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Old Station Yard - South Brent - Devon - UK - TQ10 9AL - T: 01364 649248



10794

Revision 001
Amended: N/A

TEST REPORT

No. TR048/45-24

1) Abstract

This Test Report describes the accredited Environmental Test carried out on a specimens of Carbon Steel Insulation fasteners (5x part number IS100 and 5x part number IS180) and Stainless-Steel Insulation fasteners (5x part numbers A4IS140 and 5x A4IS180). The procedure was required to assess the resistance of the specimens to a humid atmosphere containing Sulphur Dioxide SO₂. Product tested 16/10/24 until 31/10/24.

2) Applicable Standard(s)

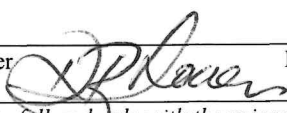
The test procedure references the International Standard - BS EN ISO 22479:2022 (BS EN ISO 6988:1995). The test was performed in accordance with Method B described in this standard.

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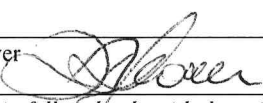
Customer:

Evolution Fasteners (UK) Ltd,
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Dalmarnock Road,
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G73 1AN.
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E: sales@evolutionfasteners.co.uk

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3) Specimen Description

a) Description

The specimens supplied by Evolution Fasteners were Carbon Steel Insulation fasteners, Part Numbers IS100 and IS180 and Stainless-Steel Insulation fasteners, Part Numbers A4IS140 and A4IS180. No stabilisation period was deemed necessary before the beginning of the test procedure.

Brief specimen descriptions:

IS100 and IS 180, carbon steel fasteners of nominal lengths 100mm and 180mm. Weights 9.1g and 17.1g. Material Grade SAEC1022 carbon steel with 500hr Evoshield ® coating. Figs. 1 and 2.

A4IS140 and A4IS180, stainless steel fasteners of nominal lengths 140mm and 180mm. Weights 13.0g and 17.1g. Material Grade SAE C1022 carbon steel-drilling point AISI 316/EN 1.4401 (A4) stainless steel – shank and head. Figs 3 and 4.



Figure 1: IS100 Fastener



Figure 2: IS180 Fastener



Figure 3: A4IS140 Fastener



Figure 4: A4IS180 Fastener

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b) Identification

Each specimen under test was assigned a unique identifier for reference purposes. 5 specimens of each type and nominal length were assigned for test.

IS180

BC030924/010/01IS180
BC030924/010/02IS180
BC030924/010/03IS180
BC030924/010/04IS180
BC030924/010/05IS180

A4IS180

BC030924/010/01A4IS180
BC030924/010/02A4IS180
BC030924/010/03A4IS180
BC030924/010/04A4IS180
BC030924/010/05A4IS180

IS100

BC030924/010/01IS100
BC030924/010/02IS100
BC030924/010/03IS100
BC030924/010/04IS100
BC030924/010/05IS100

A4IS140

BC030924/010/01A4IS140
BC030924/010/02A4IS140
BC030924/010/03A4IS140
BC030924/010/04A4IS140
BC030924/010/05A4IS140

c) Specimen Condition

All specimens, spares and substitutes, were received in new and boxed condition by 20/09/24.

4) Procedure

Reference is to be made to the latest version of internal Test Method M014 'Sulphurous Atmosphere Test'.

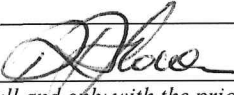
Prior to the start of the formal test procedure on the supplied specimens, a Performance Check was undertaken on the Kesternich chamber according to Annex B of the test Standard in question.

5 test specimens of CR4 grade steel panels (nominal 100mm x 50mm x 1mm) and 2 substitute panels (nominal 250mm x 400mm x 1mm) were prepared. These were subjected to 5 test cycles of Method B using 0.2lt of sulphur Dioxide (SO₂) and 2lt of deionised water per 24hr cycle.

After the 5 cycles, the corrosion products on the 5 test specimens were removed mechanically and chemically. These were then weighed and compared with the pre-test weights. Using this difference and the individual panel geometries, the metal mass losses were calculated.

For the correct operation of the chamber, the mass losses were required to lie between (145^{+/-}35)g/m² and the individual losses not to deviate from the mean by more than 20%.

Those measured were 165, 155, 164, 153 and 150g/m², with a maximum deviation of 4.9%. All measured parameters within specification.

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The formal test on the supplied specimens for the 300lt internal volume of the chamber being used, required 0.2lt SO² and 2lt of de-ionised water (2µS/cm conductivity) per cycle. Test Method B was to be used for a total of 15 x 24hr cycles.

The 20 specimens were prepared for test by cleaning/de-greasing using isopropyl alcohol (IPA). These were then mounted on jigs as suggested by the customer and located inside the chamber with consideration for positioning between specimens and proximity to chamber walls. Fig 5.

