PRODUCT SPECIFICATION RESOURCE

Contains specifications and test reports for ConduFlow manufactured by SAE Inc.

ConduFlow is designed and manufactured to be a dust free conductive pourable backfill that provides corrosion protection to extend the lifetime of grounding systems and increases the surface area of the electrode.

CONDU
FLOW

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CONDU FLOW

ConduFlow Technical Specifications

Physical Properties

Property	Typical Value	Unit	Test Method
Slurry Density	1374	kg/m^3	SAE Inc. Standard 104
	1.374	g/cm^3	
	85.91	lb/ft^3	
Cured Density	1136	kg/m^3	SAE Inc. Standard 111
	1.136	g/cm^3	
	70.92	lb/ft^3	
Volume (per pail)	0.008	m^3	SAE Inc. Standard 104
	0.291	ft^3	
Water Permeability	8.3×10^{-6}	cm/sec	ASTM D5084 (2.6 psi)
Electrical Corrosion Resistance		%	SAE Inc. Standard 100
Copper	100		
Steel	100		
Galvanized Steel	99.68		
Compatibility			SAE Inc. Standard 100
Copper	Yes		
Steel	Yes		
Galvanized Steel	Yes		
Environmental Impact	Neutral		Ontario Regulation 558/00 (Leachate Testing)
Freeze-thaw Withstand	30	Years	SAE Inc. Standard 102
Physical State (Uncured)	Grey - Black Granular Solid (Part 1) White Liquid (Part 2)		
Physical State (Cured)	Black Solid		

Property	Typical Value	Unit	Test Method
Odor	None		
Working Time	10-30	minutes	
Setting Time	24	hours	
Cure Time	28	days	
Flow Rate	7805	g/minute	SAE Inc. Standard 109 (funnel with 1.5” diameter opening)

Electrical Properties

Property	Typical Value	Unit	Test Method
Resistivity	< 20	Ω·cm	SAE Inc. Standard 105
Conductivity	> 0.05	S/cm	SAE Inc. Standard 105

Published Date: May 2023

ConduFlow Freeze-Thaw Testing

1. INTRODUCTION

1.1 The behaviour of ConduFlow under freeze-thaw conditions is analyzed in this report. Due to the uniqueness of the material, a combination of studies and standards for similar materials were used to develop an appropriate test procedure. The test procedure involved the rapid freezing and thawing of samples with varying water and salt-water exposure. The samples were studied over 90 freeze-thaw cycles, which is equivalent to 30 years of freeze-thaw withstand.

1.2 The mass results of the 90 freeze-thaw cycles for the ConduFlow indicate that physically none of the samples were adversely affected by freezing. The dry and wet samples experienced fluctuations in their masses during the 90 freeze-thaw cycles, however these fluctuations were not determined to be a cause for concern since the samples only lost a few grams each from their initial conditions at the conclusion of the testing. The freshwater submerged samples and the saltwater submerged samples all experienced a sharp increase in mass over the first 10 cycles and then a slow and steady increase over the remaining 80 cycles as the samples approached constant mass. This increase in mass of the submerged samples does not indicate that the samples were adversely affected by the freeze-thaw testing since the samples followed the same trend with no major deviations. None of the samples experienced any physical deterioration in the form of cracking, or other physical damage.

1.3 The resistance results agree with the mass results that no degradation of the samples occurred. All of the samples became more conductive over the 90 freeze-thaw cycles which is a very positive result. One month after the completion of the testing most of the samples were even more conductive than they had been on the final day of testing. This indicates that the performance of ConduFlow will improve when subjected to freeze-thaw conditions.

1.4 The results of this study indicate that the ConduFlow will perform in situ for at least 30 years with no significant degradation due to freezing and thawing experienced during winter conditions.

2. TEST SETUP

2.1 Background and Development

2.1.1 The freeze-thaw stability testing of any product is a topic of great debate, resulting in varying standards and practices even for commonly tested materials such as concrete. Due to its composition, properties, and end-use ConduFlow cannot be closely compared with other materials that are tested for freeze-thaw stability or withstand. This study aims to estimate the material's freeze-thaw behaviour.

2.1.2 Most existing test methods for building materials were deemed not entirely appropriate for the testing of the ConduFlow material. "Masonry: Research, Application, and Problems" (Grogan and Conway) was used as a starting point for the development of the freeze-thaw testing of the ConduFlow material. According to Grogan and Conway, a realistic freeze-thaw test method includes subjecting samples to 90 freeze-thaw cycles, which equates to 30 years of exposure to an extreme environment. It is also suggested in the same literature that three freeze-thaw cycles is to be the equivalent of one year of natural weathering. This was also explored in buried samples.

