STEEL CONSTRUCTION NEW ZEALAND

Imported Fabricated Steelwork: Case Study #1

Glass barrier bridge truss

Project

NSW Housing Estate Project Australia, 2012

The project involved the construction of a glass acoustic barrier alongside a busy road bridge to shield the residents of a local housing development from traffic noise. The acoustic barrier comprised a 62m-long triangular tubular truss, which was fabricated from square hollow section (SHS) members ranging in sizes up to 250mm.

The truss structure was tendered locally in Australia. The winning bid was based on imported fabricated steelwork and represented the lowest cost option. The cost difference between the local and imported fabricated steelwork was approximately AU$100,000.

The first sign of problems with the truss was at installation: after its erection on site, the truss deflected. The builder attempted substantial on-site repairs, including reinforcing the areas where cracking occurred: in the junction between cross beams and main truss beams; and welding reinforcing tubing alongside sections of the cross beams that had split.

But the rectification work was insufficient to stabilise the structure. An Australian fabricator was engaged to rebuild the truss to largely the same design but with compliant materials and workmanship. The rectification and rebuild costs are estimated to be AU$810,000 and, as the company responsible for importing the steelwork is now insolvent, were borne by the engineer's insurance company.

Take outs

- **Imported product was significantly non-compliant**
- **Truss had to be rebuilt from scratch by a local fabricator using compliant processes and materials**
- **Rectification and rebuild costs borne by engineer's insurance company: estimated at $810,000**
- **Locally fabricated product would have cost just $100,000 more than the imported option (estimated at $350,000 import; $450,000 offer by local fabricator)**

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Defects

When the original imported steelwork was removed and taken to a local fabricator's yard for remedial work, several additional defects and instances of non-compliance were uncovered:

- Tensile testing showed the steel had a 338MPa yield strength versus a required 450MPa
- Connecting chords to beam were cut too short, requiring spacers to be inserted at each join
- The diagonal chords, when cut, were found to be filled with water – possibly a deliberate ploy to increase the weight of the structure to achieve the specified weight
- Non-compliant elongated bolt holes drilled to allow fit, but created the risk of movement (30mm diameter holes for 20 mm bolts; 28mm diameter holes for 20mm bolts)
- The original paint system did not comply with the specified system
    - Poor paint finish against a specification of 75µm inorganic zinc silicate,
    - 125µm Epoxy and 75µm urethane
    - Lacked the specified polyurethane finish
    - Variable dry film thickness with areas below the 20% tolerance level allowed by AS 3894.3
    - Inadequate film formation at edges of square hollow sections
- Welding was substandard and not compliant with AS/NZS 1554.1
    - Poor scarfing of the weld, including undercut with potential to be below the wall thickness specification.
    - Fillet welds instead of full penetration butt welds
    - Use of a sleeve instead of the specified full penetration butt weld
    - Under cut on weld profiles

"In recent years Australia has become exposed to the full effects of a global supply of steel and fabricated steelwork. The lack of rigour in current Australian compliance regimes covering the supply of structural steel has led to a proliferation of unsuitable and often faulty steelwork for major development projects in Australia. To address this, the Australian Procurement Construction Council and the Australian Steel Institute (ASI) have been working jointly with construction companies and industry bodies to generate a procurement guidelines document."

– ASI report on the compliance requirements for delivery of the structural steel component for projects