BACK TO THE FUTURE

FORTE APARTMENT BUILDING - DOCKLANDS MELBOURNE

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Australian Code

- The National Construction Code (NCC) is a performance based standards document for building and plumbing construction in Australia, which provides for national uniform building regulations.
- Under this model that NCC is called up by the states and territories under their respective building acts and they are the regulators for its implementation and compliance, typically through private certifiers.
- One of the functions of private (or public) certifiers is to consider Alternative Solutions, whereby the practitioner must ensure that an Assessment Method is chosen that satisfactorily indicates that an Alternative Solution will meet the relevant Performance Requirement of the NCC.
- In the case of the Forte project, the use of cross laminated timber was new to Australia and hence no Deemed to Satisfy building solution existed for all Performance Requirements. Therefore Lend Lease sought to achieve compliance through a mixture of Deemed to Satisfy and Alternative Solutions.
- One of the key opportunities to access this unrealised potential is through quantification of performance, which should aid the development of alternative solutions for innovative products such as CLT.

History

- Australia has an early history in the use of timber for large span multi-storey timber buildings.
- The most pronounced example of this form of construction is in the wool stores that dominated parts of the skylines of several Australian cities at the end of start of the 20th century, often up to six storey's in height.
- Typically constructed of red gum and other native hardwoods, these buildings used brick fabric and wrought iron to establish their sturdy frame.
- Many of these buildings remain and have been converted into hotels, apartments, museums, retail stores and a university. Structural integrity, durability and embodied energy being key features.
- In the 1980's and 1990's, Melbourne City Council embarked on an ambitious program to convert many existing and often older buildings to residential uses to bring people back into the city.
- Under the banner of Postcode 3000, the Council worked with the Victorian regulator, property owners and developers to identify alternative solutions, particularly fire standards, to overcome issues with timber construction, recognising the performance of these structures in the event of fire.

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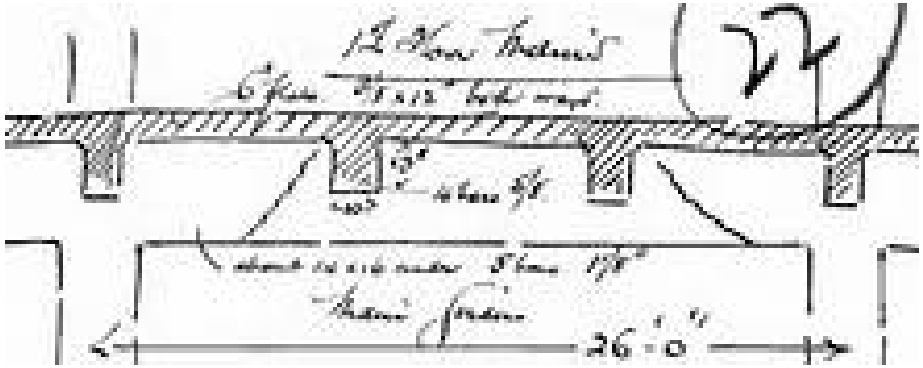

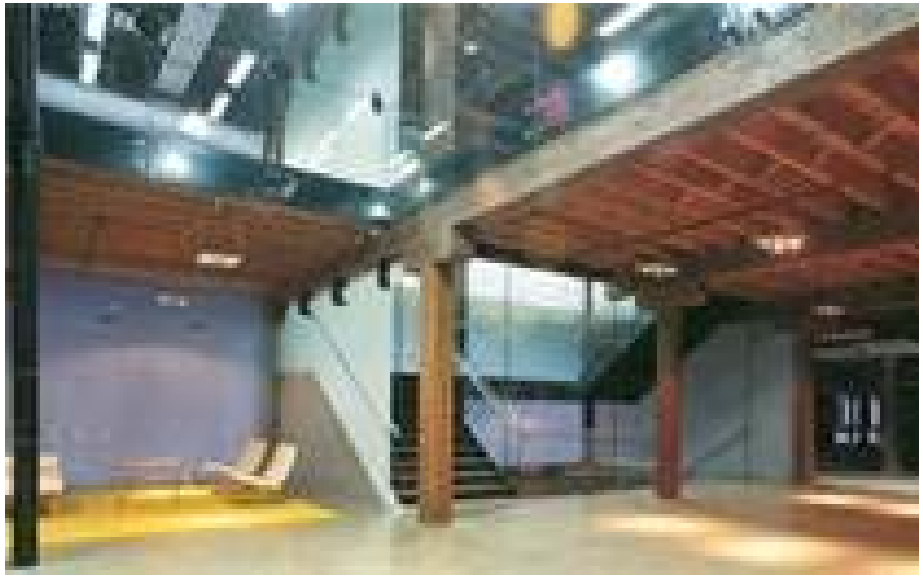

Building Australia's Future

Background

- The Forte apartment project is located in Melbourne's Docklands, a relatively new economic precinct built adjacent to Melbourne's CBD and containing the headquarters of a number of major national institutions, particularly in the financial and media sectors.

