



Vector®

Ebonex®

Discrete Cathodic Protection Anodes for Reinforced Concrete Structures and Steel Framed Buildings

Description

Ebonex is a discrete Impressed Current Cathodic Protection (ICCP) anode, specifically designed to protect reinforced concrete and steel-framed structures from corrosion. The anode utilizes an innovative ceramic/titanium composite, combined with an integral gas venting system. The anode system includes Ebofix grout, a high density, acid buffering grout used for long-term performance. Ebonex discrete anodes are available in a range of sizes to provide excellent design flexibility. Ebonex discrete anodes are capable of exceeding the 100mV potential shift requirement for effective Cathodic Protection, as defined in NACE (National Association of Corrosion Engineers) standard RP0290 and the European Standard EN12696 - Cathodic Protection of Steel in Concrete.

Applications

- Bridges
- Tunnels
- Parking garages
- Heritage structures
- 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** - longest life expectancy of any discrete CP anode - in excess of 50 years depending upon design.
- **Highest level of protection** - capable of satisfying 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 many sectors within the construction industry.

Specification

Where indicated, cathodic protection to reinforced concrete elements shall be provided by Ebonex discrete composite anodes as supplied by Vector Corrosion Technologies. Ebonex anodes shall be capable of maintaining long term stability at current densities of up to 900mA/m² (of anode surface), for the specified design life. The Ebonex discrete anodes shall be gas vented and shall be grouted in place using Ebofix grout, a thixotropic high density, acid buffering grout used for long-term performance.

How It Works

Ebonex works by distributing sufficient electrical current to overcome ongoing corrosion in the structure. Ebonex anodes are connected to an external DC power supply, which provides the electrical current that mitigates corrosion activity. The anodes are connected to the positive (+) terminal. According to industry

IMPRESSED CURRENT SYSTEMS



Ebonex anodes with electrical connectors

Level of Protection	Description	Ebonex®
Corrosion Prevention	Mitigates initiation of new corrosion activity	
Corrosion Control	Reduces on-going corrosion activity	
Cathodic Protection	Reduce or eliminate on-going corrosion activity	•

standards, an ICCP system is considered to be providing cathodic protection when the steel is sufficiently polarized to result in a 100mV depolarization.

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.

Anode Diameter	Current rating per 100 mm Anode length** (mA)
8mm Ebonex	2.0
10mm Ebonex	2.8
12mm Ebonex Plus, 18mm Ebonex	5.1
18mm Ebonex Plus, 28 Ebonex	7.9

** Anodes lengths supplied to order - typical lengths 75-600mm

Installation Instructions

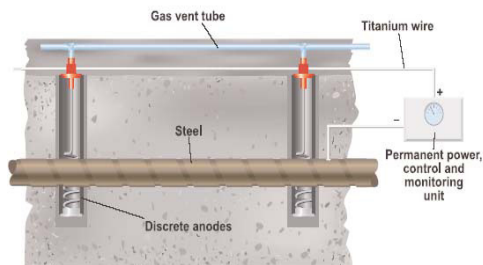
Preparation

Ebonex discrete anodes are installed in pre-drilled holes 4 to 8 mm larger than the nominal anode diameter and typically no further 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



Vector® Ebonex®

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

Ebofix grout should be mixed with a slow speed drill (400-500 rpm) and paddle mixer. Place between 3.0-4.0 litres of potable water into a suitable mixing container, add one full 10 kg bag of Ebofix grout and mix for three minutes until fully homogeneous.

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 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 within 30 minutes of mixing to gain benefit of the expansion system and allow to cure for a minimum of 24 hours, without physical disturbance. 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 coated or non-coated titanium feeder wire and electrical connectors or titanium crimp connectors. 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 greater 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 Ebofix grout or a cementitious 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 the local Vector office.

Packaging

Ebonex discrete anode	Anode with 500 mm tail wire (packaging varies depending upon the anode dimensions)
Ebofix grout	10 kg bags
Wire pack	Titanium feeder wire 40 m x 1.5 mm diameter
Crimping pack	80 titanium crimps
Connectors	50 electrical connectors
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 Vector Corrosion Technologies.

About Vector

Vector Corrosion Technologies takes pride in offering technically advanced, cost effective corrosion protection solutions to extend the service life and improve the durability of concrete and masonry structures around the world. Vector has earned numerous project awards and patents for product innovation and is committed to a safe, healthy and sustainable environment. For additional information or technical support, please contact any Vector office or our extensive network of international distributors.