

The DuoGuard 350 TS™ Hybrid Anode™ Installation Guidelines



Concrete Preservation
Technologies Ltd

DuoGuard 350 TS™

IMPORTANT: This installation methodology is an outline – modifications will be made for local site requirements and will be identified in the final specification.

The structure should be assessed prior to application of the DuoGuard 350 TS anode technology as follows;

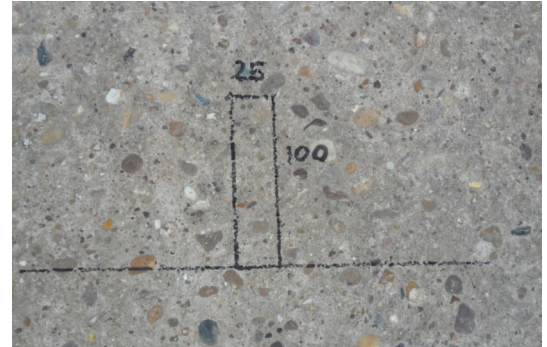
1.0 Preliminaries

- 1. Review of records:** All available drawings and recorded information should be reviewed for information relating to location, quantity, nature and continuity of reinforcement and to concrete quality.
- 2. The reinforcement continuity** shall be proven on site by measuring the electrical resistance between reinforcing bars in mutually remote locations across the structure and between reinforcing bars exposed during concrete repairs or other works following the method and acceptance criteria as specified in EN 12696:2000, clause 7.1. These measurements shall include the following:
- 3. The continuity of metallic items**, other than reinforcement. Any external metallic items shall be electrically bonded during the initial impressed current phase of treatment.
- 4. Reinforcement location/concrete cover:** Steel reinforcement size and location should be established to confirm details in the drawings.
- 5. Concrete cover of the area to be protected** should be determined to ensure a minimum cover of at least 20 mm for the purposes of installation of the DuoGuard 350 TS anode system, and that a slot of appropriate dimensions can be formed.
Confirm depth of surface to be treated prior to installation.
- 6. Stray currents:** The structure should be assessed for the presence of AC or CD stray currents. If stray currents are evident, remedial action must be undertaken under the auspices of a competent electrical/corrosion engineer.

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2.0 Installation

1. **Confirm steel continuity in areas to be treated.**
2. **Undertake a reinforcing steel survey as follows:**
 - a) Mark steel locations on concrete surface in conjunction with drawings
 - b) Mark locations for DuoGuard 350 TS units on concrete surface in conjunction with drawings
 - c) Mark locations for saw cuts in conjunction with drawings
 - d) Mark locations for reference probes if used
 - e) Mark locations for the DuoGuard 350 TS anodes surrounding the reference probes in the test areas if utilised
 - f) Mark position of the monitoring/connection boxes if used.
 - g) Mark position for the temporary power supplies



3. Break out rectangular sections **L:100 D:45 W:25 mm** at the locations identified in the drawings and 2(ii) above

Note that the rectangular sections should be cut parallel with the direction of the traffic low in a car park deck situation, with the shorter edge exposed to the direction of traffic.



4. Cut chases as identified in 2(iii) above, 4 mm wide x 15 mm deep, between holes for location of titanium feeder wires. Ensure that no reinforcing steel is exposed as this has the potential to cause electrical shorts.

Cut chases for the additional titanium wire connections as identified in 2(iii) above.

All holes and saw cuts shall be fully cleaned out prior to application of the DuoCrete TS mortar and concrete repair mortar.

5. Make electrical connections to the reinforcing steel by first exposing the steel, drilling a 4.5 mm hole and riveting a titanium wire connection with a 3.2 mm diameter stainless steel rivet (grip range 3.2 - 4.8 mm). At least two steel connection per zone of anodes shall be made.



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6. Position temporary power supplies.
7. Strip the coating from the titanium wire using wire strippers, only in the location where the anodes are to be fixed. Electrically pre-connect the individual DuoGuard 350 TS units to the titanium feeder wire using the plastic screw connectors, with the DuoGuard 350 TS units positioned in the holes. Twist the excess wire from the DuoGuard 350 TS units around the titanium feeder wire to ensure electrical continuity. The screw connectors should be hand tight – electrical resistance between the primary titanium anode wire and the individual DuoGuard 350 TS units should be checked to ensure electrical continuity (typically a resistance of less than 1 Ohm shall be obtained).
8. With the DuoGuard 350 TS units now fixed onto the titanium feeder wire, they should be removed from the holes prior to application of the DuoCrete TS mortar. Pre-wet the holes prior to application of the TS mortar, ensuring all holes are then free of excess water prior to application.
9. Thoroughly Mix Part A and Part B of the DuoCrete TS mortar using a forced action mixer and apply to the bottom of the broken out section to a depth of 25 mm. Press the individual DuoGuard 350 TS units into the mortar – the mortar should flow to fully encapsulate the anode. Ensure that any trapped air is removed and that the plastic screw connector is below the concrete surface. The DuoGuard 350 TS units should be applied immediately after the TS mortar is placed in the broken out section.
10. Fill the remaining void (at least 20 mm depth) with a low shrink repair mortar, ensuring that the DuoCrete TS mortar is not disturbed, and finish so that the repair material is flush with the deck concrete surface. Follow manufacturers instructions for priming, mix water content and mixing for the low shrink repair mortar.