2.2 Experimental Design

2.2.1 The largest factors in freeze-thaw behaviour include freeze-thaw rate and exposure to water. To account for the most extreme cases, samples were frozen and thawed as quickly as possible. The exposure to water was also varied. The conditions for each sample are summarized in Table 1.

Table 1: Test Conditions for ConduFlow Samples

Sample	Condition
81, 82	Dry
83, 84	Soaked in water, removed prior to freeze cycle
85, 86	Completely submerged in freshwater
87, 88	Completely submerged in saltwater

2.2.2 One freeze-thaw cycle in this study was defined as a freeze period for 16 hrs. +/- 2hrs, a thaw period for 24 hrs. +/- 2 hrs, then samples 83 and 84 were soaked in water for 5 – 7 hrs. and a new cycle began with the freeze period. Testing of these samples continued until 90 freeze-thaw cycles had been completed, roughly equating to 30 years of exposure to an extreme environment.

3. RESULTS AND ANALYSIS

3.1 Test Conditions

3.1.1 ConduFlow may face significant exposure to water in-situ. Thus, emphasis is placed on the material's ability to withstand freezing and thawing conditions in water. Samples 81 through 88 were half-disc samples of the ConduFlow material, with approximately 2.0'' radius and 1.0'' thickness. The initial measurements of each sample are described in Table 2.

Table 2: Initial Measurements of ConduFlow Samples

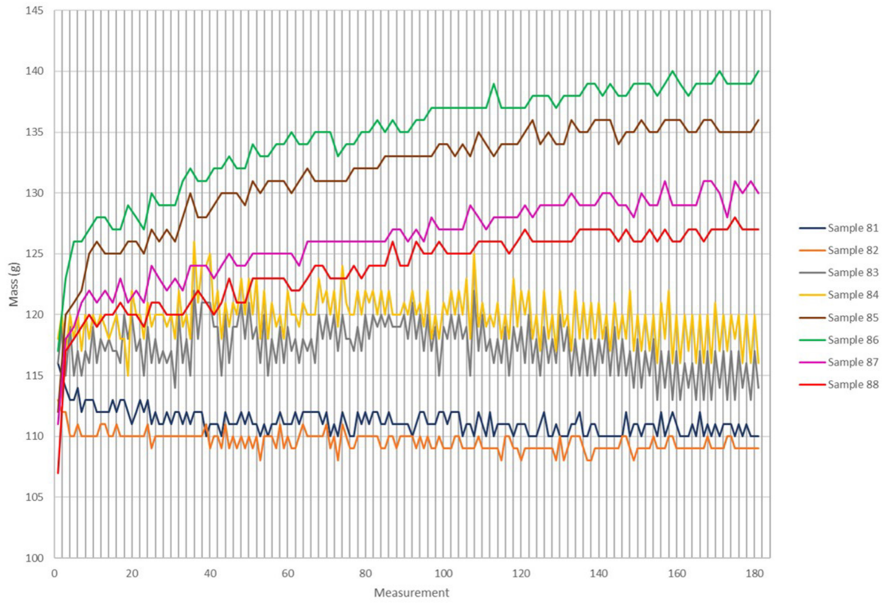
Sample	Date	Temperature (°C)	Resistance (Ω)	Mass (g)	System Mass* (g)
81	Apr 6, 2018	22.5	3.3	116	-
82	Apr 6, 2018	22.1	3.3	113	-
83	Apr 6, 2018	21.7	3.0	116	-
84	Apr 6, 2018	21.7	3.2	118	-
85	Apr 6, 2018	21.7	3.5	112	851
86	Apr 6, 2018	21.7	3.2	117	851
87	Apr 6, 2018	21.4	3.3	111	831
88	Apr 6, 2018	21.4	3.1	107	831

*System mass is defined as the combined mass of the samples, water, and container.

3.1.2 The test procedure was followed immediately after initial measurements were taken. The measurements were taken during each freeze or thaw period and the results were analyzed at the 90-cycle mark.

3.2 Changes in Mass Over 90 Freeze-Thaw Cycles

Figure 1: Changes in Mass of ConduFlow Over 90 Freeze-Thaw Cycles



3.2.1 The physical condition of the sample serves as the best indicator of freeze-thaw stability. Ideally, no changes to the appearance of the material should be observed. Cracking and other physical damage should not be observed. The mass of the samples may be used as another indicator of freeze-thaw stability; large deviations from the original mass of the sample signal material instability. Finally, the samples should not experience extreme deviations in resistance readings. Note that the vertical lines in Figure 3.2.1 above indicate data obtained during a freeze period, and the spaces between the vertical lines indicate thaw periods.

