

Conducrete®

OVERVIEW

THEFT RESISTANT AND MAINTENANCE FREE

- Conducrete® protects the underlying grounding system from theft and sabotage. Theft is increasingly becoming a pervasive problem worldwide which substantially increases the costs from the loss of material and outages. Since Conducrete® solidifies into a high strength conductive concrete, the likelihood of such issues is substantially reduced.
- Conducrete® electrodes are maintenance-free over their functional lifetime. There are NO hydration or salt replacement requirements with Conducrete®.

ENVIRONMENTALLY NEUTRAL/PH NEUTRAL

- Conducrete® has no negative impact on the environment. In fact, it has been approved for use by regulatory agencies in many environmentally sensitive areas where aquifer cross-contamination is a concern.
- Conducrete® is water impermeable and pH neutral when setup and will not corrode copper conductors.
- No salts will leach into or contaminate the soil. Leachate testing shows that Conducrete® has levels far below acceptable leachate limits (see Technical Specification).

LONG LIFE EXPECTANCY

- Independent testing indicates that Conducrete® can reduce electrolytic corrosion by 95% - 100%.
- Conducrete® can extend the life of grounding systems by a factor of 20. Electrodes protected by Conducrete® will last in excess of 25 years in many cases.

COMPRESSIVE STRENGTH AND LOW SHRINKAGE

- Conducrete® has a compressive strength of 21 MPa (3,045 psi) after 28 days. This means that Conducrete® electrodes are permanent, will not wash away and will withstand heavy ground fault currents.
- Conducrete® testing yields shrinkage of 0.015% at 28 days. This means that Conducrete® bonds or knits to the surrounding soil resulting in a superior electrode due to the constant contact with the surrounding soil.

HIGH VOLTAGE/CURRENT TEST RESULTS

- In independent testing in a high voltage lab precast Conducrete® electrodes withstood 1682V/688 amp fault for duration of 500 ms. Other grounding enhancement materials of lower compressive strength have exploded under these test conditions which would render the protection system useless. Conducrete® is the only grounding backfill that has documented evidence of high fault current withstand.

WATER ABSORPTION

- Conducrete® is a very hygroscopic material. Lab testing shows that Conducrete® will absorb up to 32.4% of its weight in water. This quality is especially important in arid environments. Conducrete® is constantly hydrating and therefore continuously absorbing any available moisture from the surrounding soil. The result is an electrode that delivers more stable resistance to ground over time even during dry conditions.

Conducrete®

SUPERIOR OPERATING PERFORMANCE

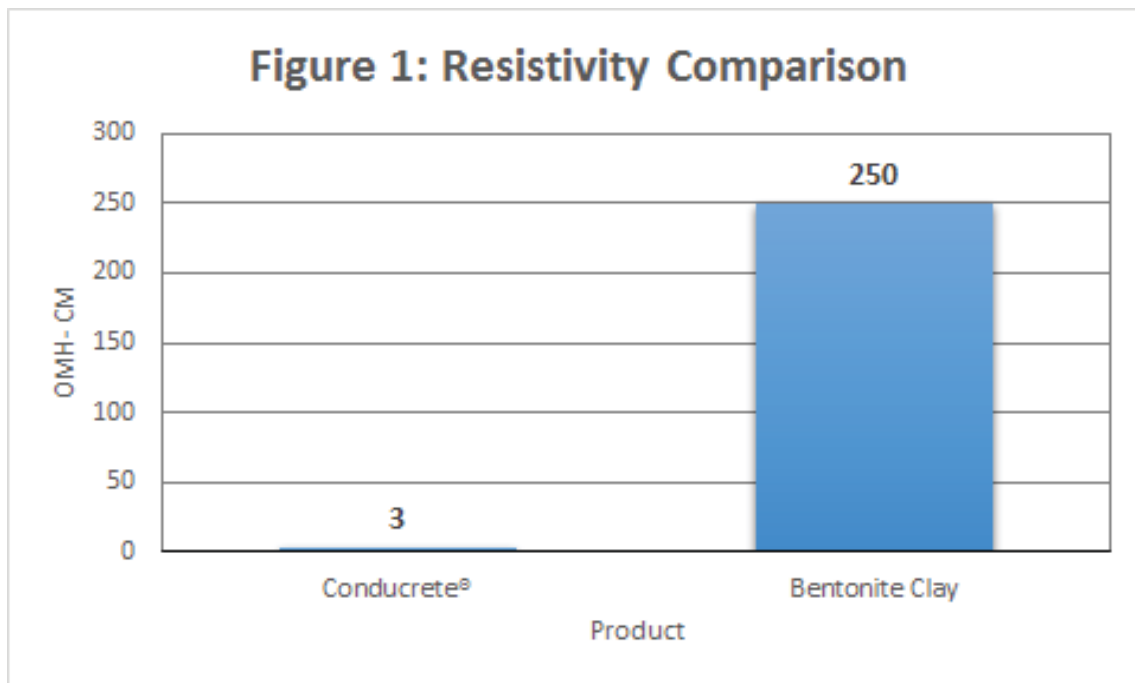
(Low Impedance, Lower Resistance, Superior Conductivity and Capacitance)

LOW IMPEDANCE

- The ability to provide low impedance is critical to dissipate lightning energy quickly to protect assets from damage. Conducrete®'s low impedance is due to the low resistance, high capacitance and low inductance of the unique blend of materials.

LOWER RESISTANCE AND SUPERIOR CONDUCTIVITY

- Lower resistivity results in superior conductivity.
- Independent lab testing indicates that Conducrete® has a very low resistivity (2.8 - 5.0 ohm-cm).
- Figure 1 illustrates that Conducrete® has a resistivity that is approximately 50 times lower than bentonite clay.



