



Latitude East Building Sydney

**AN ATRIUM OF DIMENSIONS 29 M BY 14.5 M
WILL CONNECT ALL OF LEVELS 12 TO 22.**

OWNER

Multiplex

DEVELOPER

Multiplex

ARCHITECT

Crone Partners

STRUCTURAL ENGINEERS

Taylor Thomson Whitting

BUILDER

Multiplex Construction

FIRE ENGINEER

Norman Disney & Young

This new building forms part of the Latitude development. A podium structure comprising 8 levels of basement carparking and 3 levels of retail has previously been extended above its west side with the construction of the 50-storey Latitude building. The new Latitude East building currently under construction comprises 11 storeys above the east side of the podium, forming Levels 12 to 22. The new storeys will be used for offices throughout.

The external dimensions of the building will be approximately 67 m by 46 m. An atrium of dimensions 29 m by 14.5 m will connect all of Levels 12 to 22. Because of this atrium, there will be no central core.

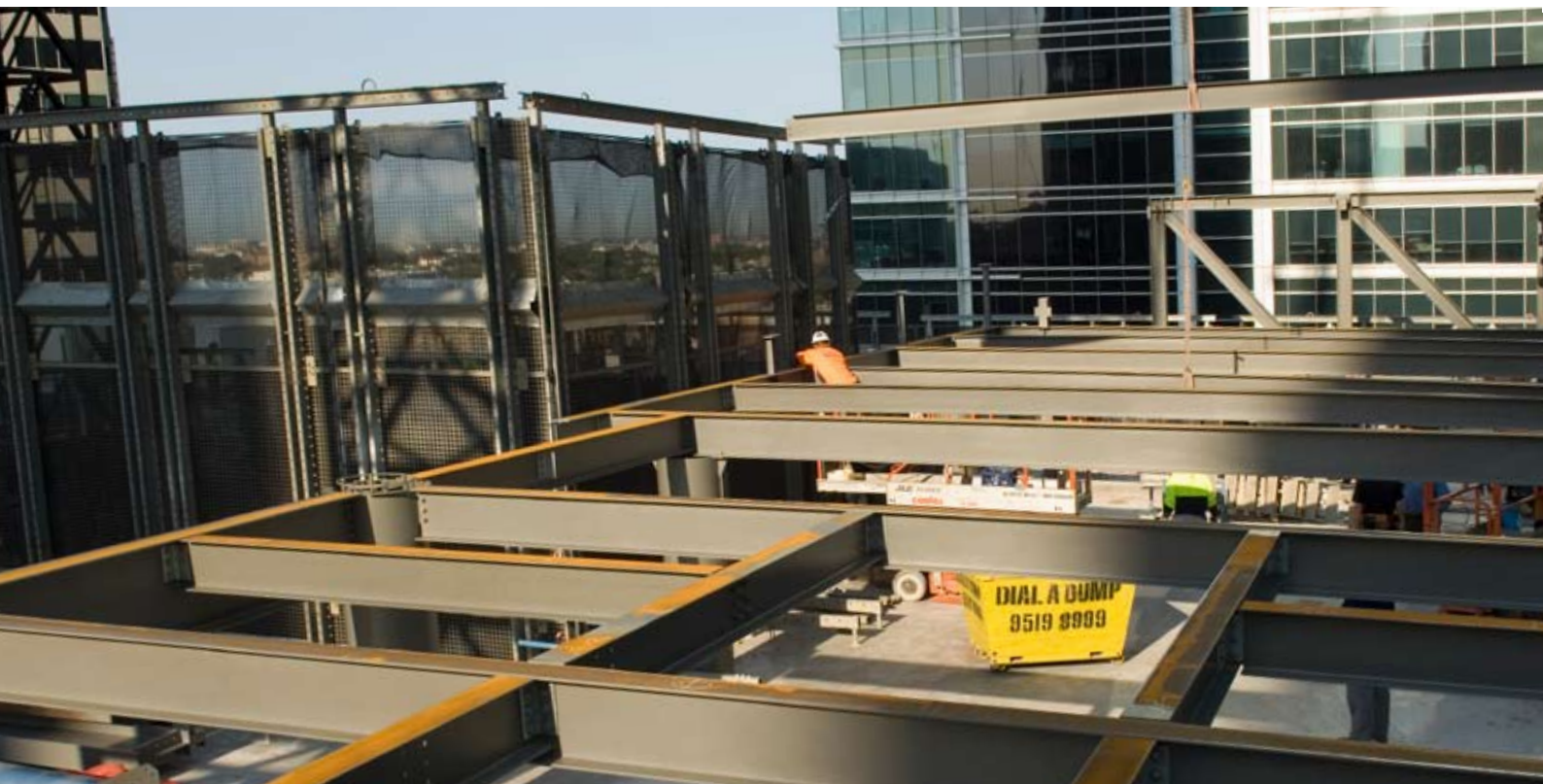
Overall building stability will mainly be provided by two concrete structures, located near the north-east and south-west corners of the building.

The façade of the building will be fully glazed on all sides, with a separation distance to any adjacent building of more than 3 m on all sides.

There will be two fire-isolated stairs. These will be partially supported on steel beams and encased with masonry walls. In addition, there will be a non-fire-isolated communication stair within the atrium space, enclosed with glazing. We understand that this stair will not be classified as a designated or required exit.

The building will be fully sprinkler-protected throughout, which is required under the deemed-to-satisfy (DTS) provisions of the Building Code of Australia. The sprinkler system will be enhanced by the provision of monitored floor-by-floor valving and end-of-line testing.