3.2.2 For the dry samples (81 and 82), the mass decreased for the first 20 cycles, then remained relatively constant for the remaining 70 cycles. There were small fluctuations in the mass, however these fluctuations were small and were likely due to the inherent scale error, which is accurate to +/- 1 g. The data for these samples indicates that both samples have lost a small amount of mass over the 90 cycles, however this loss in mass is only 6 g for sample 81 and 4 g for sample 82, this is a 5.2% loss in mass for sample 81 and a 3.5% loss in mass for sample 82. This indicates that the samples were not adversely affected by the freeze-thaw testing since the loss of mass is minor.

3.2.3 For the wet samples (83 and 84), the mass generally increased when measured after a freeze cycle, since these samples are soaked in water prior to freezing, this indicates that water is absorbed. During the thaw periods the samples expel the water and lose some of the water mass they gained. There were a few periods when both samples experienced no change in mass between freeze and thaw cycles which indicated that no water was absorbed or expelled by the samples at this time. Over the course of the 90 cycles the wet samples lost a small amount of mass, 2 g or 1.7% for both samples. The small decrease in the mass of the samples does not indicate that the samples were adversely affected by the freeze-thaw testing since there were no significant deviations from the trend.

3.2.4 The two samples submerged in freshwater (85 and 86), demonstrated a sharp increase in mass as the samples absorbed water for the first 10 cycles. During the remaining 80 cycles the samples still demonstrated an increase in mass as the samples absorbed water however the rate of water absorption had significantly decreased, the samples appeared to be approaching constant mass. These samples can only be measured during thaw cycles since they are frozen in their containers during freeze cycles. The increase in the mass of the submerged samples does not indicate that the samples were adversely affected by the freeze-thaw testing since there were no significant deviations from the trend. Both of the samples had absorbed a similar amount of water after the 90 cycles. Sample 85 had increased in mass by 24 g or 21.4% and sample 86 had increased in mass by 23 g or 19.7%.

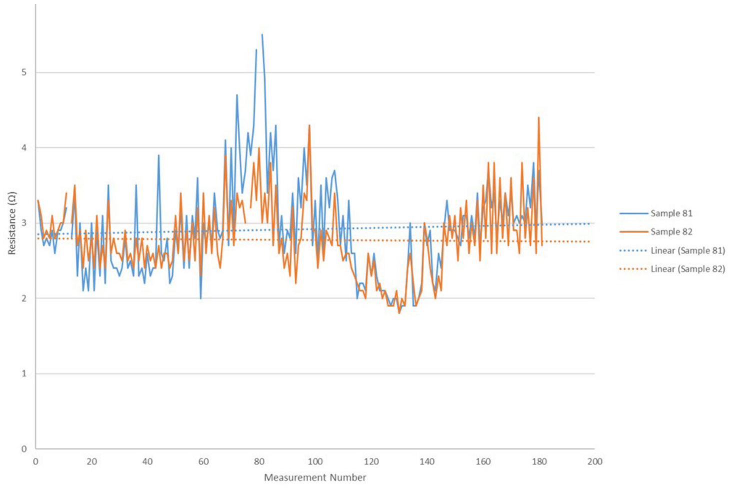
3.2.5 The two samples submerged in saltwater (87 and 88), also demonstrate a sharp increase in mass as the samples absorbed water for the first 10 cycles. During the remaining 80 cycles the samples still demonstrated an increase in mass as the samples absorbed water however the rate of water absorption had significantly decreased, the samples appeared to be approaching constant mass. These samples were also only measured during thaw cycles since they were frozen in their containers during freeze cycles. The increase in mass of the samples does not indicate that the samples were adversely affect by the freeze-thaw testing since there were no significant deviations from the trend. Both of the samples had absorbed a similar amount of water after the 90 cycles. Sample 87 had increased in mass by 19 g or 17.1% and sample 88 had increased in mass by 20 g or 18.7%.

3.2.6 None of the samples in this study experienced any change in the appearance of the material after 90 freeze-thaw cycles. No cracking or other physical damage to the samples was observed.

3.2.7 One month after testing of the ConduFlow samples was completed the samples were analyzed. The dry samples, 81 and 82, had experienced no change from the values recorded on the final day of testing. Sample 81 was 6 g or 5.2% less than its initial mass, and sample 82 was 4 g or 3.5% less than its initial mass. The wet samples, 83 and 84, had experienced a loss in mass from the value recorded on the final day of testing. Sample 83 was 6 g or 5.2% less than its initial mass. Sample 84 was 5 g or 4.2% less than its initial mass. All of the submerged samples, freshwater and saltwater, had lost all of the water mass they absorbed during testing and were lower than their initial masses. Sample 85 was 6 g or 5.4% less than its initial mass, sample 86 was 7 g or 6.0% less than its initial mass. Sample 87 was 5 g or 4.5% less than its initial mass, and sample 88 was 3 g or 2.8% less than its initial mass.

