Innovative Grounding Solutions

CONDUCRETE®

Premium Conductive Concrete

Engineering Technical Assistance
& Product Ordering
Call 877-234-2502 www.saeinc.com

Product Description

CONDUCRETE® is a premium conductive cementitious and carbonaceous material that dramatically reduces impedance and enhances the performance, reliability and longevity of grounding systems. This results in superior electrical and lightning protection for your assets.

CONDUCRETE® is sold in powder form and is available in 25 lb or 55 lb bags. It is easy to install dry directly from the bag, or mixed with water in a slurry format and pumped into the trench or hole.

CONDUCRETE® adds substantial protection to any system where low impedance grounding is required and it has been successfully utilized to enhance and protect grounding systems across many industries including the following: Electrical Utilities, Telecommunications, Broadcasting, Wind Farms, Mining, Oil and Gas, Industrial and Manufacturing, Municipal and Institutional & Military.

Summary of conducrete®'s Key Features & Benefits

1. Protects grounding systems from theft and sabotage
2. Environmentally neutral
3. Significantly extends the life of grounding systems
4. Dramatically enhances the performance of grounding systems for superior electrical and lightning protection for your assets
5. Excellent overall value

SAE Grounding Services

SAE offers the engineering, product and project expertise to provide effective, long-life grounding systems that incorporate:

- 20 years of proven, real-world experience engineering and constructing grounding systems that work
- Innovative design techniques and product technologies combining the best of leading-edge academic knowledge with extensive field experience
- An engineering design process that integrates site geography, soil characteristics and soil resistivity data with advanced computer modeling tools
- Complete installation and project management services for the deployment of electrical protection and grounding systems

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CONDUCRETE® Features & Benefits

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. The photos below show two copper samples, one bare copper and the other embedded in CONDUCRETE®. The CONDUCRETE® reduced the amount of electrolytic corrosion by 86%.
- CONDUCRETE® can extend the life of grounding systems by a factor of 10. Electrodes protected by CONDUCRETE® will last in excess of 25 years in many cases.

BEFORE | AFTER WITHOUT CONDUCRETE® DM100 | AFTER WITH CONDUCRETE® DM100

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 34% 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.

Superior Operating Performance

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

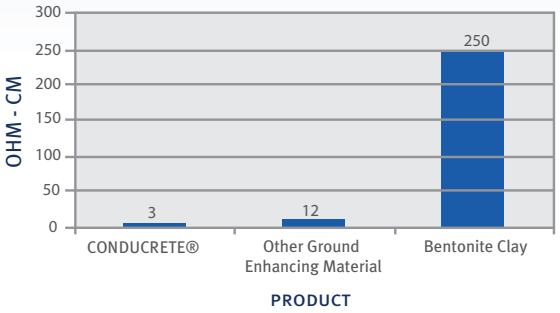
Low Impedance

- The ability to provide low impedance is critical to dissipate lightning energy quickly in order 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 (3.06 ohm-cm).
- Figure 1 illustrates that CONDUCRETE® has a resistivity of less than half of another leading brand of ground enhancing material and approximately 50 times lower than bentonite clay.

Figure 1 - **Resistivity Comparison**



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.

Technical Specifications

Conductive concrete must be environmentally neutral. It must set up in situ to from a solid and must 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 must be maintenance free and not require recharging of any kind i.e. watering, chemicals or salts. The material must have a dry resistivity of less than 10 ohm cm and an ability to reduce corrosion by at least 80%. The complete technical specifications are contained in tables below.