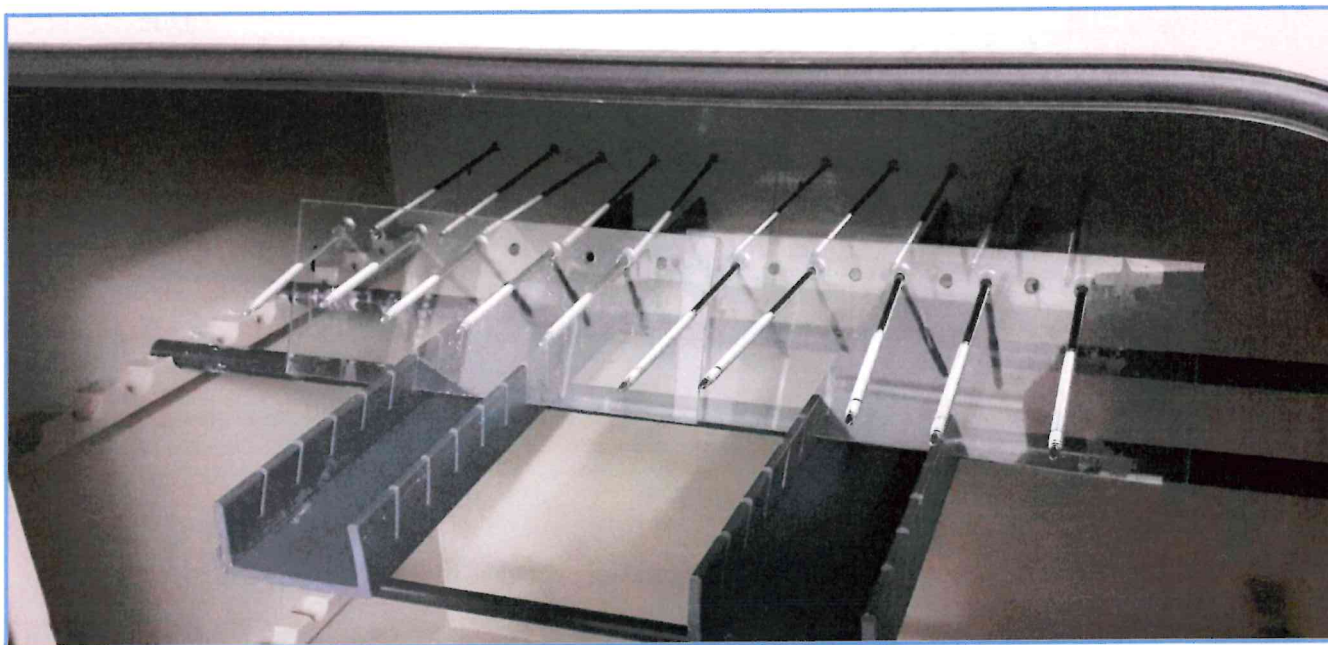


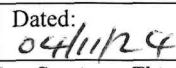
Figure 5: View of Specimens Positioned Inside the Kesternich Chamber. Substitute Specimens not in-Situ for Clarity

With reference to Fig.5, illustration of position of specimens in chamber (viewed from above).

BACK

IS180	A4IS180
01 02 03 04 05	01 02 03 04 05
IS100	A4IS140
01 02 03 04 05	01 02 03 04 05

With all external services in place, gas, de-ionised water and compressed air, the test procedure was started. The cycling was automated, with water and gas of correct volumes being introduced to the chamber at the required times. The status of the testing was monitored several times during each cycle to ensure correct operation was maintained.

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After the test procedure was completed – 15 cycles, the tested specimens were removed from the chamber. Photographs were taken and condition of each noted. All samples then individually wrapped in LDPE bags and returned to customer for formal evaluation.

5) Testing and Measuring Equipment Descriptions.

Items of equipment used during the procedure described above.

Item	Description	Manufacturer	Model	Serial No.	Calibration Due
1	Kesternich Chamber	Co.Fo.Me.Gra.	D200	0213	18/04/25
2	Conductivity Meter	Hanna Instruments	DiST3	H198303	By std. solutions

6) Test Results and Parameters Recorded

Note 1: If any Customer data is supplied, it must be clearly identified with a disclaimer highlighting that this could affect the validity of the test results

Note 2: If there are any deviations from the agreed customer request scoping document and actual laboratory activities these must be communicated and agreed as required by the customer and any other stakeholders. Deviations must be clearly noted within the test results and highlighted in customer reports.

After the test, the conditions of the specimens were noted as below, Figs. 6 to 25.

