Case Study

Constructing the Central Station Feature Roof: Built Three Times to Maximise Safety and Efficiency of Logistics Delivery

Laing O'Rourke

Key Safety Focus:
Design for Manufacture and Assembly – Central Station Roof

In 2018, Laing O'Rourke Australia Construction Pty Ltd was awarded a $955 million contract to deliver the new Sydney Metro platforms at Central Station and Central Walk, a new underground concourse. This case study focuses on the Design for Manufacture and Assembly (DfMA) approach employed by Laing O'Rourke, specifically addressing the construction of the station's Northern concourse feature canopy roof. This project presented notable challenges due to the tight timeline of just fourteen weeks and the site location within Australia's largest and busiest live railway station, surrounded by some of Australia's most densely populated suburbs.

Thus, this project required an innovative approach to construction and logistics and careful consideration of Safety Management. To ensure a safe and efficient completion of the Central Station roof with minimal disruptions, incidents, and injuries, Laing O'Rourke implemented a modularised construction approach.

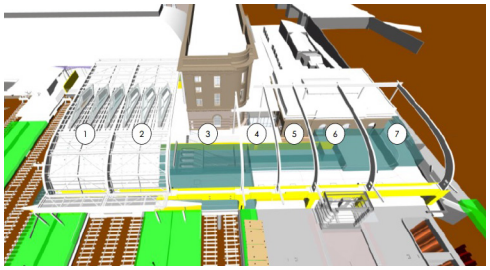
This involved digital construction of the roof, assembly at a fabrication yard, and subsequent dismantling and transportation to the construction site. This case study explores the key implementation details of Laing O'Rourke's construction logistics approach for the Central Station roof, highlights the challenges encountered during the process, and outlines the DfMA achievements and reduction of community impacts.

Implementation

The original plan for this project entailed constructing the roof in situ at Central Station within fourteen weeks. However, as planning progressed, it became clear that the transportation and construction of over 330 tonnes of steel in the busy live rail environment would not be practicable and would create disruptions for the community and other road users.

To address this challenge, Laing O'Rourke pivoted towards a modularised construction approach. This alternative strategy involved the digital construction of the roof, followed by its assembly at a designated staging site before being transported in sections to the Central Station location. This proposal aligned with the Safety Management goals of both Laing O'Rourke and Transport for NSW for the Sydney Metro project. Notably, it reduced the number of heavy vehicles on metropolitan roads, minimised changes to traffic conditions and disruptions to the rail system, and mitigated the risks associated with working at height if the roof was constructed within the station premises.

The construction process of Central Station's new roof unfolded in three distinct phases. Firstly, the roof was digitally created, ensuring precision and accuracy in the subsequent stages.



Subsequently, it was fully assembled at a fabrication yard in Kurri Kurri, situated within the Hunter Region of New South Wales. This approach eliminated the need for at-height construction, as the roof was built approximately one meter above the ground.

Finally, the fully assembled roof was dismantled into sections and transported to Sydney. This transportation endeavour involved the movement of over 330 tonnes of steel, including 58 cassettes (roof sections), with the largest cassette measuring 14 metres in length and 5 metres in width. These sections were transported overnight, accompanied by front and back vehicle escorts, ensuring a safe and seamless journey. Erecting these sections on-site at the station was carefully orchestrated within night-time windows over fourteen weekends, minimising disruptions to the station and the broader transportation system.

Key challenges

The modularised roof construction project represented a significant milestone as the first of its magnitude to embrace the DfMA methodology. Successful implementation required significant consultation with design, engineering and haulage consultation, including project partner Alfabs Engineering Group.

There was also a need to engage with the City of Sydney and Newcastle councils to discuss and provide details (e.g., vehicle escort use and routes) on the transportation of the oversized loads between the staging site and Central Station. The councils supported the approach, recognising that this approach significantly reduced the number of heavy vehicle movements and disruptions to the road network and community.

Achievements and Community Impacts

The successful implementation of the DfMA approach played a vital role in delivering the Central Station feature roof within the required timeframe. This approach brought about numerous key benefits for the community and the industry.

Firstly, Laing O'Rourke's approach resulted in an impressive estimated 70% reduction in heavy vehicle movements compared to the traditional method of directly transporting all construction materials to the on-site location. This reduction in traffic was particularly significant in densely populated Sydney. Moreover, all transportation activities were strategically scheduled during night-time hours, minimising the risk of interactions with other road users, including vulnerable road users like cyclists, motorcyclists, and pedestrians. The use of escorts ensured that all truck manoeuvres were carried out in a controlled manner, prioritising community safety.

By conducting transportation and construction operations during scheduled weekend hours over fourteen weeks within the live rail environment, disruptions to the neighbouring residents, the community utilising the road networks, and the overall transportation system were effectively minimised. This approach allowed Australia's busiest train station, Central Station, to remain fully operational. At the same time, the off-site construction of components contributed to reduced noise levels and minimised construction waste.

Moreover, this innovative approach is a practical example of how the DfMA methodology can be employed to maximise the safety of the community and workers during major construction projects. This is particularly significant given the transportation and construction industry's current skills and labour shortages.

Summary

In conclusion, Laing O'Rourke's successful implementation of the DfMA approach for constructing the Central Station feature roof demonstrated its effectiveness in meeting project timelines, minimising disruptions, and prioritising community and vulnerable road user safety. The modularised construction approach achieved a significant reduction in heavy vehicle movements while also reducing noise and waste. It is a practical example of maximising safety and addressing labour shortages in the transportation and construction industry.

More about the organisation

Laing O'Rourke is a global engineering enterprise with 50 years of Australian construction and infrastructure involvement. Laing O'Rourke operates in building construction, infrastructure construction, investment and development, modular manufacturing, engineering expertise and support services.

The organisation is delivering some of Australia's most exciting projects across the transport, building construction, defence, airports, mining, civil and social infrastructure sectors and is committed to becoming the recognised leader for innovation and excellence in the construction industry.

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