Sika® Ebonex®
Discrete anodes for impressed current cathodic protection

Description
Ebonex is a discrete impressed current cathodic protection (ICCP) anode that utilizes an innovative ceramic/titanium composite with an integral gas venting system. The anode system requires Ebofix grout which has a high density and is acid absorbent for long term stability.

Ebonex discrete anodes are available in a range of sizes and diameters to provide excellent design flexibility. Ebonex discrete anodes satisfy the 100mV potential shift requirement for effective cathodic protection as specified under National Association of Corrosion Engineers Standard RP 0290.

Applications
• Bridges
• Parking garages
• Marine structures
• Steel framed buildings

Features and Benefits
• Gas venting - no buildup of anodic gases. Can be installed under fiber-reinforced polymer (FRP) strengthening systems, membranes, and coatings.
• Embedded installation - no added dead weight or increase to physical dimensions of structure from thick overlays.
• Long lasting - 25+ year service life, the longest of any discrete CP anode system.
• Highest level of protection - satisfies the 100mV depolarization criteria for effective cathodic protection.
• Proven technology - field verified performance.
• Cost competitive - compared to other types of ICCP anodes.
• Deep installation - addresses multi-levels of steel and difficult access.
• High operating current - suitable for use in areas of high steel density.
• Versatile - can be used in new construction as a preventative measure.

Specification
Where indicated, cathodic protection to reinforced concrete elements shall be provided by Ebonex discrete composite anodes capable of maintaining long term stability at current densities of up to 900mA/m² (of anode surface).

The Ebonex discrete anodes shall be gas vented and shall be grouted in place using Ebofix grout, a thixotropic high density, electrochemically compatible grout.

How It Works
ICCP mitigates corrosion activity by supplying sufficient electrical current from an external source to overcome the on-going corrosion current in the structure. Ebonex anodes are permanently installed into the structure. An external DC power source provides the source of electrical current that overpowers corrosion activity. The anodes are connected to the positive (+) terminal. According to industry standards, an ICCP system is considered to be effective when the system polarizes the reinforcing steel sufficiently to result in a 100mV depolarization after the system is turned off.

Design Criteria
Ebonex is a discrete cathodic protection system providing long term durability to both new and existing structures under highly aggressive conditions. In line with other cathodic protection systems, Ebonex discrete anode systems should be designed by corrosion specialists and installed by knowledgeable and experienced contractors.

<table>
<thead>
<tr>
<th>Level of Protection</th>
<th>Description</th>
<th>Ebonex</th>
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</thead>
<tbody>
<tr>
<td>Corrosion Prevention</td>
<td>Preventing new corrosion activity from initiating</td>
<td></td>
</tr>
<tr>
<td>Corrosion Control</td>
<td>Significantly reducing or stopping on-going corrosion activity</td>
<td></td>
</tr>
<tr>
<td>Cathodic Protection</td>
<td>Highest level of protection intended to stop on-going corrosion activity</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Ebonex Type</th>
<th>Diameter x length (mm)</th>
<th>Current rating (mA)</th>
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<tbody>
<tr>
<td>CP07/100</td>
<td>7 x 100</td>
<td>2.0</td>
</tr>
<tr>
<td>CP10/100</td>
<td>10 x 100</td>
<td>2.8</td>
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<tr>
<td>CP10/150</td>
<td>10 x 150</td>
<td>4.2</td>
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<tr>
<td>CP18/100</td>
<td>18 x 100</td>
<td>5.1</td>
</tr>
<tr>
<td>CP18/200</td>
<td>18 x 200</td>
<td>10.2</td>
</tr>
<tr>
<td>CP18/300</td>
<td>18 x 300</td>
<td>15.2</td>
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<tr>
<td>CP28/100</td>
<td>28 x 100</td>
<td>7.9</td>
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<tr>
<td>CP28/300</td>
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<td>23.7</td>
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<tr>
<td>CP28/600</td>
<td>28 x 600</td>
<td>47.5</td>
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</table>
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Installation Instructions

Preparation

Ebonex discrete anodes are installed in pre-drilled holes 4 to 8 mm larger than the nominal anode diameter and typically no closer than 600 mm apart. The holes and Ebonex discrete anodes should be located to minimize their proximity to the steel reinforcement in order to provide an even current distribution to the steel within the local vicinity.