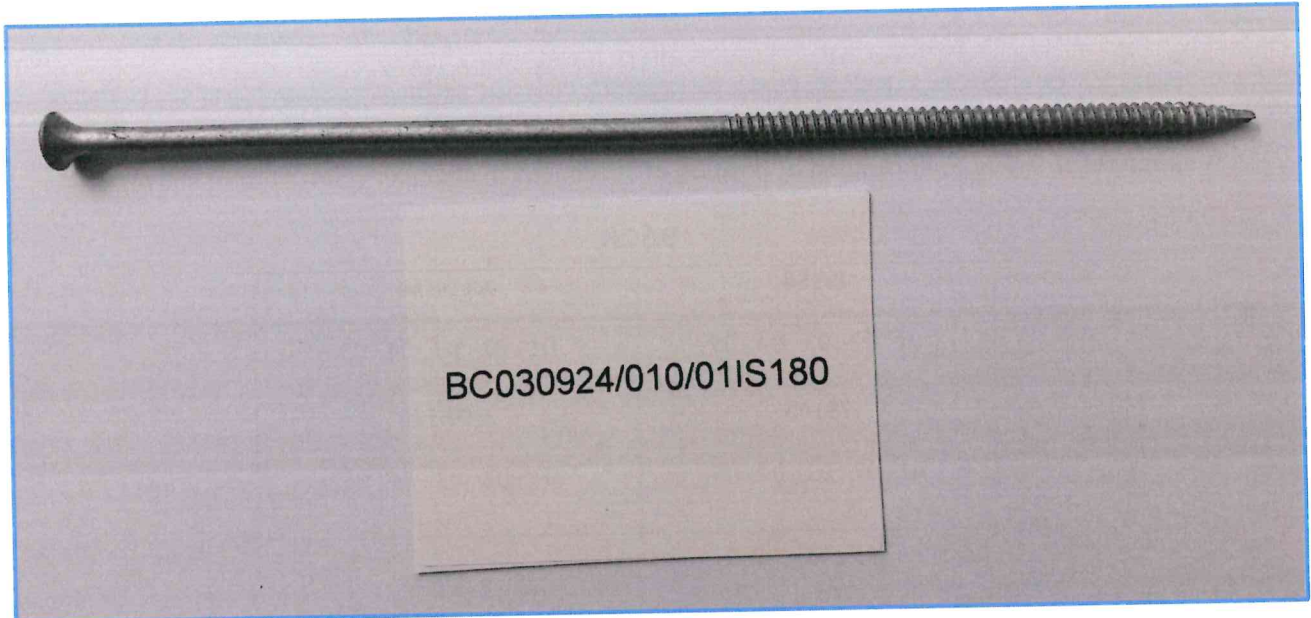


Figure 6: Specimen BC030924/010/01IS180 After Test

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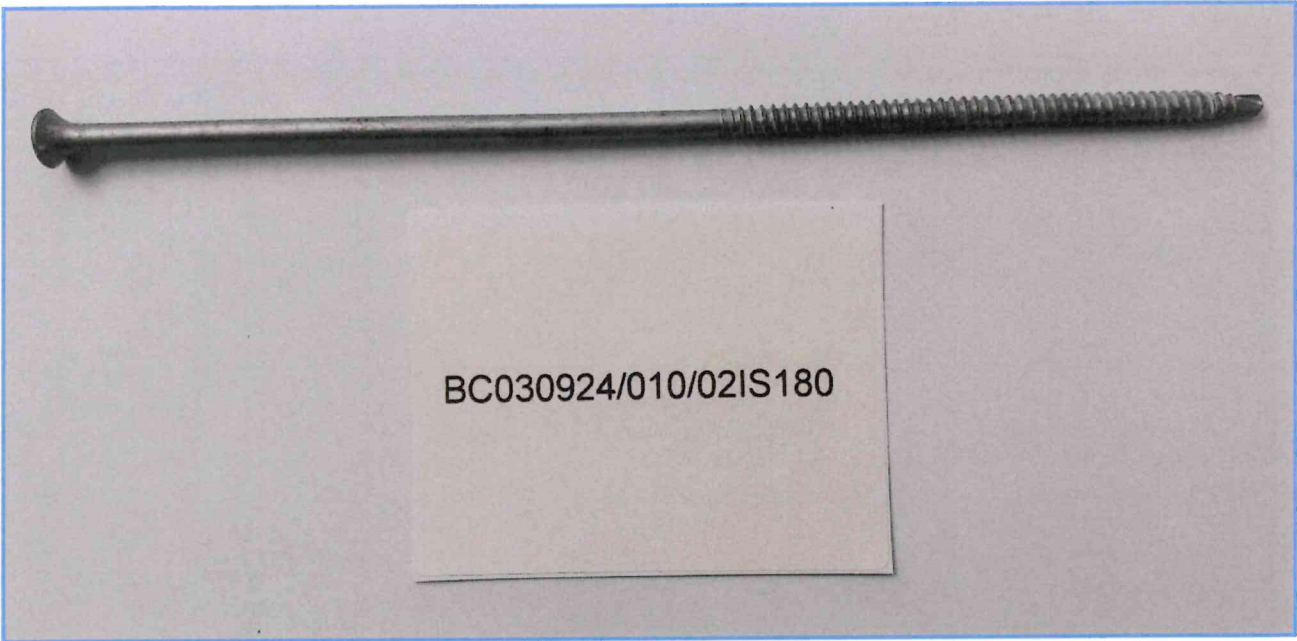


Figure 7: Specimen BC030924/010/02IS180 After Test

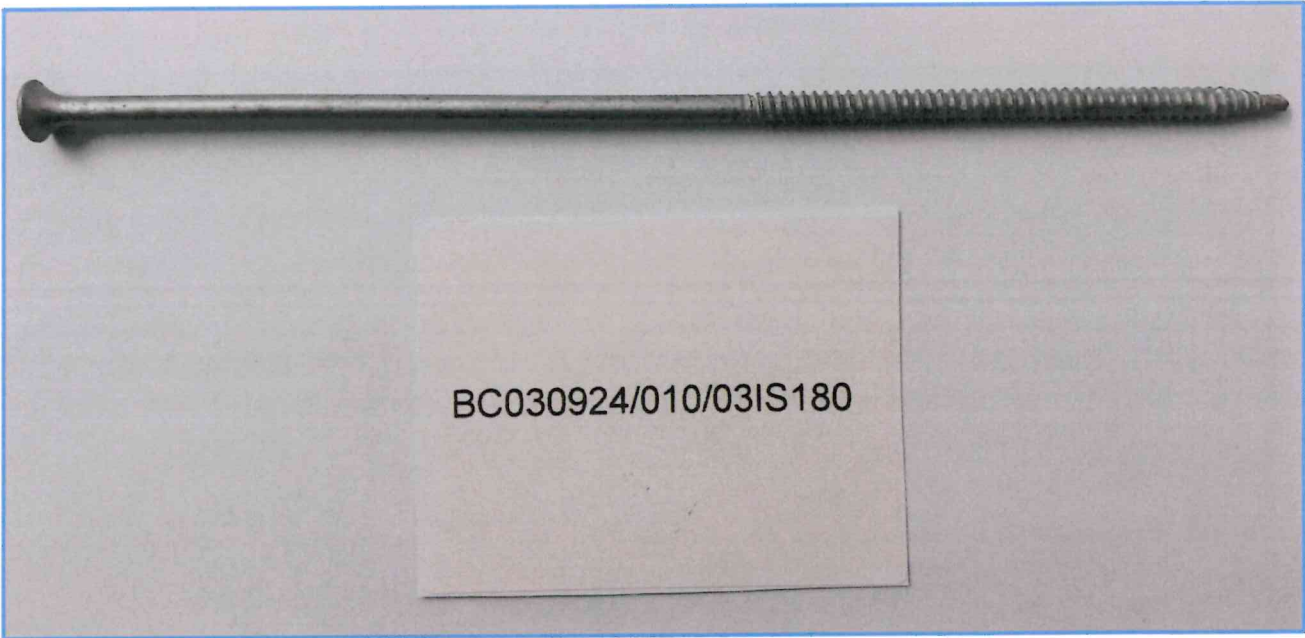
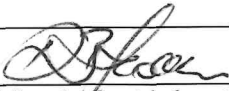