The structure of the new building will comprise steel beams and columns, composite slabs and shear studs providing composite action between the beams and the slab. Columns will generally be steel hollow sections of 610 mm diameter, concrete-filled, containing longitudinal reinforcement with 40 mm cover and designed for ambient strength, ignoring the contribution of the external steel.



The building structure will be fire-protected as follows:

- all columns will be protected to achieve an FRL of 120/-/-;
- all beams framing directly into columns at the floor between Levels 18 and 19 and below will be protected to achieve an FRL of 60/-/-;
- secondary beams spanning only between other beams will not be protected;
- cantilever beams will not be protected; and
- transfer beams supporting columns (if any) will be protected to achieve an FRL of 120/-/-.

In addition, any beams which support fire-isolated stairs (either directly or indirectly) will be protected to achieve an FRL of 120/-/-.

All steel beams will be left unprotected at the following levels:

- the floor between Levels 19 and 20, which supports the top office level; and
- the floor between Levels 20 and 21, which supports the rooftop plant room.

The plant room will not contain any equipment required for fire brigade intervention.

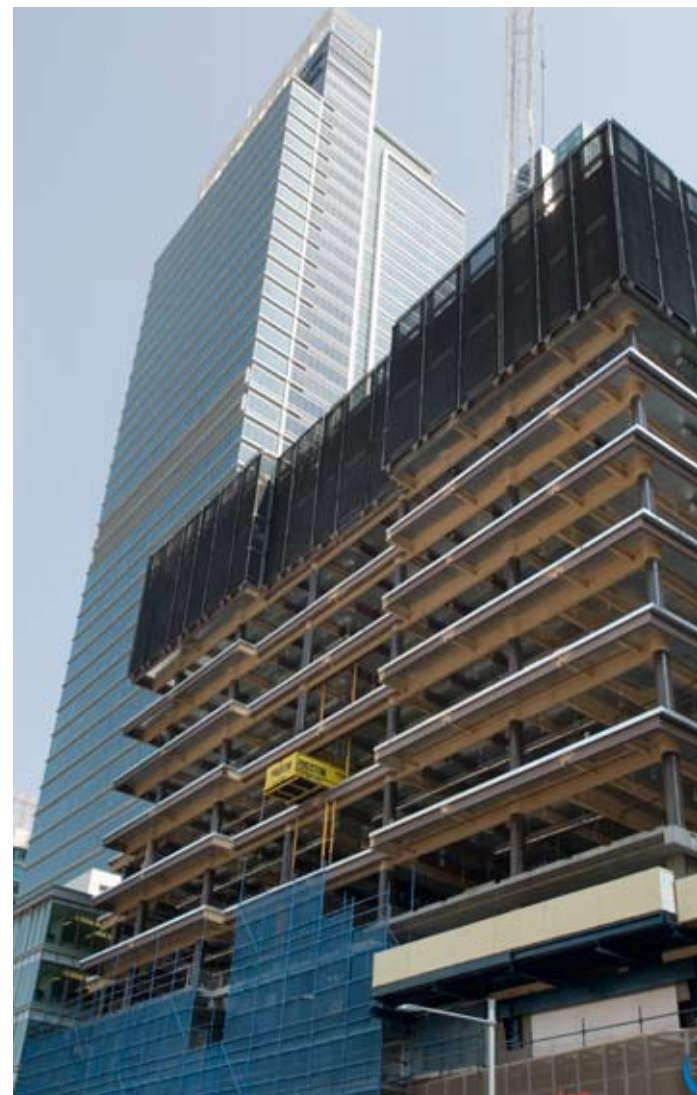
The columns will be required to achieve an FRL of at least 120/-/-, but in practice the typical columns being used are likely to achieve an FRL between 180/-/- and 240/-/-.

The structural protection solution was approved on the basis of the beneficial effect of the enhancements to the sprinkler system in substantially reducing the probability of sprinkler failure, in addition to the understanding of whole-structure behaviour gained through full-scale fire testing conducted at Cardington in the UK and BHP Research in Australia. The most likely cause of sprinkler failure is deliberate isolation of parts of the system for the purpose of refurbishment. The proposed sprinkler design measures will directly mitigate the effects of this hazard.

Given the large atrium and consequent lack of a central core structure (a building feature not included in the Cardington tests), it was necessary to protect all beams framing directly into columns and thus enhance the stability of the columns.

The philosophy for not protecting the floor of the top habitable level was that the columns passing through this level are not critical in terms of the fire safety objectives. Thus, if a fire

occurs in the second top habitable level (Level 19), the floor of the top level may deflect and the occupants will have strong cues to evacuate. If these columns should fail, only the roof above would be affected, which is of limited importance with respect to life safety. In the current case, the plant room may also be affected, but this also is extremely unlikely to have any impact upon life safety. Furthermore, regarding fire brigade safety, any deformations will occur in a gradual manner, providing adequate warning to firefighters to enable escape as necessary.



LATITUDE EAST BUILDING – FIRE RESISTANCE REQUIREMENTS SUMMARY

BUILDING ELEMENT	ELEMENT REQUIREMENT	
	DTS	Alternative Solution
office beams	120/-/-	Beams framing directly into columns: 60/-/- Other beams: unprotected Top two levels: all beams unprotected
office columns	120/-/-	120/-/-
sprinklers	Yes	Yes (with enhancements)

Table 2