Fire protection for university building

The design of the Australian Catholic University’s National Centre for Health and Wellbeing in Melbourne offered many challenges to the fire safety engineering consultant Unow Lai.

The building will consist of physical science laboratories, lecture theatres, a chapel, hospital-type wards, general office spaces and outdoor entertaining areas. It will be built on a brownfield site next to the university’s existing Victoria Street campus. Construction is due to begin in June, with completion scheduled for February 2012.

According to Unow Lai team leader Tony Lenko, the design of fire protection services sought to increase reliability and lower the costs of the system, while meeting the requirements of the Building Code of Australia and the Australian Standards.

Although the building’s open entrance has been designed to enhance light penetration and ventilation, it also a major fire hazard because all occupants above the ground level could be exposed to smoke if a fire started anywhere in the atrium space.

The solution is to divide the atrium into three fire compartments with automatic horizontal fire curtains made of woven fibreglass fabric with stainless steel wire mesh. According to Unow Lai, the curtains should close within 60 seconds – 90 seconds of activation. When active, they will be stored in architecturally designed boxes at the edge of the atrium openings. This approach requires no smoke exhaust, no zone pressurisation and no bounding wall construction.

During schematic design phase it was noted that pumps would be necessary to achieve the required pressures and flows in sprinklers and hydrants. Unow Lai specified a combined pump system split into separate risers for hydrants and the sprinklers. This provided space and cost savings, and improved reliability, Lenko said.

Unow Lai fire safety engineer Michael Dobbs said. The design also avoided the need to have sprinkler control valves at each level of the glazed fire stairs, which was an aesthetically pleasing outcome.

In the sub-floor spaces, used to distribute air through each level of the building, sprinklers are omitted where there are no ignition sources or other hazards. According to Unow Lai, as the depth of the sub-floor spaces does not exceed 800mm, full sprinkler protection is not required as long as the conditions in AS2181.1 are met.

Sprinklers and fire-resistant steel members were also omitted in the design of the roof garden and its canopy. “The area is open to the outside at three sides of the perimeter and the roof garden has large openings. The openings would ensure that heat from a fire is not contained within the area. Therefore sprinklers would be unlikely to activate if they were installed and steel members would be highly unlikely to fail,” Lenko and Dobbs said.

According to Unow Lai, the consequences of a large fire triggering the collapse of the canopy would be minimal as the fire would be unlikely to spread to the inside of the building.

The Building Code of Australia requires the minimum width of the exits and the maximum distances building occupants would have to travel to reach one. Our calculations indicate that the travel distance could safely be extended up to 7m and exit width reduced by 250mm based on building characteristics, fire rate, occupant load and the included fire protection systems,” Lenko and Dobbs said.

A fire alarm is triggered, SMG warning will be sent to five university staff mobile numbers.

Engaging a fire engineer in the concept design stage has realised significant benefits and influenced the building’s major architectural features, Dobbs said.

In addition to its fire engineering work, Unow Lai is the mechanical, electrical, hydraulic, communications, security, vertical transportation and sustainability consultant. Unow Lai is the mechanical, electrical, hydraulic, communications, security, vertical transportation and sustainability consultant. Winward Structures is the civil and structural consultant. Alder Consulting is the audiovisual consultant while Goldie Associates is the geotechnical consultant. The constructor has not yet been appointed.

Sydney Town Hall reopens after major works

Sydney Town Hall has reopened after a major upgrade of the fire service, building services and internal fire protection systems. The upgrade also transformed the Lower Town Hall and improved community function rooms and exhibition spaces.

The reopening marks the conclusion of a $40 million stage in a five-year rescue plan to protect the 19th-century building for future generations.

"We have completed the first comprehensive overhaul of building services since the 1930s," said Sydney lord mayor Clover Moore.

The City of Sydney said it was required to act as the fire safety of the building was not in accordance with current codes.

“Three-tiered fire protection system comprising early warning alarms, fire sprinklers to the whole building and smoke exhausting and air-lifting for safe emergency egress, now make this large and important public venue code compliant,” Moore said.

Works included more than 1200 sprinkler heads, 1.2km of sprinkler pipes, 1.4km of water pipes and 58km of new cabling installed in a heritage building which had no roof space to hide them.

“This is a very elaborate and extensive system that has been built into the fabric of a heritage building,” City of Sydney project director Russell Lord said.

Fire-fighting systems include a special system of inert gas cylinders to stop potential fires in the custodial store, where water from sprinklers would damage precious historic artefacts.

The Town Hall’s oral record now have own fire system and humidifier to regulate moisture, ensuring the old cedar and leather do not dry out.

Fire engineering audits were initially undertaken by Bassett and Holmes Fire and Safety. The latter went on to report on improvements that could be made, and this report was peer reviewed by three other fire engineering companies and improved, Holmes Fire and Safety then continued to work with City of Sydney through the project.

Tanner Architects, including heritage architect Howard Tanner, designed the building improvements while Taylor Thomson & Whitting was commissioned for the structural engineering. NSW Public Works (a division of the Department of Services, Technology and Administration) was responsible for the mechanical, electrical and services. Kell and Legge Building carried out the construction works.

As part of the works, the City of Sydney seized the opportunity to improve sustainability of the building. New plant, sustainable lighting and control and renewable energy systems have increased the building’s energy efficiency by 30%. More than 1700 new, energy efficient lights have been installed, along with smart sensors controlled by a computer system to switch lights off in unused areas.

An installation of the city’s largest array of solar panels, 240 in all, on the northern roof will provide 48kW in peak conditions.

Note: hydraulics and stormwater infrastructure has been added throughout the building and will help reduce water use by up to 20%.

As well as substantial restoration work in affected areas, the City of Sydney also took the initiative to transform Sydney Town Hall into a more accessible, multipurpose public venue, and provide exhibition spaces where treasures and historic artefacts can be put on public display. Soil and rock excavation of 6700m3 has been removed and recycled during the construction of the new Lower Town Hall.

Upgrades and repairs were also made to the historic building’s foyers and the Tier Hall, believed to be the oldest operating electric lift in NSW.

The City of Sydney has been working with the NSW Heritage Council on the project.