Figure 8: Specimen BC030924/010/03IS180 After Test

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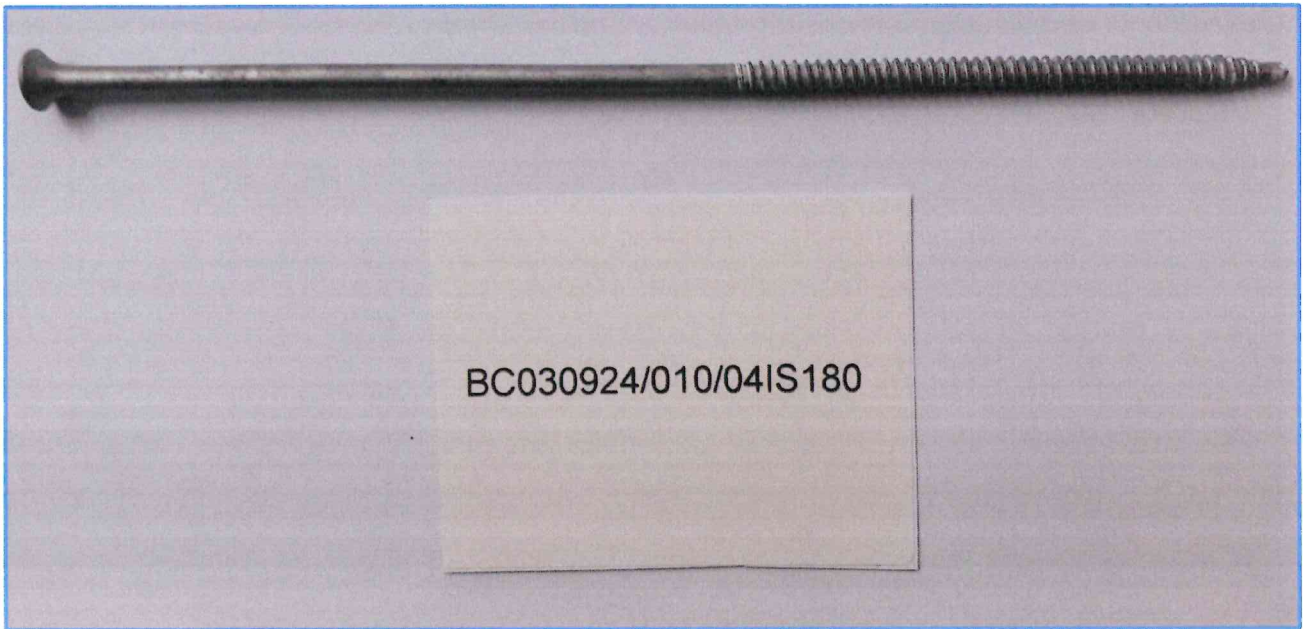


Figure 9: Specimen BC030924/010/04IS180 After Test

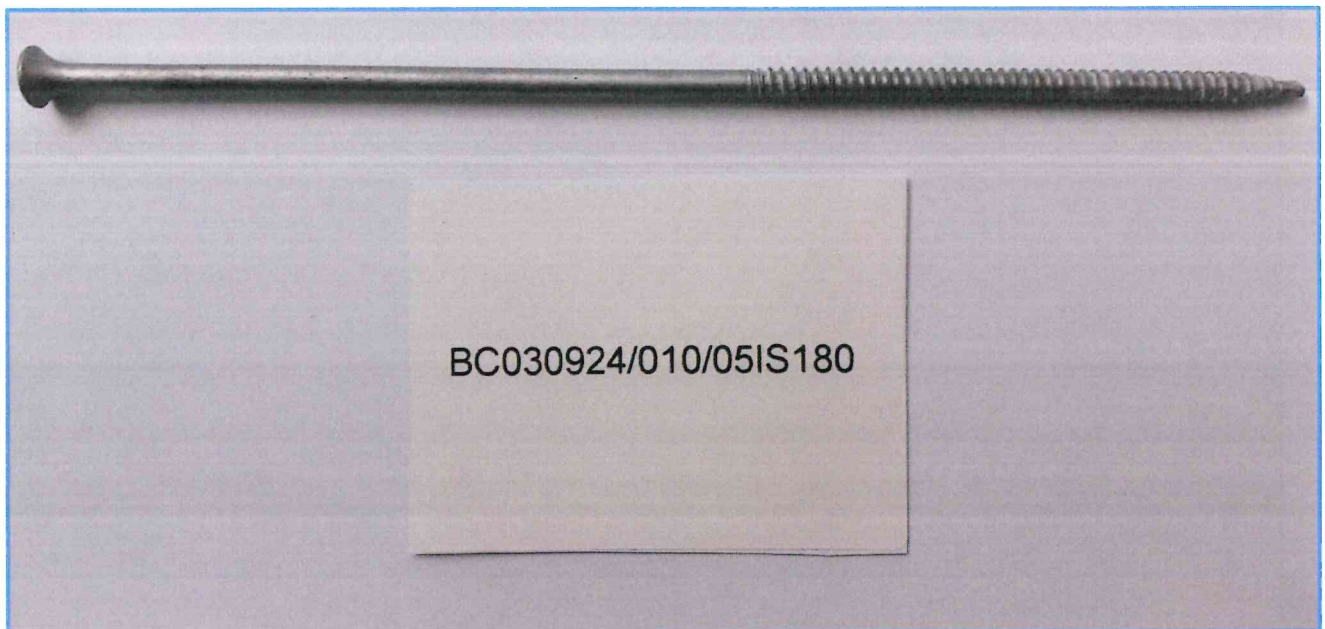
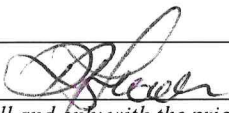


