



28 September 2018

Metal Rollforming Ltd
PO Box 18217
Glen Innes
AUCKLAND 1072

Attention: R.Swan

LBA Ref: 161157-01

Durability Appraisal of *Moduline* Barrier Fencing

1. Introduction

Les Boulton & Associates Ltd (LBA) was requested by *Metal Rollforming Ltd* to carry out a durability appraisal on the materials employed for the construction of *Moduline* barrier fencing manufactured by *Metal Rollforming Ltd*. The purpose of the appraisal was to assess the materials used to manufacture the barrier fencing to ensure that the materials comply with the durability requirements of the New Zealand Building Code (NZBC), Clause B2 *Durability*.

Moduline barrier fencing is designed to comply with the Building Code and the fencing system provides a barrier against people falling from heights. The barrier fencing system is available in three heights, namely, 1000mm, 1100mm and 1200mm. The barrier fencing is fabricated from steel components and the fences are designed for installation using ground support structures. *Moduline* barrier fencing is available with different ground fixing methods for the fence support posts. Producer Statements (PS1) are available for each of the types of barrier fencing in the *Moduline* range.

The *Moduline* barrier fencing comprises two different structural support posts. The support posts are made of zinc-coated (galvanised) steel square hollow sections (SHS) that are fabricated from grades G350 and G450 steel and powder-coated in a range of colour options. The other barrier fence support posts are on the sides of the infill panels. They are rollformed U-channels fabricated from G550 *Colorsteel* with the steel coated with the pre-painted *Endura* system.

Examples of *Moduline* safety fencing installations are shown in *Figure 1* and *Figure 2*.

The following documents and technical data sheets were submitted by *Metal Rollforming Ltd* to assist with the durability appraisal of the *Moduline* barrier fencing:

- *Moduline Color Screen* Fencing brochure, Metal Rollforming Ltd.
- *Moduline Pool Side* Fencing brochure, Metal Rollforming Ltd.
- *Moduline Barrier Fencing*, preliminary brochure, Metal Rollforming Ltd, 2016.
- *Moduline* barrier fencing technical descriptions, Metal Rollforming Ltd, 2016.
- Producer Statements for *Moduline* 1000mm, 1100mm, 1200mm height barrier fencing, Marino Consultants and Associates Ltd, 2016.

- *Colorsteel Endura* pre-painted finish on zincalume, Technical Data Sheet, NZ Steel Ltd.
- *Colorsteel* used for fence posts, Product Technical Advice, NZ Steel Ltd, 2016.
- Cold-formed structural steel hollow sections, Test Certificate, Steelforce Pty Ltd, 2016.
- Technical information sheet, powdercoating galvanised steel; REP Powder Coaters.
- Technical information on self-drilling metal screws, CMI Fasteners, 2016.

2. Assessment of materials employed for barrier fencing

2.1 The posts that support the barrier fencing infill panels are manufactured from square hollow section (SHS) pre-galvanised steel. The support posts are protected against corrosion by a factory-applied zinc coating with a powdercoating system. The standard powdercoating chosen for *Moduline* support posts is *Duralloy* (Dulux) polyester powdercoating. For barrier fences installed in coastal environments the more durable *Duratec* (Dulux) powdercoating is used over an epoxy primer.

2.2 The barrier fencing posts are fixed to a ground support structure by different methods depending upon the model of the barrier fence. The support post fixing can be to: (1) timber deck, (2) concrete slabs and concrete walls, (3) timber retaining walls, (4) concrete piles. Producer Statements (PS1: Design) are available for each barrier fence ground fixing system, namely, fence heights of 1000mm, 1100mm and 1200mm. The Producer Statements (PS1) give details of the barrier fence engineering design and the requirements for the different ground fixing methods.

2.3 The barrier fence support posts employ good corrosion protection measures that include quality surface coatings on the steel substrate. The barrier fence post tops have tight fitting plastic caps installed to minimise rain water ingress. *Colorsteel Endura* is approved for fence posts where the base of the support post is set in a concrete footing.

2.4 The infill panels for the barrier fencing are standard *Moduline* panels manufactured from *Colorsteel Endura*. The *Colorsteel Endura* paint system consists of a Zincalume steel substrate to which a coating system is factory-applied. *Colorsteel Endura* is designed to provide good corrosion protection at locations where moderate to severe environmental conditions are experienced. The barrier fence infill panels comprise channel side sections, top rail, bottom rail and vertical bars, all fabricated from *Colorsteel Endura*. Powdercoating (as per Section 2.1) can be chosen for special colour requirements.