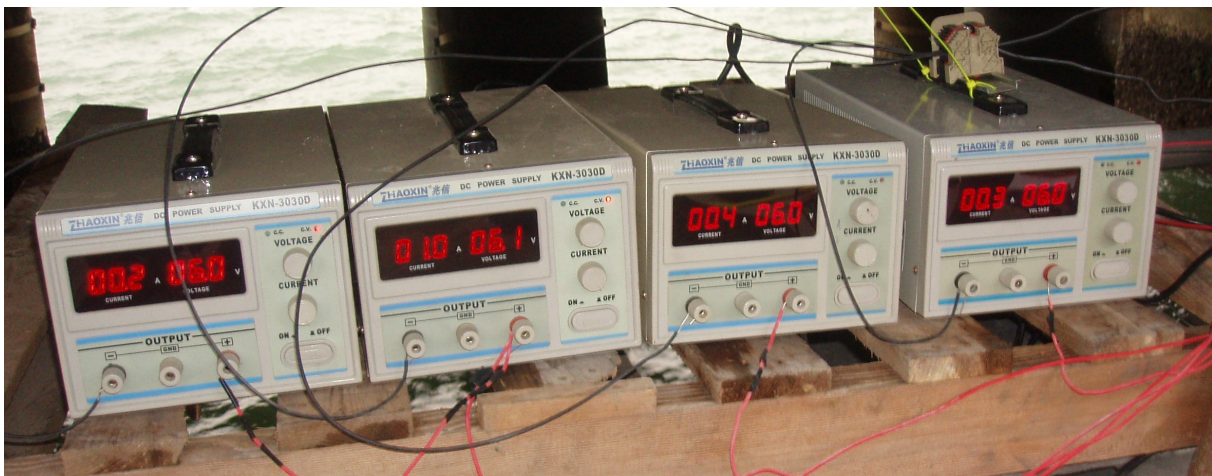
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11. The installation is checked for electrical shorts by measuring the electrical potential between the reinforcing steel and the DuoGuard 350 TS units using a high impedance voltmeter within 2 hours of installation. The potential difference should be greater than 600 mV and stable.
12. The installed DuoGuard 350 TS units in each zone are connected to the respective 12V temporary power supply. **The titanium feeder wire from the DuoGuard 350 TS units is connected to the positive terminal; the wire from the steel is connected to the negative terminal.** This should be completed within 3 hours of installation of the units. Also ensure that any bare titanium wires outside of the concrete, which can possibly short, are insulated using insulation tape.
13. Undertake a polarity check and record the data. The steel potential must shift more negative relative to the reference electrode. If the potential moves to a more positive potential relative to the reference electrode then the current should be disconnected immediately and professional advice sought. A method statement must be provided by the contractor

Polarity check data will be recorded for all zones of DuoGuard 350 TS application.

Note – A method of obtaining a polarity check is to place a surface reference electrode adjacent to a DuoGuard 350 TS unit and observe the change in potential registered as the impressed current is applied. Ensure that the reference electrode is in the COM terminal for polarity checks.

** Note – the DuoCrete TS mortar should only be applied and cured at a temperature greater than 5°C and rising.



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14. Activate the power supply for 1 week. If batteries are used, exchange battery power units on a daily basis or as necessary to maintain charge capacity in excess of 50% (ensure that replacement batteries are kept fully charged). The voltage and current output for each zone shall be recorded on a daily basis. A method statement must be provided by the contractor.

Each treated zone is logged as follows***;

Zone	Date connected to power supply	Date power supply disconnected	Daily Voltage (V)	Daily current (mA)													
				1	2	3	4	5	6	7	1	2	3	4	5	6	7

*****A copy of this information is to be forwarded to the client and CPT.**

Note: To determine the voltage of the battery power supply, use a voltmeter to direct read from the terminals of the battery. A typical method of measuring the current delivered from the power supply is to measure the voltage drop across a 0.1Ω resistor placed in series with the circuit.

After 1 week disconnect the wires from the positive and negative terminals of the 12V power supply and splice them together within the connection box.

- 15.** The feeder wires are buried in the chases using repair mortar or pourable compound as specified which is allowed to cure according to the manufacturer’s instructions.
- 16.** The DuoGuard 350 TS units are now operating in galvanic mode.
- 17.** Clean the treatment area.
- 18.** The installation phase is now complete.

Any unusual site details should be discussed with the engineer/CPT prior to installation of the system.

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3.0 Additional Information

Any unusual site details should be discussed with the engineer/CPT prior to installation of the system.

Process Monitoring

- **Visual inspection**

Before the DuoGuard 350 TS system is connected to the power supply for the 1st phase treatment, the installation and all its component parts shall be subjected to a complete visual inspection to check they are installed correctly, labelled and protected from environmental, human and animal damage.

- **Routine inspection and maintenance**

Routine inspection shall be carried out at least once a day. The following checks shall be carried out and the data recorded:

Phase 1 – Impressed current

Confirmation that the battery power supplies are functioning correctly and have sufficient charge capacity for the impressed current treatment.

Measurement of current delivery to each treatment zone.

Visual checks of cable insulation and anode connections, to confirm their proper function.

Phase 2 – Galvanic protection

Confirmation of galvanic activity after the 1st phase impressed current treatment may be undertaken by measuring current between the DuoGuard 350 TS anodes and the reinforcing steel after a period of 2 hours after disconnection of the power supply. A protective current will be observed from the DuoGuard 350 TS anodes.