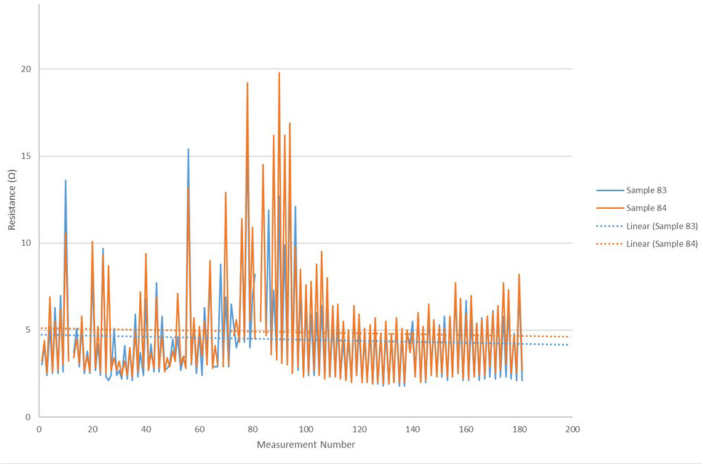
3.3 Resistance Measurements Over 90 Freeze-Thaw Cycles

Figure 2: Resistance Trends of the Dry ConduFlow Samples



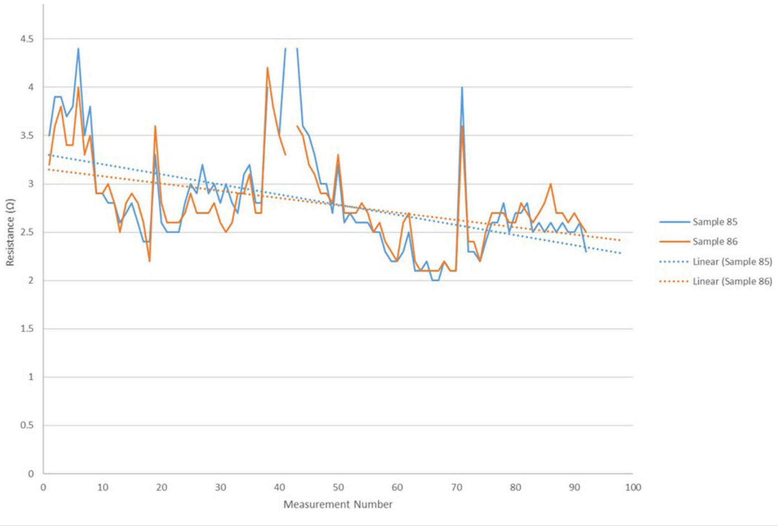
3.3.1 Both dry ConduFlow samples demonstrated very similar resistance trends. There were fluctuations between the resistances of the samples when measured during a freeze cycle or a thaw cycle. In general, both dry ConduFlow samples were more resistive when frozen and less resistive when thawed. After 90 cycles the resistance of both dry ConduFlow samples had decreased in resistance slightly from their initial values, sample 81 had decreased by 0.3 ohms and sample 82 had decreased by 0.6 ohms. This is a very positive result, indicating that the performance of the samples is not negatively affected and actually improves when subjected to freeze-thaw conditions. The less resistive the samples are the easier the flow of electrons through the material to ground. One month after testing of the samples was complete the resistance was checked. Sample 81 was 0.2 ohms less than the initial value and sample 82 was 0.5 ohms less than the initial values.

