



Table of Contents

1.	Objective	1
2.	Tests	1
3.	Performance Criteria	2
4.	NZF3000	2
5.	Application	2
6.	Bolt Torque	3
7.	Confidentiality	3





1. Objective

This document's objective is to define the required tests, minimum performance criteria, and environmental conditions for fasteners which can be used in thermoplastic co-polymer plate environmental conditions.

Thermoplastic co-polymer coated structural plate has increased the environmental application range beyond that of galvanized plate. Polymer coated structural plate is performing well in soft-water and high chloride environments. However, galvanized fasteners installed in these environments are exhibiting red rust. As a result, alternatively coated fasteners which perform well in soft-water and high chloride environments are desired.

Thermoplastic co-polymer structural plate is used in the following environments:

- pH = 4 to 9.
- Resistivity > 750 ohm-cm.
- Abrasion level 1, 2 and 3.
- · No limit on hardness

2. Tests

The following tests are considered most relevant to evaluating durability performance:

Kesternich: Test as per DIN 50018:2013-05, SFW 2S (2L/cycle of SO2). Kesternich testing subjects the fastener to moist SO2. Test results are used to predict a fastener's performance in acidic environments (i.e. - soft water, which undergoes acidic fluctuations).

Salt Spray: Test as per ASTM B117. Salt spray testing involves subjecting the fastener to moist salt spray. Test results are used to predict a fastener's performance in chloride environments.

Abrasion: Test as per MTQ test procedure LC 21-102 (2008 12 15). Abrasion testing involves subjecting the fasteners to a high pressure Ottawa sand (ASTM C778) spray. Test results are used to predict a fastener's performance in flowing water carrying abrasive bedload.





3. Performance Criteria

Minimum performance criteria is no red rust in the following conditions:

Kesternich: Minimum 30 cycles. Salt Spray: Minimum 3000 hours. Abrasion: Minimum one cycle.

4. NZF3000

MTQ report 'Evaluation of Bolt Coatings (File #16-011)' dated December 2016 summarized the following results:

Abrasion: Black NZF3000 fasteners withstood one abrasion cycle. Performance for Silver NZF3000 coated bolts is expected to be similar.

Salt Spray: Black NZF3000 fasteners started to demonstrate coating attack at 3150 hours. At 4180 hours the samples were removed and exhibited no red rust. Performance for Silver NZF3000 is expected to be similar.

Kesternich: Black NZF3000 fasteners withstood 30 Kesternich cycles with no red rust. Silver NZF3000 fasteners with-stood 35 Kesternich cycles with no red rust.

5. Application

Fasteners satisfying the performance criteria and requirements of CAN/CSA G401 cl. 4.4.2 may be used with coated structural plate for the following environments. NZF3000 fasteners satisfy the following conditions:

Soil: pH = 4 to 9. Resistivity > 750 ohm-cm.

Water: pH = 4 to 9. Resistivity > 750 ohm-cm. Hardness: no limit.





Most fasteners are located out of the water. Galvanized fasteners located in water have historically satisfied structural criteria. Fasteners located in flowing water tend to have lower abrasion exposure due to the corrugation profile, bedding or rip rap slowing down water. When a fastener is located in flowing water, the fastener's bolt head or nut and thread beyond the nut have the greatest exposure. The most critical part of the bolt is the major load carrying portion: bolt diameter at the plate/fastener interface. Abrasion exposure is typically low at the plate/fastener interface. Accordingly, fastener abrasion performance concerns are more aesthetic than structural.

6. Bolt Torque

Leland Industries indicates NZF3000 fasteners have a K = 0.18 to 0.24. Typical K values for mechanically and hot-dip galvanized fasteners are 0.20 and 0.25 respectively. CHBDC bolt torques are considered applicable to NZF3000 fasteners.

7. Confidentiality

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