Figure 10: Specimen BC030924/010/05IS180 After Test

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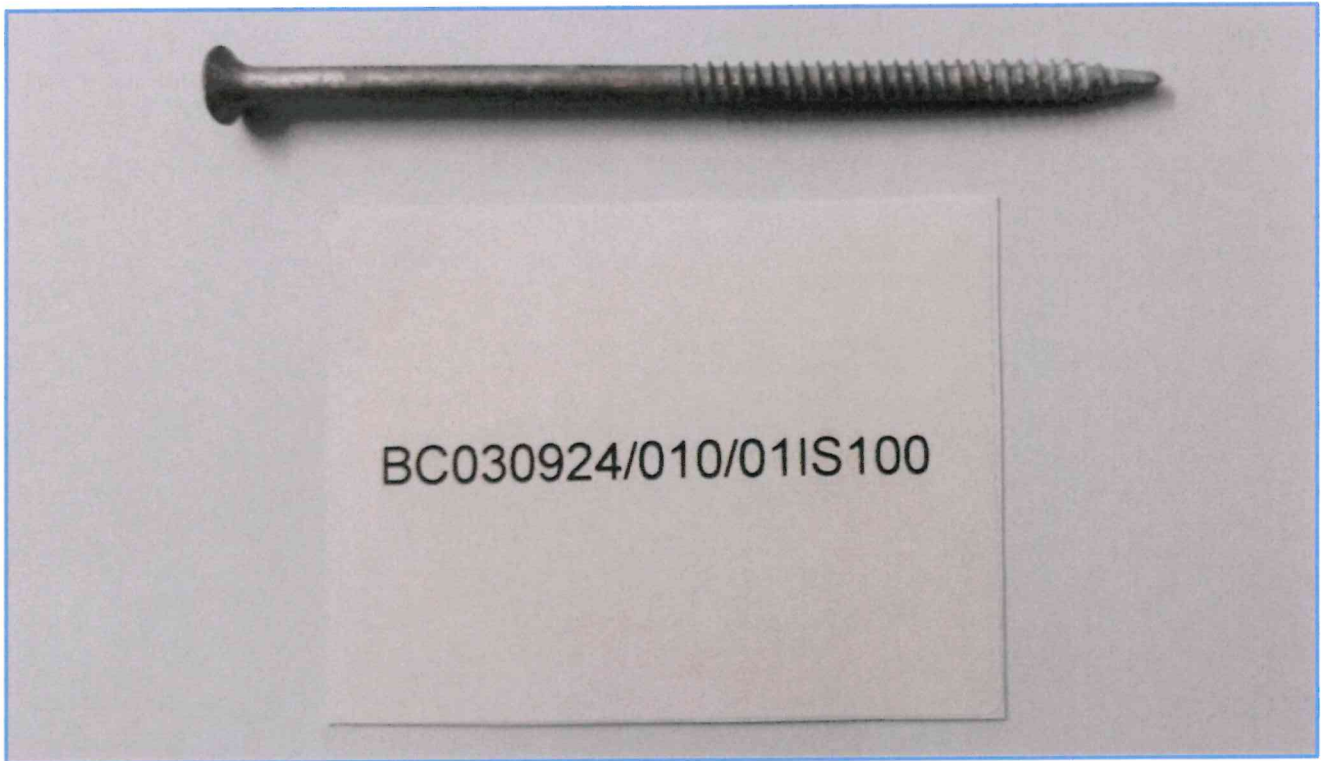