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

ICAP	CONDUCRETE®	Acceptable Limit
Arsenic	<0.05	2.5
Barium	0.850	100.0
Boron	0.005	500.0
Cadmium	<0.005	0.5
Chromium	0.005	5.0
Lead	<0.02	5.0
Mercury	<0.01	0.1
Selenium	<0.1	1.0
Silver	<0.005	5.0
Uranium	<0.02	10.0

Note: All results expressed as ppm unless otherwise stated
< denotes less than method detection limit (MDL)

Parameter	CONDUCRETE®	Acceptable Limit
Fluoride	0.126	150
Nitrate (NO_3-N)	<0.100	1,000 (Nitrate + Nitrite)
Nitrite (NO_2-N)	<0.100	1,000 (Nitrate + Nitrite)
Cyanide	<0.005	20

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

Summary of CONDUCRETE® Features and Benefits

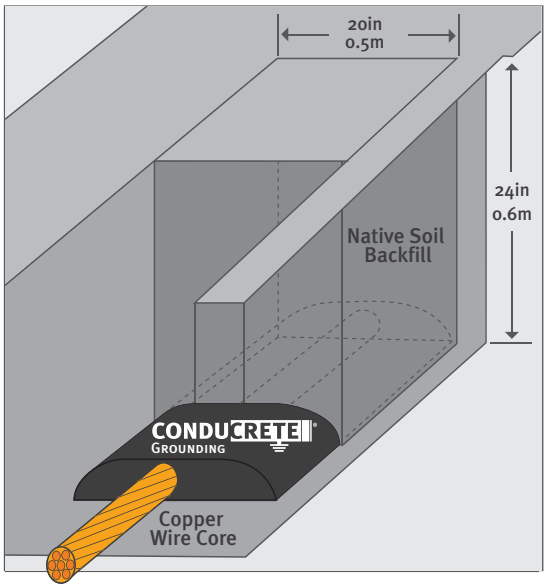
Physical State	Powder
Appearance	Dark grey
Odor	None
Dry Density	~1400 kg/m3 (dependent on compaction)
Wet Density	~1700 kg/m3 (hardened state)
Shrinkage	0.015% at 28 days
Compressive Strength	28 days 21 MPa
Permeability to Water	3.8 X 10-7 cm/sec
Hygroscopic Property (water absorption)	32.4%
Resistivity (ASTM G187-05)	3.06 to 6.38 ohm cm
Electrolytic corrosion resistance	Reduction in corrosion of 86%
High fault current test withstand	1686 V for 500 ms
Environmental Impact / PH in situ	neutral

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 0.5 m (20“) wide and 0.6 m (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 center of trench.
3. Pour dry CONDUCRETE® over wire. Cover the wire to 4 cm (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®.
6. Backfill remainder of trench using native excavated material.



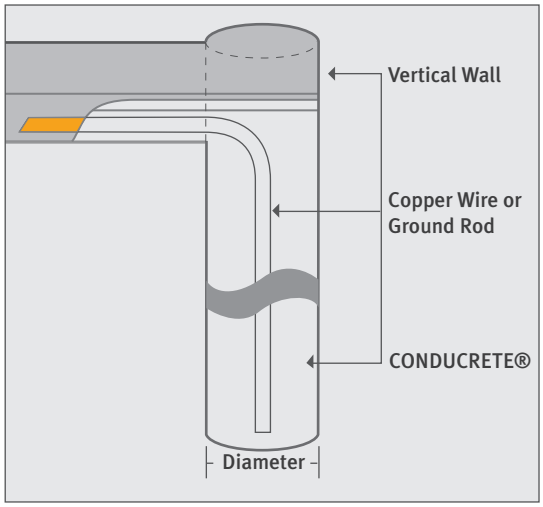
Recommended # of 55 lb bags/m (3.28 ft) of trench using various trench dimensions

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	0.6	0.8	0.9
0.05 m (2”)	0.5	0.8	1.1	1.3
0.1 m (4")	1.1	1.7	2.1	2.5
0.15 m (6")	1.6	2.5	3.2	3.8
0.2 m (8”)	2.1	3.4	4.2	5.1

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

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 (16 liters or 4.2 US gallons water/bag) and pump down hole from bottom to displace any mud or water as the hole fills. For shallow holes (3 m/10 ft) it may be possible to use the material dry.



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

Hole Diameter cm (in)	No. of 55 pd bags/meter (3.38 ft)
5 cm (2”)	0.1
10 cm (4”)	0.4
15 cm (6”)	1.0
20 cm (8”)	1.8
25 cm (10”)	2.8
30 cm (12”)	4.0

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

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