Cut a saw cut of minimum 10 mm depth and 8 mm width into the concrete or mortar joint between the holes. This saw cut will accommodate the titanium feeder wire interconnecting the Ebonex anodes, and the gas-ventilation tubing. A 3 mm saw cut can be used if the venting pipes are not interconnected.

Prior to application the holes and saw cuts should be blown or vacuum cleaned of all debris and pre-soaked with water.

Mixing

The Ebofix grout should be mixed in accordance with the instructions on the product technical data sheet.

Installation

Standing water should be removed from the drilled anode hole and the Ebofix grout placed to the rear of the hole to avoid air entrapment, ensuring sufficient grout is placed to cover the entire length of the active Ebonex discrete anode once installed. The thixotropic nature of the Ebofix grout will prevent significant flow from vertical and overhead holes. Wet each Ebonex anode with clean water, but do not immerse for more than 10 seconds, before gently inserting into the hole. Ensure the vent pipe is unobstructed and that sufficient tail wire remains exposed to enable connection with the feeder wire.

Place the Ebofix grout in accordance with the recommendations of the product technical data sheet. When cured, the open end of the gas vent network can be directed to a well-ventilated location.

Connect strings of Ebonex discrete anodes together as recommended by the CP design engineer using non-coated titanium feeder wire. All wire jointing requires the use of titanium metal crimps, secured using an appropriate crimping tool.

After connections have been made continuity should be tested with a resistance meter. Any reading found to have a resistance less than 1 ohm require recrimping the connection. When the integrity of the connection is established the tail of each Ebonex discrete anode can be gently bent, thus settling the wire into the saw cut groove.

The saw cut is filled with Sika mortar, and left undisturbed for a minimum of 4 days before connecting to the power system.

Precautions

In chloride contaminated structures, particular attention should be paid to the control of applied voltage. Potentials greater than 7 volts should not be applied to the titanium connecting wires. Performance of the Ebonex discrete anode is dependent upon the correct design, installation and maintenance of the cathodic protection system. For further information consult Sika Corporation.

If Sika Ebonex discrete anodes are used to protect post-tensioned, pre-stressed or otherwise highly stressed steel, adequate controls and monitoring are required in order to prevent any harmful side effects including, but not limited to, hydrogen embrittlement of the steel. The system of cathodic protection, controls and monitoring should be designed and managed by a specialist who can demonstrate expertise and successful project experience.

Packaging

| Ebonex discrete anode | Anode with 500 mm tail wire (packaging varies depending upon the anode dimensions) |

Additional Accessories

| Ebofix grout | 10 kg. bags |
| Wire pack | Titanium feeder wire 40 m x 1.5 mm diameter |
| Crimping pack | 80 titanium crimps |
| Venting pack | 20 m PVC tube plus 40 connecting T-pieces |
| Crimping tool | Crimping tool plus plattens |

Storage

Store both the Ebonex discrete anodes and Ebofix grout in dry conditions in their original unopened packaging. Ebofix grout has a shelf life of 12 months.

Health and Safety

There are no known health hazards associated with Ebonex discrete anodes.

Ebofix grout is alkaline and should not come into contact with the skin and eyes. Avoid inhalation of dust during mixing. Gloves, goggles and dust mask should be worn. If contact with skin occurs, wash with water. Splashes to eyes should be washed immediately with plenty of clean water and medical advice sought.

Ebonex discrete anodes and Ebofix grout are non-flammable.

Related Documents

A range of related Ebonex documents are available. For more information, contact Sika Corporation.

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURRING CONDITIONS.
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