Figure 11: Specimen BC030924/010/01IS100 After Test

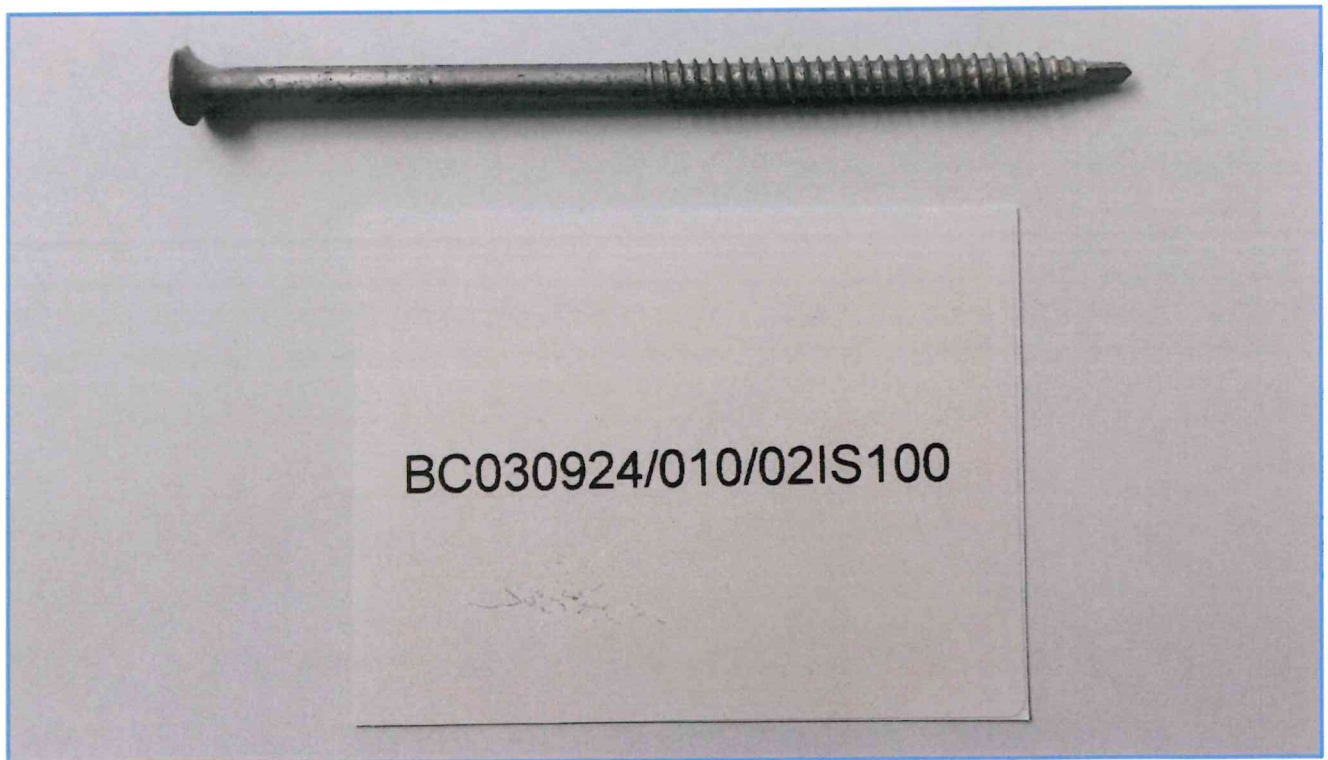
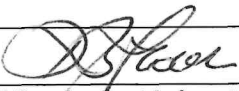


Figure 12: Specimen BC030924/010/02IS100 After Test

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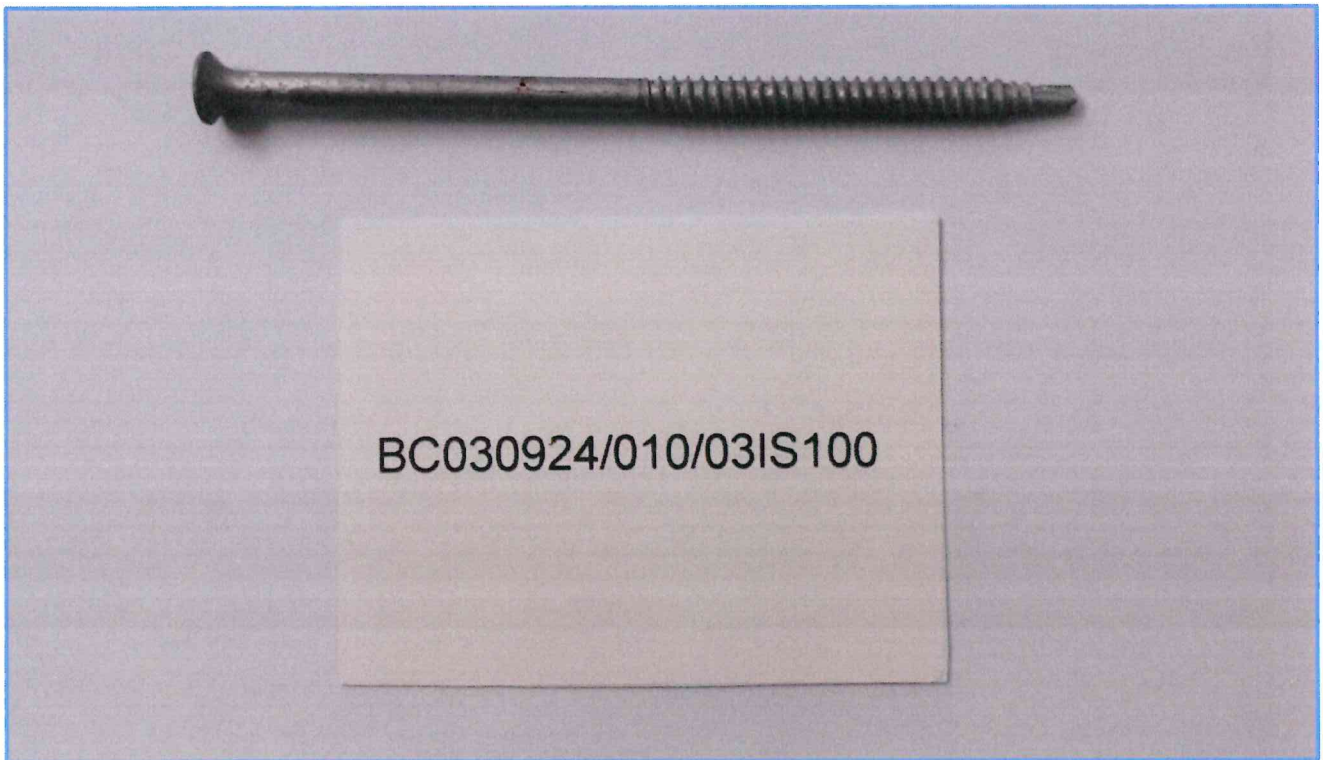


