configuration.

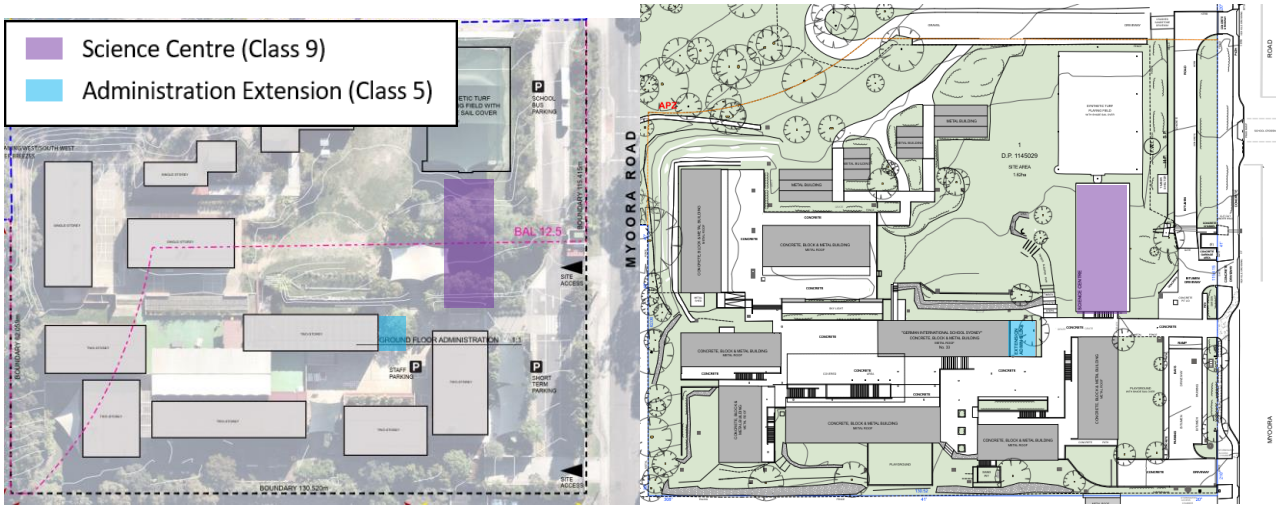

Figure 1.1: Current and Proposed Site view

1.3 Purpose

The preliminary fire safety engineering review was undertaken to determine 'in-principle' whether the design will achieve compliance with the Performance Requirements of the Building Code of Australia (BCA) (ABCB, 2019) and to support a DA submission. The design review relates to the fire-resisting construction, egress provisions and fire protection services for the proposed development.

The design issues as identified by the BCA consultant specific to the subject building will be formally assessed through the application of fire safety risk engineering process in accordance with the International Fire Engineering Guidelines (IFEG) (ABCB, 2005). It is the expectation that a suitable Performance Solution will be developed and supported through robust fire engineering methodologies of the current design proposal.

1.4 Building Design Issues and Performance Requirements

There are design issues that have been identified by BCA Logic that will represent deviations from the traditional prescriptive design requirements from Volume One of the National Construction Code (BCA) (BCA, 2019). Rather than seeking compliance with the more traditional 'Deemed-to-Satisfy' (DtS) provisions of the BCA, a 'Performance Solution' shall be formulated such that the identified design issues achieve compliance with the Performance Requirements of the BCA. The following table lists the anticipated design issues, the DtS provisions of the BCA and the corresponding Performance Requirements. It should be noted that the DtS provisions and Performance Requirements listed in the following table were identified by the Certifying Authority and agreed by relevant stakeholders.