Figure 3: Resistance Trends of the Wet ConduFlow Samples



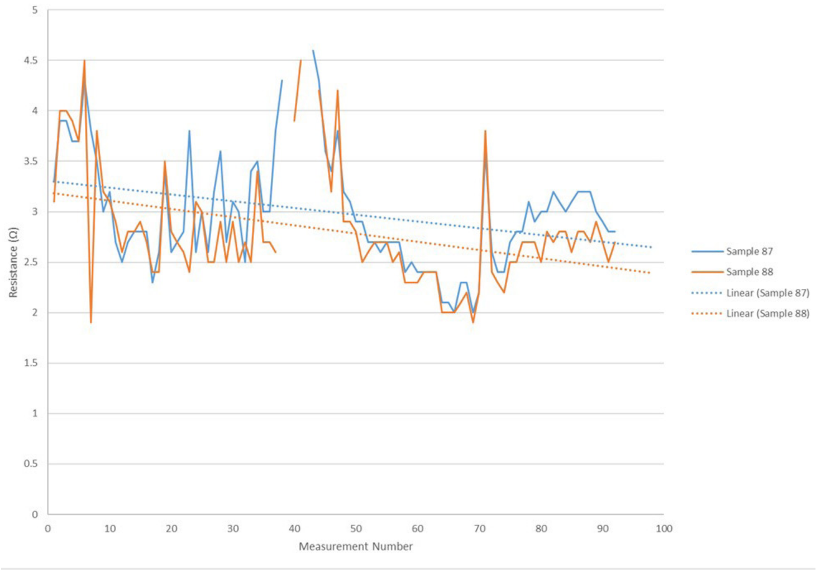
3.3.2 Both wet ConduFlow samples demonstrated similar resistance trends. There were fluctuations between the resistances of the samples when measured during a freeze cycle or a thaw cycle. In general, both wet ConduFlow samples were more resistive when frozen and less resistive when thawed. After 90 cycles the resistance of both wet ConduFlow samples had decreased from their initial resistance values, sample 83 had decreased by 0.9 ohms and sample 84 had decreased by 0.5 ohms. This is a very positive result, indicating that the performance of the samples was not negatively affected, and actually improves when subjected to freeze-thaw conditions. The less resistive the samples are the easier the flow of electrons through the material to ground. One month after testing of the samples was complete the resistance was checked. Both samples were now 0.7 ohms lower than their initial resistance values. The resistance of sample 83 had increased slightly, by 0.2 ohms, from the final testing value and the resistance of sample 84 had decreased slightly, by 0.2 ohms, from the final testing value.

Figure 4: Resistance Trends of the Submerged Freshwater ConduFlow Samples



3.3.3 Both ConduFlow samples submerged in freshwater demonstrated fairly similar resistance trends. The values shown in Figure 3.3.3 above are the resistance readings taken during the thaw cycles, the samples were frozen in their containers during the freeze cycles and the resistances could not be measured. The samples showed a fairly steady decrease in resistance over the course of the 90 cycles with only a few spikes in resistance. After 90 cycles the resistance of sample 85 submerged in freshwater had decreased by 1.2 ohms, and the resistance of sample 86 submerged in freshwater had decreased by 0.7 ohms. This is a very positive result, indicating that the performance of the samples is not negatively affected, and actually improves when subjected to freeze-thaw conditions. The less resistive the samples are the easier the flow of electrons through the material to ground. One month after testing of the samples was complete the resistance was checked. Sample 85 had decreased in resistance by an additional 0.4 ohms and was 1.6 ohms less than the initial value. Sample 86 had decreased in resistance by an additional 0.6 ohms and was 1.3 ohms less than the initial value.

Figure 5: Resistance Trends of the Submerged Saltwater ConduFlow Samples



3.3.4 Both ConduFlow samples submerged in saltwater demonstrated fairly similar resistance trends. The values shown in Figure 3.3.4 above are the resistance readings taken during the thaw cycles, the samples were frozen in their containers during the freeze cycles and the resistances could not be measured. The samples showed a fairly steady decrease in resistance over the course of the 90 cycles with a few spikes in resistance. After 90 cycles the resistance of sample 87 submerged in saltwater had decreased by 0.5 ohms, and the resistance of sample 88 submerged in saltwater had decreased by 0.4 ohms. This is a very positive result, indicating that the performance of the samples is not negatively affected, and actually improves when subjected to freeze-thaw conditions. The less resistive the samples are the easier the flow of electrons through the material to ground. One month after testing of the samples was complete the resistance was checked. Sample 87 had decreased in resistance by an additional 0.6 ohms and was 1.1 ohms less than the initial value. Sample 88 had decreased in resistance by an additional 0.8 ohms and was 1.2 ohms less than the initial value.

4. CONCLUSIONS

4.1 The results of the 90 freeze-thaw cycles when analyzing the changes in mass of the samples indicate that none of the samples were adversely affected by freezing. The dry samples and the wet samples all experienced minor fluctuations in their masses during the 90 freeze-thaw cycles, however these fluctuations were not determined to be a cause for concern since the samples only lost a few grams each from their initial conditions at the completion of the testing. The freshwater submerged samples and the saltwater submerged samples all experienced a relatively steady increase in mass as the samples absorbed water. This increase in mass of the submerged samples does not indicate that the samples were adversely affected by the freeze-thaw testing since the samples followed the same trend with no major deviations. Also, one month after testing was completed all of the submerged samples had only lost a few grams from their initial values. None of the samples experienced any physical deterioration in the form of cracking, or other physical damage.