Figure 13: Specimen BC030924/010/03IS100 After Test

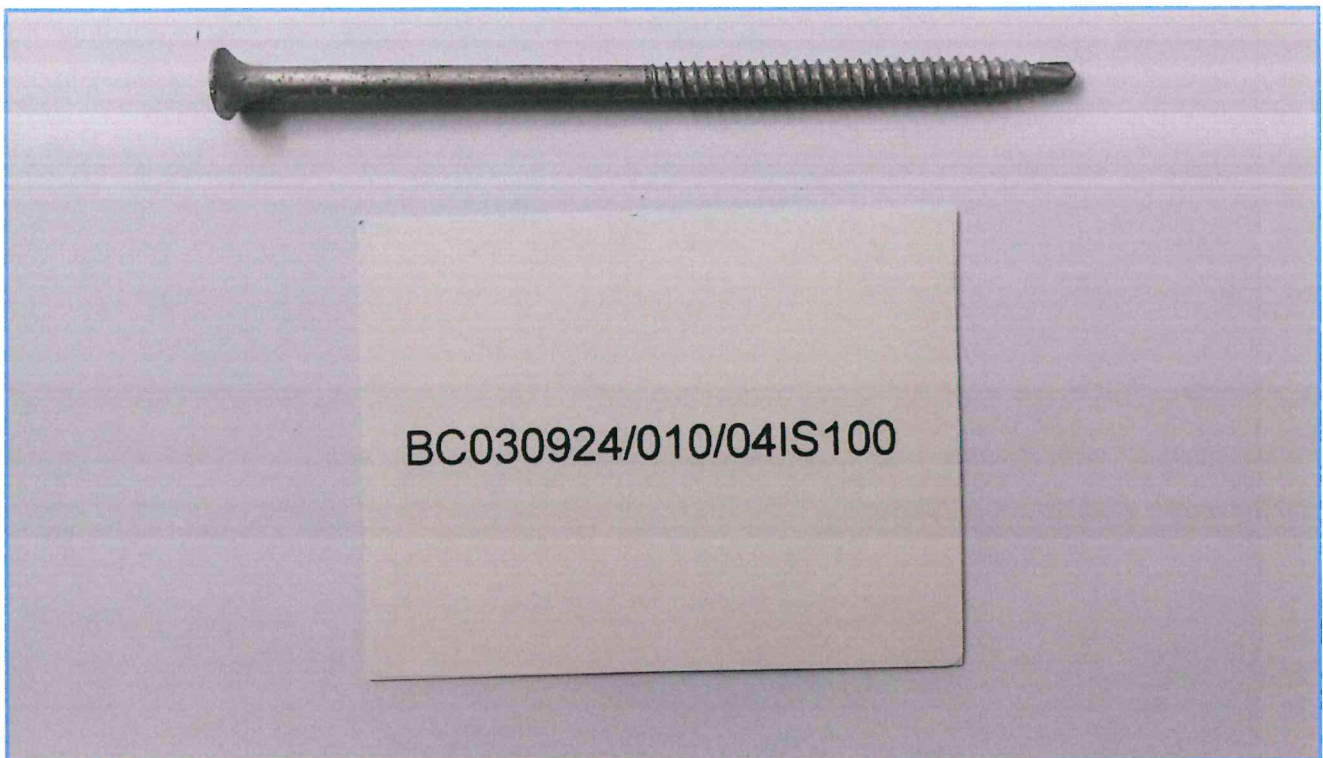


Figure 14: Specimen BC030924/010/04IS100 After Test

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Figure 15: Specimen BC030924/010/05IS100 After Test

