Concerns with B2 *Durability*

The guidance for using structural steel and other metals in Building Code clause B2 *Durability* is limited, and no Acceptable Solutions are offered. Perhaps there's a need for an addendum to be incorporated.

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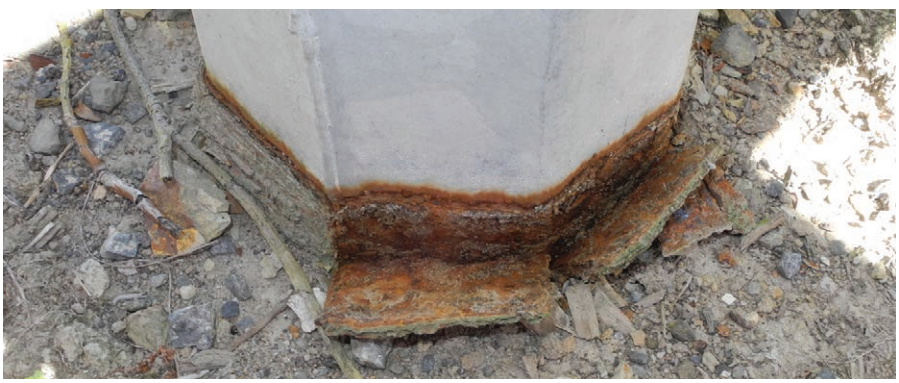

Figure 1: Ring bark corrosion on 18-year-old lighting pole. This has lost up to 40% of its original thickness.

THE NEW ZEALAND BUILDING CODE sets the performance standard that all structures are required to comply with. While this is commonly taken as being buildings and houses, it includes road and rail bridges plus other types of infrastructure including masts or telecom poles and even your pool fence.

The main purpose of the Building Code is to ensure buildings are safe, healthy and durable for everyone who may use them.

What makes structures durable?

The guidance given in Building Code clause B1 *Structure* is clear on how engineers and users can work toward its compliance. This includes a rigorous peer-review process.

However, clause B2 *Durability* has some limitations, especially regarding the use of steel and other structural metals such as aluminium and stainless steel.

There are two main requirements that all structures need to meet to ensure compliance with this part of the Building Code.

Clause B2.2: Functional requirement

Clause B2.2 says 'Building materials, components and construction methods shall be sufficiently durable to ensure that the building, without reconstruction or major renovation, satisfies the other functional requirements of this code throughout the life of the building.'

Clause B2.3.1: Performance

Clause B2.3.1 says 'Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or...'

This is then followed by guidance on the period that the different building elements should be designed for, which is typically taken as not less than 5, 15 or 50 years.

Lack of Acceptable Solutions

While there are tables in E2/AS1 on metal compatibilities, the guidance for using ➤

structural steel and other metals in B2/AS1 is limited. For example:

- there is no Acceptable Solution reference to the relevant durability standards for steel, other structural metals or their protective coatings
- there are no Acceptable Solutions for steel structures, the use of protective coatings and recommended detailing to provide the required level of durability.

Need to add references to standards

It should be relatively simple to rectify the lack of references to durability standards. This would bring the Acceptable Solution in line with the references currently given for concrete, timber, solid plastering, earth buildings and insulating glass units. This will then provide a pathway for practitioners to satisfy the Verification Method B2/VM1 requirements.

As a minimum, reference to AS/NZS 2312:2014 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings* should be included in the references section of clause B2 *Durability*.

Developing Acceptable Solutions complex

Developing suitable examples of Acceptable Solutions for structural steel could be a more complex matter. What level of detail should be provided for practitioners? Should it be provided as an additional Acceptable Solution to B2?

Ground or concrete contact problem

A common poor detail with a simple solution is not applying additional protection for ground or concrete-embedded steelwork, such as columns and lighting poles. In most cases, these are hot-dip galvanized, and without protection, ring bark corrosion (see Figure 1) will occur at the ground to air interface. This often results in significant section loss and possible structural failure before the end of the intended life.

Figure 1 shows an 18-year-old lighting pole that has lost up to 40% of its original thickness. This could have been mitigated by applying an additional protective coating for the ground-embedded portions of the pole, up to 50 mm above the interface. This information is given in HERA Report R4-133 and NZ Transport Agency M26 *Specification for lighting columns*. It has been available since 2005 but is not commonly used by design engineers.

Corrosion in roof cavities

There is also limited understanding of the extent of moisture and condensation problems in buildings (especially within roof cavities), and the increase of corrosivity within the cavity environment.

Late 1990s house roof cavity

Figures 2 and 3 show the roof cavity of a late 1990s building. Access to the cavity required the removal of the building soffit. Based on B2.1.2.1(a), elements that are difficult to access or replace elements within such a cavity require a durability of not less than 50 years.

The inline galvanized purlins have a heavy build-up of white rust with signs of red rust commencing on the purlin and the hold-down screws. This indicates that its original corrosion protection is completely depleted. Clearly, the required 50-year durability period for these purlin and screw elements will not be met.

Figure 2: Roof cavity in 1990s house. Inline galvanised purlins with a heavy build-up of white and red rust indicating depletion of the original corrosion protection.

Figure 3: A closer view of the rust on the hold-down screws in the galvanised purlin in Figure 2.

Reason for material degradation

Moisture levels were high in this cavity, and degradation is due to the elements being on the cold side of the building and cooling to below the dew point. Condensation has then occurred on their surface.

While removing the soffit to expose the elements, a large volume of collected condensation water was found ponding on the cladding. This, in turn, increased the period of wetness and humidity that they were exposed to.

This was not the dry internal environment the designer originally assumed. The atmospheric corrosivity in this microclimate was likely to have been closer to C3 (medium) than the assumed C1 (very low) corrosivity category.

Many simple design solutions

There are many other examples of durability problems occurring throughout New Zealand that, with relatively simple details and an understanding of the corrosion mechanism, could be mitigated during the design stage.

What about an addition?

The question is whether the development of additional sections in the Acceptable Solution to B2 *Durability* is required.

This document could cover not only structural steel but could be expanded to include other metallic structural materials, in addition to timber and concrete. It could become a comprehensive reference document for all users from design engineers and architects to the homeowner.

Do you think New Zealand requires such a document?

For more Your feedback would be appreciated. Please email raed.elsarraf@opus.co.nz.