4.2 The resistance results agree with the mass results that no degradation of the samples occurred. All of the samples became more conductive over the 90 freeze/thaw cycles which is a very positive result. One month after the completion of the testing most of the samples were even more conductive than they had been on the final day of testing. This indicates that the performance of ConduFlow will improve when subjected to freeze-thaw conditions.

4.3 The results of this study strongly indicate that the ConduFlow will perform in situ for at least 30 years with no significant degradation due to freezing and thawing experienced during winter conditions.

Published Date: October 2022

Resistance of Encased Copper in ConduFlow to Electrolytic Corrosion

1. INTRODUCTION

1.1 SAE Inc. has developed ConduFlow, a product which can be used as a dust free alternative backfill to ConduCrete. ConduFlow is a pourable conductive backfill used for utility pole installations. It solidifies and provides corrosion resistance and strength. ConduFlow can also be used as backfill for the installations of ground rods and with tower guy anchor rods.

1.2 In order to determine the effectiveness of ConduFlow compared to ConduCrete, the following experiment measuring the electrolytic corrosion resistance of copper when encased in ConduFlow was conducted.

2. TEST SETUP

2.1 Two rectangular copper strips (approximately 3" x ¾") were weighed using an electronic balance and connected to insulated wire. One of the strips was left bare and the other was encased in a cylinder of ConduFlow. The cylinder was allowed to cure for 4 weeks prior to the start of the experiment. Each sample was placed in a 5 US gallon pail and surrounded with topsoil. A length of steel rebar was placed in each container approximately six inches from the copper. One litre of water and 20 g of sodium sulfate was added to each of the containers. The pair of samples was connected in series in a DC circuit and energized by a 30 V power supply to ensure equal current load across each sample. The power source was set to supply 3 mA for the duration of the experiment. Water was added to the samples on a regular bases to ensure the soil was moist. The resistance data was recorded throughout the experiment.

3. RESULTS AND ANALYSIS

3.1 The resistance data was recorded throughout the experiment and can be seen below in Table 1.

Table 1: Resistance Data for the ConduFlow Experiment

Date	Voltage (V)	Current (A)	Circuit Resistance (Ω)
Jan 16, 2019	1.53	0.003	510.00
Jan 17, 2019	2.15	0.003	716.67
Jan 18, 2019	2.33	0.003	776.67
Jan 21, 2019	2.67	0.003	890.00
Jan 22, 2019	2.56	0.003	853.33
Jan 23, 2019	2.56	0.003	853.33
Jan 24, 2019	2.59	0.003	863.33
Jan 25, 2019	2.63	0.003	876.67
Jan 28, 2019	9.86	0.003	3286.67
Jan 29, 2019	30	0.001	30000.00
Jan 30, 2019	30	0.001	30000.00
Jan 31, 2019	30	0.001	30000.00
Feb 1, 2019	30	0.001	30000.00
Feb 4, 2019	30	0.001	30000.00
Feb 5, 2019	30	0.001	30000.00
Feb 6, 2019	30	0.001	30000.00
Feb 7, 2019	30	0.001	30000.00
Feb 8, 2019	30	0.001	30000.00
Feb 11, 2019	30	0.001	30000.00
Feb 12, 2019	30	0.001	30000.00
Feb 13, 2019	30	0.001	30000.00
Feb 14, 2019	30	0.001	30000.00
Feb 15, 2019	30	0.001	30000.00

3.2 After thirty days, the experiment was completed and both samples were removed from the soil for analysis. As seen in Figures 1 and 2 all of the copper directly in contact with the soil was consumed. The copper sample encased in the ConduFlow was removed from the cylinder for examination. Images of the copper encased in ConduFlow before and after the experiment can be seen in Figures 3, 4 and 5. The copper encased in the ConduFlow appeared unaffected from the electrolysis. This result was verified by weighing each piece of copper using an electronic balance. The copper sample directly in contact with soil lost 62.18% of its mass during the 30-day test running at 3 mA, whereas the ConduFlow encased copper sample experienced no loss in mass. The gain in mass for Copper #2 is a result of the residual solder used to connect the copper to the wire that was unable to be removed. The top piece of Copper #2 is separated from the bottom as a result of removing it from the ConduFlow cylinder.