2.5 The fasteners used to connect the infill panels to the barrier fence support posts are self-drilling metal screws with a factory-applied mechanically galvanised coating with an additional conversion coating. The self-drilling screws (*tek* screws) are of two types, either wafer-head or hexagon-head. The tek screw type employed depends upon the *Moduline* barrier fence model that is being installed. The self-drilling screws employed on the barrier fences comply with the corrosion resistance requirements for Class 4 fasteners¹ suitable for external use in marine environments.

¹ Australian Standard 3566.2: 2002, *Self-drilling screws for the building construction industries*; Part 2: Corrosion resistance requirements.

2.6 If the support structure for the barrier fence is a timber deck or a timber retaining wall, the fixings for the support posts are specified to be grade 316 stainless steel bolts and washers, with neoprene washers between the washers and bolts. Damp proof course (DPC) material is required to isolate the bottom fixing plate of the post from the timber surface. The specified fixing methods are designed to give a long life without any corrosion on the fence post support structures.

2.7 If the support structure for the barrier fence is a concrete slab or concrete block wall the fence post fixings used are specified to be grade 316 SS bolts and washers, with neoprene washers between the washers and the bolts. DPC is used to isolate the bottom fixing plate of the support post from the concrete.

2.8 If the barrier fence support posts are installed directly into soil at ground level then the support posts are embedded in a concrete footing (17.5 MPa concrete) to a depth of 700mm with compacted hard fill surrounding the concrete pile. The Colorsteel *Endura* coating on the fence posts embedded in concrete pile footings have provided more than 30 years of successful performance to the *Moduline* safety fence systems.

2.9 The recommended maintenance schedule that barrier fence owners should adhere to in order to provide the expected durability of the barrier fencing materials is twice yearly cleaning with fresh water and bristle brushing to remove deposits of airborne grime and debris from the fence component surfaces. Routine cleaning of the fencing materials, particularly in coastal environments, ensures that the barrier fence provides a long trouble-free service life.

3. Durability appraisal of barrier fencing materials

A durability appraisal of the barrier fencing materials indicates that the structural members and the infill panels are protected against corrosion by the choice of appropriate materials, good design, and the application of high quality coating systems on the steel components.

The materials employed for the *Moduline* barrier fence should withstand all weather conditions in New Zealand. In addition, *Moduline* offer a barrier fence coating that is specifically designed for exposure in marine environments. The likelihood of corrosion occurring on the barrier fence components during normal service is low, as long as the fence is maintained according to the manufacturer's recommendations. The barrier fence members and the fixings should provide a service life of at least fifteen years if the fence owner carries out recommended routine cleaning.

The external coating on the barrier fence members may require maintenance after a number of years of service life. The years in service before re-painting of an installed barrier fence depend upon how well maintained the fence has been by the owner. Maintenance of the protective coating consists of washing the fence members with fresh water at intervals of about four months in a coastal environment and at six monthly intervals for inland or rural areas. If the barrier fence is well maintained the coating systems employed will provide a service life of at least five years before any remedial painting is required.

4. Conclusions

A durability appraisal has been carried out on the design of the *Moduline* barrier fencing system. The assessment included evaluation of material data sheets for the materials and the corrosion protection measures employed on the barrier fence systems.

After the durability appraisal it was considered that the *Moduline* barrier fencing will meet the durability requirement of the NZ Building Code, Clause B2, Durability. The NZBC B2 durability requirements are as follows:

- Fixings for fencing members: 15 years
- Barrier fencing members: 15 years
- Protective coatings; easy to access and repair: 5 years

The *Moduline* barrier fencing systems appraised for *durability* should provide a service life of at least fifteen years. The coating systems employed on the fence components may require maintenance painting after five years in service depending upon the service environment and the maintenance schedule carried out by the owner.

Durability Appraisal prepared by:

L. H. Boulton

Principal Consultant
Les Boulton & Associates Ltd
Materials and Corrosion Consultants



Figure 1.
Moduline safety fence installed with fixings to a concrete retaining wall.



Figure 2.
Moduline safety fence installed in concrete pile footings behind a retaining wall.