Table 1.3: BCA requirements pertinent with the proposed Performance Solution

Design Issue	DtS Provision of the BCA	Performance Requirements
Any services penetrating through the first floor – if CLT will need to be suitably sealed noting that there are no available test reports for services through CLT products.	Clause C3.15	CP2 and CP8
The windows at ground level of the Science Centre where within 6.m of the adjacent fire source feature will not be protected.	Clause C3.2	CP2 and CP8
The non-loadbearing CLT walls of the Science Centre building are strictly required to be non-combustible – being Type B Construction, however being CLT are deemed to be combustible.	Clause 4.1 inter alia Specification C1.1	CP2
Internal loadbearing walls are required to possess a 120/120/120 FRL – it is noted that as per attached Structural advice that the lift shaft walls will be used for lateral stability thus should strictly possess a 120/120/120 FRL. The structural elements are proposed to achieve a minimum 90 minute FRL.	Clause 4.1 inter alia Specification C1.1	CP1 and CP2
If the first floor is proposed to be CLT – then such floor should strictly possess a 30/30/30 FRL, be lined to the underside with a 60 minute incipient spread ceiling or possess a fire protective covering to the underside. The proposal shall allow for non-encapsulated ceiling soffits where appropriate.	Clause 4.1 inter alia Specification C1.1	CP1 and CP2
Any loadbearing mass timber columns incorporated in the external walls are strictly required to possess a 120/-/- where located within 18.0m of any fire source features. Columns are proposed to non-encapsulated and shall achieve an inherent 90 minute FRL construction.	Clause 4.1 inter alia Specification C1.1	CP1 and CP2

1.5 Fire Resistance and Separation

With consideration of fire resistance and the type of construction proposed for the German International school buildings, the proposal is consistent with the prescriptive provisions of the BCA with the exception that the Class 9b (Science Centre) will adopt the 90 minutes fire resistance benchmark with automatic suppression systems installed in lieu of the prescribed 120 minute parameter nominated by BCA Specification C1.1. Essentially the fire resistance parameters for the buildings are as follows:

- Where mass timber methods and materials are adopted in the design the inherent fire resistance performance shall be established through the relevant mass timber design guidelines and shall achieve a minimum 90 minute resistance to fire.
- The mass timber structural elements shall be predominantly exposed internally (non-encapsulated) in order to take advantage of the natural aesthetic of the timber material. Fire engineering methodologies shall be applied to ensure safe occupant egress and fire spread containment is achieved.
- The building is off-set from adjacent property title boundaries and potential fire source features however there are window openings to the Science Centre in north western elevation that are located within 6.0m to a nearby fire

source feature (adjacent building). The protection of these windows will be assessed under the separate Fire Engineering Performance Solution report to be prepared at CC stage. Preliminary calculations suggest these opening do not require protection.

- The Science building is two (2) storeys and is proposed to be fully sprinkler protected throughout. Noting there is a reasonably large internal open stair and a lift connecting both levels it is proposed that the service installations passing through the first floor level slab structure will not be required to be fire sealed with proprietary fire rated tested systems. Given the presence of automatic sprinklers serving the Science Centre, the services penetrating through the first floor levels shall be smoke sealed. Further assessment of all services penetrations shall be undertaken at the CC stage.

The preliminary assessment conducted by SFS Australia suggests that the identified design issues relating to fire resistance & type of construction can readily satisfy the relevant BCA Performance Requirements, namely CP1 & CP2.

1.5.1 Mass Timber Construction

In recognition of the Science Centre building being predominately constructed using mass timber construction methods, the fire safety strategy for the German International school buildings shall rely on extensive experimental fire testing evidence and comprehensive fire safety engineering methodologies in order to support the proposed design.

The current approaches for fire safety design with engineered timber products suggests that the primary objective is to describe the process of "*separating the hazards*" associated with mass timber construction. The design principles will be assessed at the detailed design development stage of the project (CC stage). Upon review of the architectural drawings and preliminary structural design strategy, the design is considered to be representative and within the limitations of current mass timber construction principles.

The preliminary assessment conducted by SFS Australia suggests that the mass timber construction design can satisfy the relevant BCA Performance Requirements, namely CP1 & CP2.

1.6 Occupant Egress

In the context of occupant egress, two (2) exists are provided from the upper level of the Science building. Both exits are positioned at opposing end of the building and offer good wayfinding performance for evacuating occupants in an emergency fire situation. Both fire exits discharge occupants to external landscaped areas where occupants can readily move away from the building.