Table 2: Summary of Loss of Copper Mass

Sample	Initial Mass (g)	Final Mass (g)	Mass Difference (g)	Percentage Loss (%)
Copper #1 (Bare)	1.56	0.59	- 0.97	- 62.18
Copper #2 (ConduFlow)	1.56	1.76	+ 0.20	+ 12.82

Figure 1: Copper #1, Before Experiment

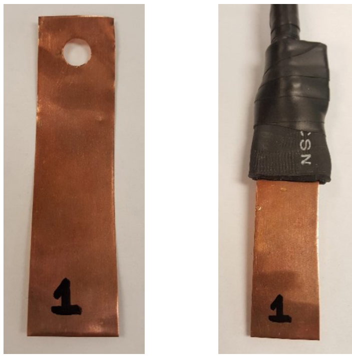


Figure 2: Copper #1, After Experiment

Figure 3: Copper #2, Before Experiment

Figure 4: Copper #2 Encased in ConduFlow Before (left) and After (right) Experiment

Figure 5: Copper #2 After (right) Experiment

4. CONCLUSIONS

4.1 As seen in Table 2 above, the bare copper sample experienced complete consumption of copper directly in contact with the soil. Copper #1 experienced a 62.18% loss in mass. The shrink tube protected the top portion of Copper #1 from direct contact with the soil which is why only 62.18% of the sample was consumed, this was the entirety of the sample in contact with the soil. Copper #2 encased in the ConduFlow cylinder was unaffected by the electrolysis process and lost no copper mass. The copper sample actually experienced a gain in mass due to the residual solder, used to connect the copper to the wire, which was unable to be removed from the sample. These results are similar to previous experimentation with ConduCrete and demonstrate that ConduFlow effectively prevents the corrosion of buried copper.

Published Date: October 2022

Resistance of Encased Steel and Galvanized Steel in ConduFlow to Electrolytic Corrosion

1. INTRODUCTION

1.1 SAE Inc. has developed ConduFlow, a product which can be used as a dust free alternative backfill to ConduCrete. ConduFlow is a pourable conductive backfill used for utility pole installations. It solidifies and provides corrosion resistance and strength. ConduFlow can also be used as backfill for the installations of ground rods, and with tower guy anchor rods.

1.2 In order to determine the effectiveness of ConduFlow as a backfill, the following experiment measuring the electrolytic corrosion resistance of steel and galvanized steel when encased in ConduFlow was conducted.

2. TEST SETUP

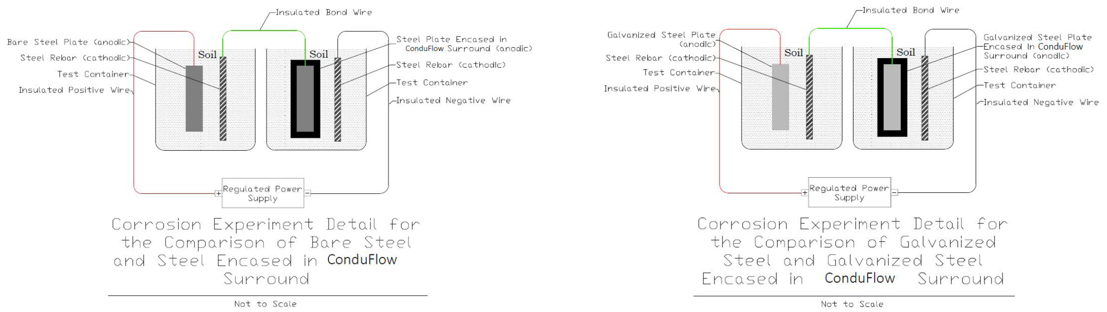
2.1 Four rectangular pieces of steel (approximately. 2" x ¾") were cut using an angle grinder and weighed using an electronic balance. A ¼" hole was drilled into each sample. Two coats of Rustoleum Cold Galvanizing Compound were applied to two of the samples, numbered 7 and 10. These samples were Hot Dip Galvanized at Supreme Galvanizing in Burlington so Rustoleum Cold Galvanizing Compound was only applied to the edges of the samples that had been cut with the angle grinder. Samples 1 and 4 were left ungalvanized. Lengths of Dual Insulated Wire (HMWPE and Kynar) were attached to each sample by soldering the wire to the steel samples. Rectifier leads were soldered to the end of the samples with no surround material, numbered 1 and 4. Samples 1 and 7 were left bare in the soil, while samples 4 and 10 were encased in ConduFlow. The samples were allowed to cure for 4 weeks prior to the start of the experiment. Each of the samples were placed in pails and surrounded with a mixture of top soil and sand. A length of steel rebar was placed in each container approximately six inches from the anode. One liter of water and twenty grams of sodium sulfate was added to each container. Each pair of samples was connected in a series circuit to an individual channel of a 30 V rectifier, to ensure an equal current load.

Figure 1: Bare Steel #1 (left) and Galvanized Steel #7 (right), Before Experiment

2.2 As seen in Figure 1 sample 1 had begun to corrode prior to the start of the experiment simply due to exposure to the air.