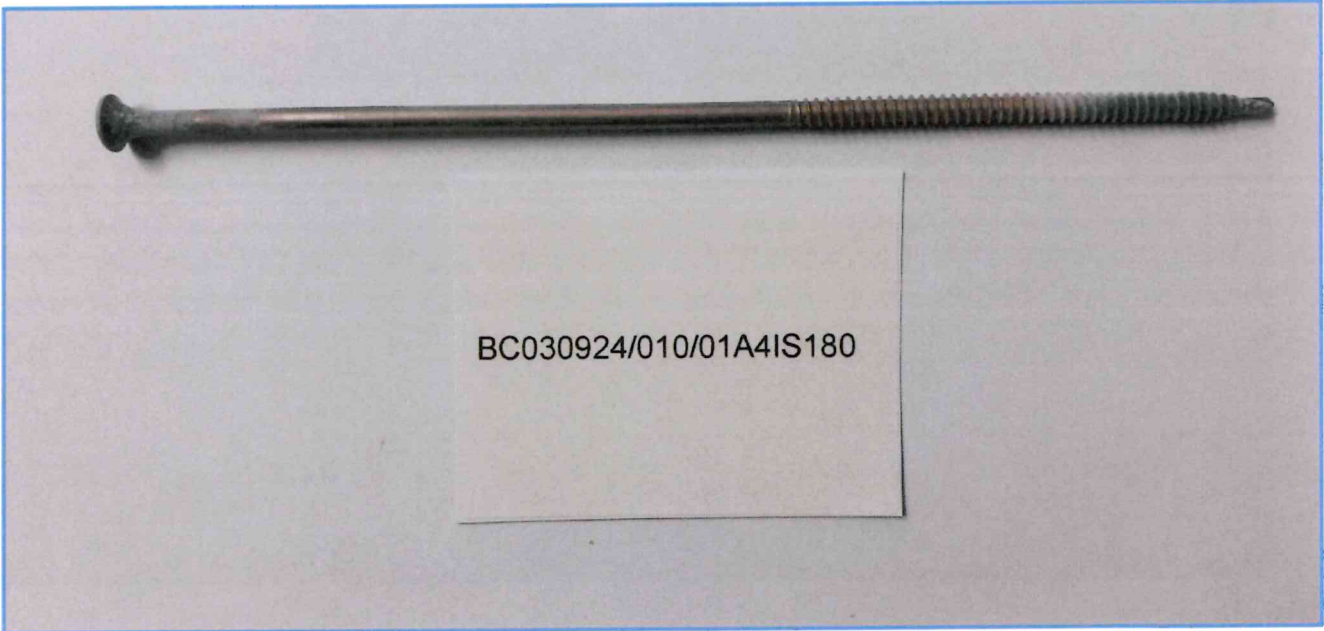


Figure 16: Specimen BC030924/010/01A4IS180 After Test

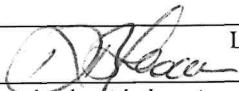
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Figure 17: Specimen BC030924/010/02A4IS180 After Test



Figure 18: Specimen BC030924/010/03A4IS180 After Test

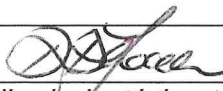
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Figure 19: Specimen BC030924/010/04A4IS180 After Test



Figure 20: Specimen BC030924/010/05A4IS180 After Test

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Figure 21: Specimen BC030924/010/01A4IS140 After Test

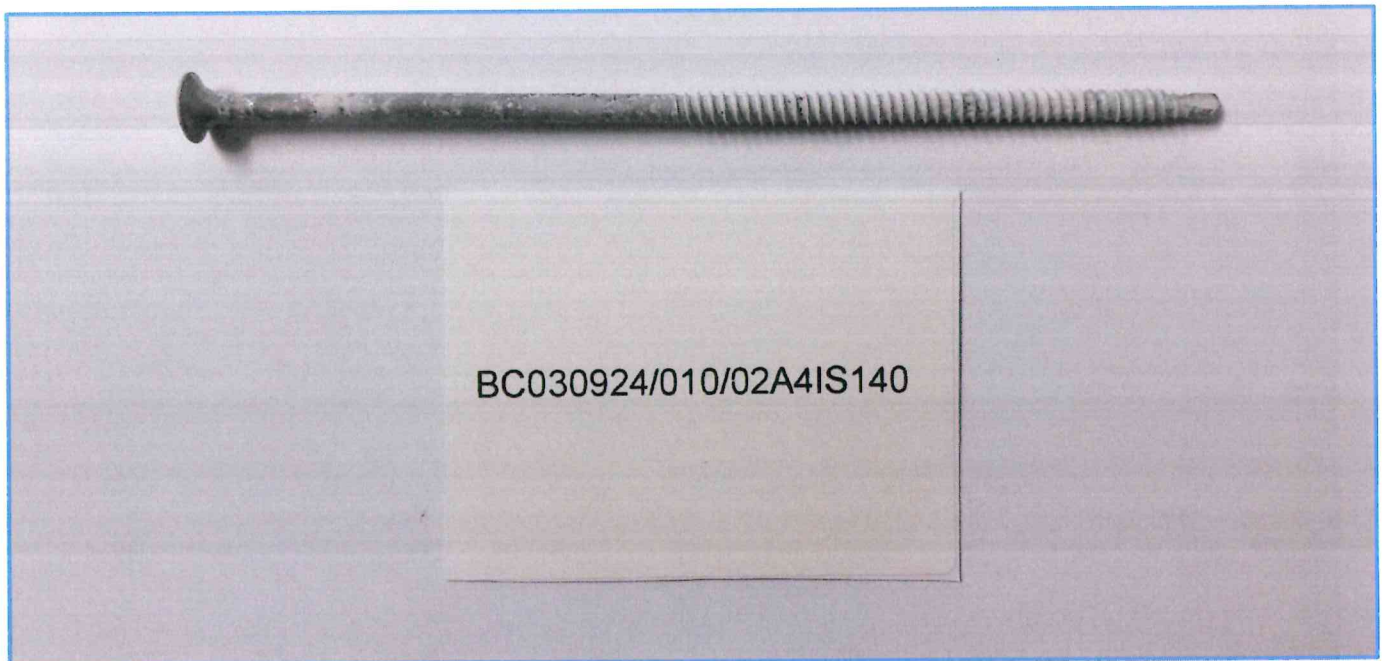


Figure 22: Specimen BC030924/010/02A4IS140 After Test

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Figure 23: Specimen BC030924/010/03A4IS140 After Test



Figure 24: Specimen BC030924/010/04A4IS140 After Test

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Figure 25: Specimen BC030924/010/05A4IS140 After Test

7) Statements of Pass or Fail

All specimens showed varying degrees of tarnish. The pass or fail decisions for each case will at the discretion of the customer on receipt of returned specimens.

8) Uncertainties

Chamber temperature $\pm 2.6^{\circ}\text{C}$.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

END OF REPORT

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