The egress design appears to comply with the code prescription in regard to the distance of travel to an emergency exit and the distance of travel between alternative emergency exits. It is proposed to undertake a thorough egress performance assessment during the CC stage having consideration to the relevant Performance Requirements of the BCA.

Further occupant egress enhancement measures may be developed during the detailed design development phase to improve the wayfinding performance. Upon review of the DA drawing set, it is considered that the location and distribution of the emergency fire stairs serving the building(s) is sufficient to satisfy the BCA Performance Requirements.

The preliminary assessment undertaken by SFS Australia suggests that the identified design issues relating to occupant egress provisions can satisfy the relevant BCA Performance Requirements DP4 & EP2.2.

1.7 Fire Services & Equipment

With respect to fire services & equipment, the design will include automatic sprinkler systems in accordance with the relevant prescriptive provision of the BCA providing early control, detection and suppression of a fire within all parts of the development.

A fire detection and alarm system will form part of the design solution throughout the Science Centre building to offer early warning to building occupants in the event of an emergency fire situation.

Fire Hydrants shall be designed and installed in accordance with relevant prescriptive provision of the BCA to offer providing attending fire brigade personnel with effective and compliant means to undertake fire brigade intervention activities. Hydrant booster assemblies and automatic sprinkler infrastructure shall be designed to achieve compliance to the relevant installation standards and shall be the subject of discussion with the Fire & Rescue NSW to ensure agreement compliance is achieved.

The standard suite of fire safety measures including portable fire extinguishers, emergency lighting, exit signage and directional exit signage shall be installed to prescriptive code compliance in accordance with Part E of the BCA.

The preliminary assessment undertaken by SFS Australia suggests that the identified design can readily satisfy the relevant BCA Performance Requirements, namely EP1.3, EP1.4 and EP1.5.

2. Statement of Endorsement

The fire and life safety related design issue(s) will be addressed through the performance-based path of compliance. SFS Australia can confirm that the proposed design will achieve fire safety design compliance to the relevant Performance Requirements of the Building Code of Australia (BCA) (ABCB, 2019) Amendment 1.

The Performance Solutions relating to EP1.4 and EP2.2 Category 2 fire safety provisions will need to be approved after consultation with Fire and Rescue NSW as part of the Construction Certificate process. Therefore, the formulation of the Fire Engineering Brief (FEB) represents the next step in the approvals process. Scientific Fire Services shall commence the process of developing this document and will provide a formal comprehensive FEB submission. As part of the process, a Fire Engineering Brief Questionnaire (FEBQ) document shall be prepared in accordance with the Fire and Rescue NSW pro forma and formally submitted as part of the referrals process.

Finally, and in order to ensure that the client can obtain a Construction Certificate for the proposed building works, Scientific Fire Services will prepare a Fire Safety Engineering Report (FSER) incorporating stakeholder conditions, comments and advice to the satisfaction of the Principle Certifying Authority (PCA).

On the basis of the review of the proposed design issues identified herein, SFS Australia can confirm that the documentation in relation to the subject development will achieve fire safety design compliance with the relevant Performance Requirements of the National Construction Code Series – Volume 1, Building Code of Australia (BCA).

I trust the above is satisfactory for your current purposes. Should you have any queries, please do not hesitate to contact me on (03) 9686 4730 or email to Russell.kilmartin@scifire.com.au

Russell Kilmartin
Director

Scientific Fire Services

BDC 0210 – Certifier- Fire Safety

Appendix A. Architectural Drawings

Table A.1: Architectural Drawings referred to

Drawing Number	Title	Date	Revision
02	Site Analysis Plan	29/10/2021	04
03	Site Plan	29/10/2021	04
04	Landscape Plan	29/10/2021	04
10	Ground Floor Science Plan	29/10/2021	04
11	Upper Levels Science Plan	29/10/2021	04
12	Roof Plan	29/10/2021	04
30	Sections 1:100	29/10/2021	04
31	Elevations South & West	29/10/2021	04
32	Elevations North & East	29/10/2021	04