

LAMINEX NEW ZEALAND - CANTILEVER RACKING PROOF CHECK Non-Linear Geometric and Natural Frequency Analysis

Date: August 2010

Client: APC Group

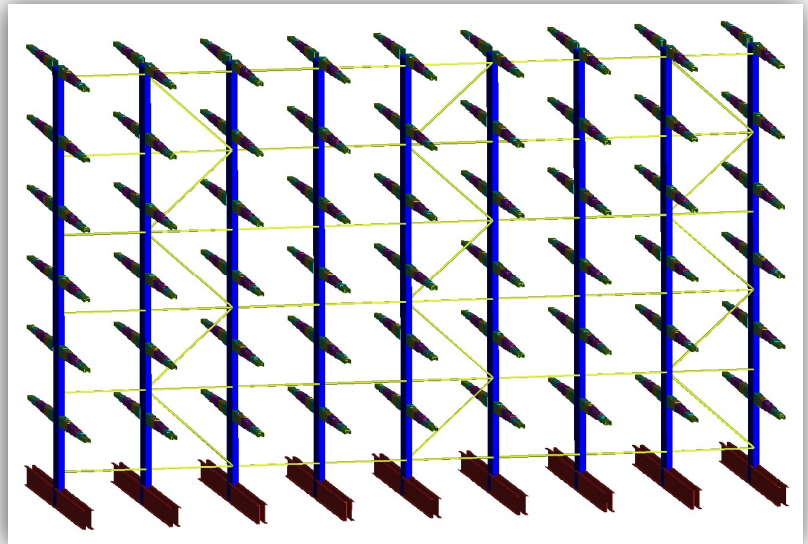
Project Description:

David Beneke Consulting was commissioned by APC Group to undertake a proof check of four cantilever racking systems for their client Laminex. The racking systems were to be installed at Penrose, Auckland New Zealand.

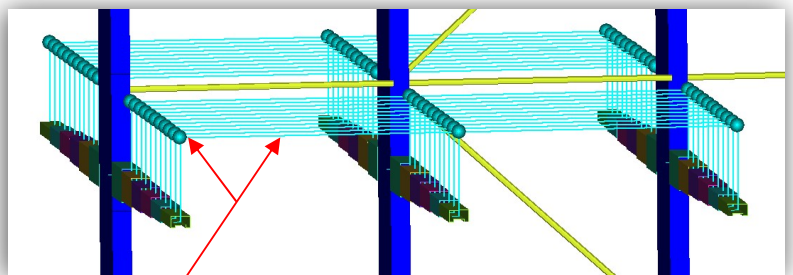
Each rack system was modelled in 3 dimensional form using 1 dimensional line elements to represent the uprights, cantilever beams, base beams and down-aisle bracing. Out-of-plumb, placement and impact loads were incorporated into the FEA model and combined together all consistent with FEM10.2.09. Earthquake loading was derived in accordance with NZS1170.5 and applied as static loads at the centre of gravity of the pallets.

A non-linear geometric analysis was conducted with the resulting member moments and axial forces extracted. Using AS/NZS4600:2005, members were checked for ultimate strength. Serviceability deflections were also assessed as with overall down-aisle sway buckling. Connection checks were then undertaken on actions derived from the analysis compared to tested capacities and/or hand calculations.

For the purposes of the earthquake assessment, a natural frequency analysis was undertaken. This is so the earthquake loads could be derived in conjunction with the site based geotechnical data.

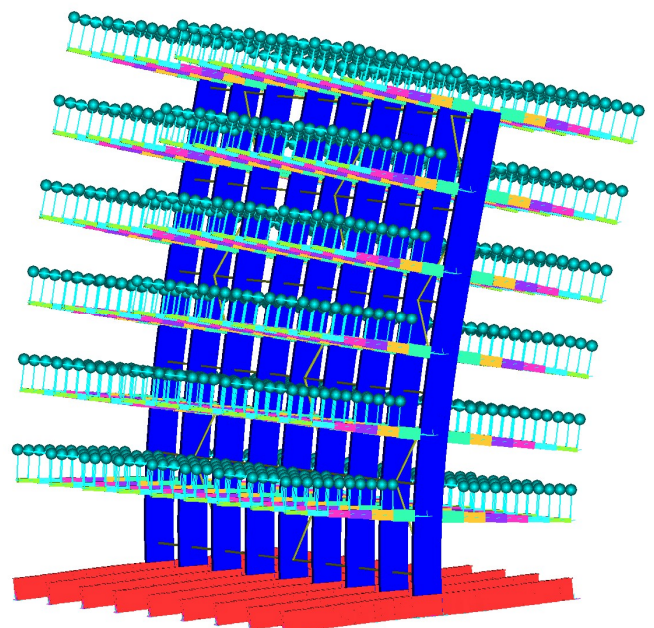


Isometric elevation of the cantilever racking system



Nodal masses and rigid links simulating the pallets.

Simulated pallet masses for earthquake loading



First mode cross-aisle sway mode of vibration

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