- Scattered amongst these large office facilities are a host of high density residential apartment complexes, many incorporating the latest designs and technologies for sustainable buildings, including responding to the minimum standards set by the NCC.

- Within this setting, Lend Lease, one of Australia's largest property development companies, and with a contemporary history in setting new benchmarks for sustainable design, embarked on building a timber residential apartment tower.

- The decision to proceed with CLT was based on a range of factors, but included light weight construction because of soil conditions and the use of pre-fabrication as a different construction method.

- Lend Lease expects to use CLT on 30-50% of its apartment building pipeline and others can be expected to follow based on the results of this project.

Performance

- *The general approach adopted by Lend Lease was to have the project as close as possible achieve the NCC's Deemed to Satisfy (DTS) provisions and ensure as much testing as possible was conducted to take to the next project. With some features, however, it was necessary to use Alternative Solutions (AS). The following outline these against the relevant sections of the Code:*

- Section A – General – DTS and AS fire resistance determined in accordance with glue laminated structure r achieve FRL of standard fire test

- Section B – Structural – DTS and AS designs to comply with AS1170 series (including 'catastrophic' collapse when one element is lost) and AS1720, as well as compared back to European Standards. Also, AS3660 to comply with termite treatment, however ground floor and level 1 slab is concrete

- Section C – Fire Resistance and Stability – DTS and AS covering a range of building elements including cladding separation of apartments and fire penetrations, as well as structural elements to be non-combustible. Utilised AS1720 and AS1530, with a host of testing by the CSIRO and Exova Warrington to obtain 90/90/90 FRL, however, lift door only achieved -/30/- and fire door openings -/90/30, hence AS

Performance cont'd

- Section D – Fire Stair – DTS and AS fire stair to be non-combustible and shaft to retain integrity
  Travel distances – DTS
  Balustrades – DTS
  Disability access – DTS

- Section E – Fire Services – DTS, but did include sprinklers and smoke detection to common areas

- Section F - Acoustic – AS laboratory trials undertaken to ensure design would pass
  Weatherproofing – AS review of dew point combined with air movement in cavity

- Section J – Energy Efficiency – DTS thermal modelling for this project was undertaken using Accurate software and resulted in a collective energy rating of 7 stars, with a minimum of 5.8 stars. This exceeds the minimum requirements of 6 stars and 5 stars respectively and results in a reduction in heating and cooling loads for a comparative 6 star apartment in Melbourne of 28%.

Features

- Currently tallest timber building in the World at ten storeys.
- No timber framing used, but rather all pre-fabricated panels with old beam/lintel used.
- Bathrooms, kitchens and laundries all pre-fabricated units assembled at site.
- No basement given soil conditions and concrete used for foundations and up to first floor construction given bigger spans required for ground floor retail use and to remove potential threat from termite attack.
- Whilst only 3 layers of CLT required structurally, 5 layers used (typically 128mm for the walls and 156mm for the floors) to provide 2 sacrificial layers in the case of fire. Direct fixed fire grade plasterboard also applied, with sprinklers throughout.
- Fire hydrant system had to be installed and operational once construction work commenced on the timber structure.
- Apartment balconies and lobbies not to be used for storage and no back-of-house storage area.

Lessons

- Similar levels of structural integrity as traditional concrete
- Significant reduction in building's projected life-cycle CO2 emissions allowing for CLT importation
- Thermal performance exceeding NCC minimum requirements
- Predictable fire performance of CLT over ordinary timber, with fire ratings achieved by adding additional layers
- Light weight features of CLT (20% the weight of concrete) and other prefabricated products significantly reduced costs
- Construction materials and methodology increased speed of development and reduced costs
- Construction materials and methodology reduced high risk work and enhanced the work environment, again helping reduce costs
- Fixing into timber for sub-trades considered a lot easier than fixing into concrete