INCREASED CAPACITANCE

- The conductive and insulating materials used in the formulation of Conducrete® gives it a capacitive nature. Conducrete® has the ability to store and release energy the same way that a capacitor will store energy until it is grounded or allowed to release the energy into a circuit. The material quickly absorbs high rise time electrical surges keeping ground potential rise in check and preventing equipment interruption and infrastructure damage.

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TECHNICAL SPECIFICATIONS

Conducrete® is environmentally neutral. It sets up in situ to form a solid that does not leach, dissolve or migrate into the soil or water. May be installed dry or mixed with water to form a slurry for horizontal or vertical applications. The material is maintenance free and not require recharging of any kind i.e. watering, chemicals or salts. The material has a dry resistivity of less than 2.8 to 5.0 ohm-cm and an ability to eliminate electrolytic corrosion.

Conducrete® meets NSF/ANSI - Drinking Water Treatment Chemicals - Health Effects
<http://info.nsf.org/Certified/PwsChemicals/Listings.asp?Company=C0169859&>

This product was evaluated to NSF/ANSI Standard 60, Section 8 for backfill applications with a maximum diameter of 12 inches and a maximum aquifer contact depth of 20 feet with an assumption of a minimum ½ acre aquifer (293,760 gallons) of 25% porosity.

Leachate Data (TCPL Procedure) based on Regulation 558 performed by Accuracy Environmental Laboratories Ltd. Demonstrates that Conducrete® is environmentally neutral.

IEC TESTING RESULTS

Ion	Concentration	Amount Released
Aluminum	0.68 mg/L	0.000174%
Barium	1.74 mg/L	0.000068%
Zinc	0.06 mg/L	0.000006%

LEACHATE TESTING RESULTS

Constituent	USEPA Max Contaminant Level (mg/L)	Conducrete®	NSF Acceptance Criteria (mg/L)
Arsenic	0.010	<0.01	0.001
Barium	2.000	0.383	0.2
Boron	2.000	0.158	-
Cadmium	0.005	<0.001	0.0005
Lead	0.015	<0.01	0.0015
Mercury	0.002	0.001	0.0002
Selenium	0.050	<0.01	0.005
Silver	0.100	<0.01	-
Uranium	0.030	<0.01	-
Fluoride	2.000	<0.01	-
Nitrate (as Nitrogen)	10.000	<0.1	-
Nitrite (as Nitrogen)	1.000	<0.05	-
Cyanide	0.200	0.050	-

Note: All results expressed as mg/L unless otherwise stated. < denotes less than method detection limit (MDL).

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SUMMARY OF CONDUCRETE® SPECIFICATIONS

Physical State	Powder
Appearance	Grey
Odour	None
Dry Density	~1021 kg/m ³ (dependent on compaction)
Wet Density	~1700 kg/m ³ (hardened state)
Shrinkage	0.015% at 28 days
Compressive Strength	28 days 27.6 MPa
Permeability to Water	2.0 x 10 ⁻⁸ cm/sec
Hygroscopic Property (Water absorption)	32.4%
Resistivity (ASTM G187-05)	3.06 to 6.38 ohm cm
Electrolytic Corrosion Resistance	Eliminated (95%-100%)
High Fault Current Test Withstand	1682V/688amps for 500 ms
Environmental Impact / PH in situ	Neutral

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CONDUCRETE® INSTALLATION INSTRUCTIONS

Conducrete® is easy to install in either horizontal or vertical applications. Conducrete® can be installed dry or as a water based slurry and pumped into the trench or hole.

HORIZONTAL INSTALLATIONS

1. Dig trench to designed depth, width and length. Smooth out bottom of trench. Typically the trench is 0.5m (20") wide and 0.6m (24") deep. The length of the trench is determined by the soil resistivity at the site and the required system R value.
2. Lay copper wire in centre of trench.
3. Pour dry Conducrete® over wire. Cover the wire to 4cm (1.5") depth with Conducrete®.
4. Ensure the wire is completely immersed in Conducrete®.
5. Carefully hand shovel 10 cm (4") of loose native backfill over the Conducrete®.

Recommended # of 55lb bags/m (3.28ft) of trench using various trench dimensions

Conducrete® Maximum Thickness	0.25 M (10")	0.4 M (16")	0.5 M (20")	0.6 M (24")
0.04 m (1.5")	0.4	0.7	0.8	1.0
0.05 m (2")	0.5	0.8	1.0	1.2
0.1 m (4")	1.0	1.6	2.0	2.4
0.15 m (6")	1.5	2.4	3.1	3.7
0.2 m (8")	2.0	3.3	4.1	4.9

One (1) 55lbs bag – 0.025m

VERTICAL INSTALLATIONS

1. Drill hole to desired depth and diameter as determined by soil resistivity at the site and the required R value. The type of drill rig used is dependent on soil conditions.
2. Place conductor in middle of drilled hole.
3. Mix Conducrete® in a slurry (11.4 litres or 3 US gallons water/bag) and pump down hole from bottom to displace any mud or water as the hole fills. For shallow holes (3m/10ft) it may be possible to use the material dry.
6. Backfill remainder of the trench using native excavated material.

Recommended # of 55lb bags/m (3.28ft) of length using various hole diameters

Hole Diameter cm (in)	No. of 55lb bags/meter (3.28ft)
5 cm (2")	0.1
10 cm (4")	0.4
15 cm (6")	0.8
20 cm (8")	1.5
25 cm (10")	2.3
30 cm (12")	3.3

One (1) 55lb bag = 0.025m³ (0.865 ft³)

Sample calculation: 15 cm diameter hole, 10 m deep: #55lb bags required= 1.0 x 10=10 bags