



**Breathing Life into Hardwood  
Bridge Trusses:  
*A Marriage of Steel and Timber***

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# Setting



- Three 80 year old single lane Howe Truss bridges
- Akatarawa Road: a strategically important route

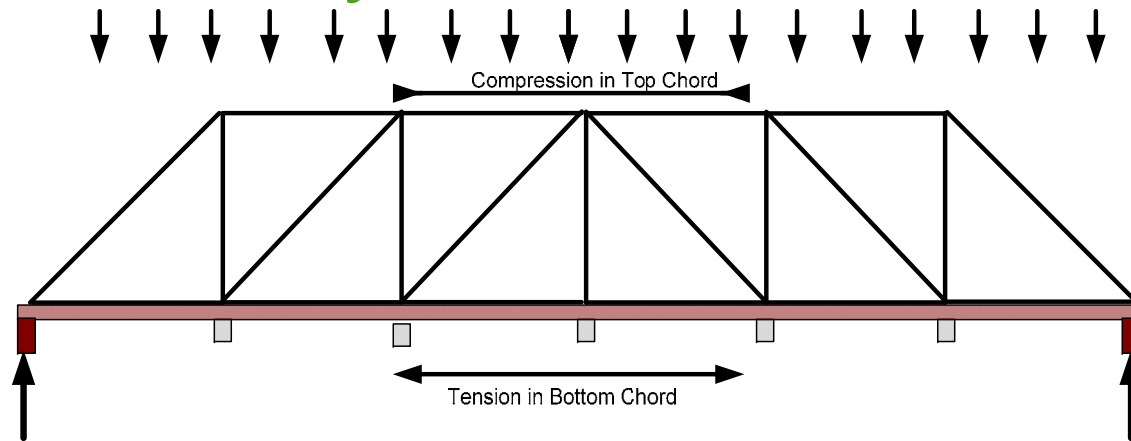


# Setting



- Trusses analysed for a Class 1 load (85% HN)
- Critical elements identified from careful field inspection.
- Structural steel additions designed and built
- Each bridge remained open during repairs.

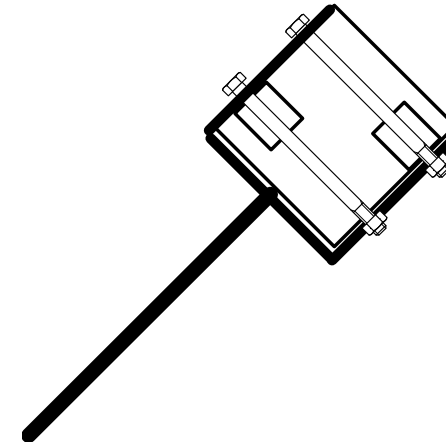
# Analysis



- Simplified manual analysis using 85%HN loading

# Design

- Main challenge was nodes (joints)
- Some timber ends were seriously decayed
- Objective was to span across ends with steel



# Design

- In the picture below, the thrust block is split
- End diagonal post seriously decayed at base, –80% loss of end section
- Steel brace repair reacts thrust back into bottom chord



# Design

- Blocks reacting hanger load are split
- Unable to be replaced without unloading hangers
- Instead, strapped to provide hoop strength



Light strapping was also added to confine split struts

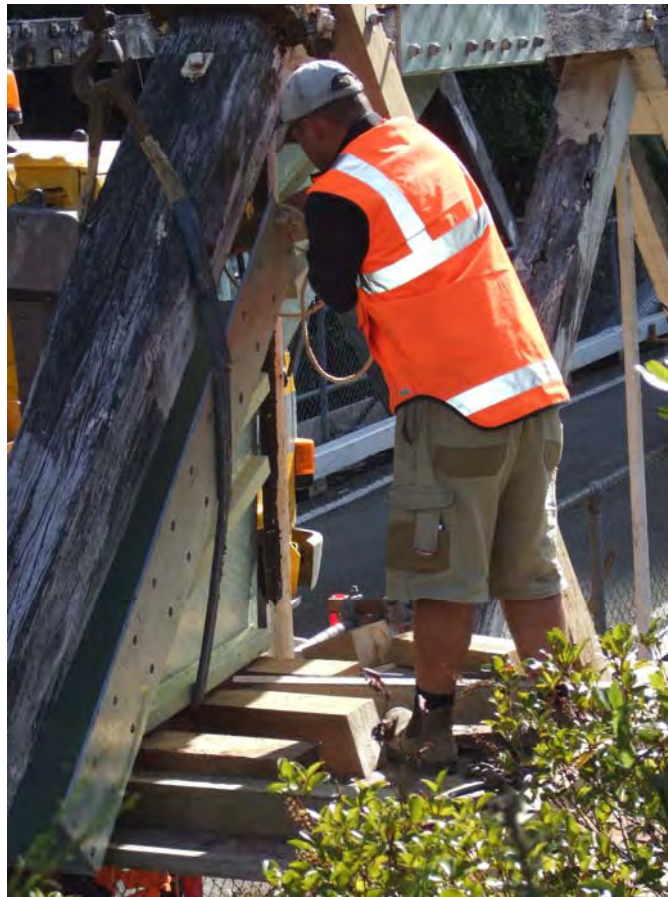


# Construction

- Scaffold erected alongside carriageway
- Structure waterblasted to reveal decay
- Careful inspection
- Limited ability to see transoms or deck soffits, but abseiling provided some viewpoint
- Carpenter set out plywood templates
- These were used for fabrication of steelwork
- Steelwork done locally and fabricator executed welding on site (to hangers)
- High level of interaction between designer, carpenter and steel fabricator



# Placing Elements



Site measurements for fitting were critical



# Placing Elements



- Fitting two segments into position
- Then site welded to hanger



# Placing Elements



Coring 50 mm holes for ring connector





# Issues

- An efficient solution has been designed and constructed, but some issues remain:
- Tension chords
  - Tension splices in chords are a critical element
  - Only outside faces could be inspected
  - Some evidence of decay commencing on one
  - No room to install strengthening
  - Propose that monitoring, including extension measurement, be implemented
- Because of uncertainty that all weak spots have been identified, and with the expectation that decay will continue, recommended that replacement commence in five years.