2.3 The power source was set to provide 3 mA throughout the duration of the test. A schematic of the layouts can be seen below in Figure 2. Two hundred and fifty milliliters of water was added to each pail twice a week to ensure that the soil remained moist. Voltage and current readings were taken throughout the experiment. All samples were removed from the soil after thirty days, cleaned, and weighed using an electronic balance.

Figure 2: Schematics of the Circuit Configuration for Each Sample



3. RESULTS AND ANALYSIS

3.1 The resistance data was recorded throughout the experiment and can be seen below in Tables 1 and 2.

Table 1: Resistance Data for the Galvanized Steel Samples

Date	Voltage (V)	Current (A)	Circuit Resistance (Ω)
Oct 16, 2018	42.79	0.001	42790.00
Oct 17, 2018	6.428	0.003	2142.67
Oct 18, 2018	7.714	0.003	2571.33

Date	Voltage (V)	Current (A)	Circuit Resistance (Ω)
Oct 19, 2018	8.248	0.003	2749.33
Oct 22, 2018	8.602	0.003	2867.33
Oct 24, 2018	8.701	0.003	2900.33
Oct 25, 2018	8.823	0.003	2941.00
Oct 26, 2018	8.879	0.003	2959.67
Oct 29, 2018	9.000	0.003	3000.00
Oct 30, 2018	8.795	0.003	2931.67
Oct 31, 2018	8.825	0.003	2941.67
Nov 1, 2018	8.865	0.003	2955.00
Nov 2, 2018	8.989	0.003	2996.33
Nov 5, 2018	8.992	0.003	2997.33
Nov 6, 2018	8.561	0.003	2853.67
Nov 7, 2018	8.617	0.003	2872.33
Nov 8, 2018	8.752	0.003	2917.33
Nov 9, 2018	8.877	0.003	2959.00
Nov 12, 2018	7.909	0.003	2636.33
Nov 13, 2018	8.654	0.003	2884.67
Nov 14, 2018	8.911	0.003	2970.33
Nov 15, 2018	9.093	0.003	3031.00

Table 2: Resistance Data for the Bare Steel Samples

Date	Voltage (V)	Current (A)	Circuit Resistance (Ω)
Oct 16, 2018	12.69	0.003	4230.00
Oct 17, 2018	10.99	0.003	3663.33
Oct 18, 2018	10.76	0.003	3586.67
Oct 19, 2018	10.51	0.003	3503.33
Oct 22, 2018	9.10	0.003	3003.33
Oct 24, 2018	8.57	0.003	2856.67
Oct 25, 2018	8.57	0.003	2856.67
Oct 26, 2018	8.75	0.003	2916.67
Oct 29, 2018	8.59	0.003	2863.33

Date	Voltage (V)	Current (A)	Circuit Resistance (Ω)
Oct 30, 2018	8.68	0.003	2893.33
Oct 31, 2018	8.62	0.003	2873.33
Nov 1, 2018	8.58	0.003	2860.00
Nov 2, 2018	8.41	0.003	2803.33
Nov 5, 2018	7.98	0.003	2660.00
Nov 6, 2018	7.73	0.003	2576.67
Nov 7, 2018	7.65	0.003	2550.00
Nov 8, 2018	7.56	0.003	2520.00
Nov 9, 2018	7.61	0.003	2536.67
Nov 12, 2018	5.47	0.003	2156.67
Nov 13, 2018	7.23	0.003	2410.00
Nov 14, 2018	7.33	0.003	2443.33
Nov 15, 2018	7.42	0.003	2473.33

3.2 After thirty days the experiment was completed and the samples were removed from the soil for analysis. The samples were cleaned and weighed using an electronic balance. As shown in Table 3 and Figure 3 both the bare steel sample in soil, sample #1, and the galvanized steel sample in soil, sample #7, had experienced significant corrosion and consumption of steel. The galvanized steel sample in soil, sample #7, had actually corroded almost twice as much as the bare steel sample #1. This is likely due to the rapid consumption of the zinc layer as it sacrificed itself to protect the steel underneath. In comparison as shown in Table 3 and Figure 4 the bare steel and galvanized steel samples encased in ConduFlow, samples #4 and #10 respectively, experienced negligible changes in mass and there was little to no visible corrosion on the samples.

Table 3: Percentage of Mass Consumed from Each Sample

Sample	Initial Mass (g)	Final Mass (g)	Mass Difference (g)	Percentage Loss (%)
Bare Steel #1 (Soil)	20.67	19.07	- 1.60	- 7.74
Bare Steel #4 (ConduFlow)	21.51	21.51	0	0
Galvanized Steel #7 (Soil)	24.99	21.02	- 3.97	- 15.89
Galvanized Steel #10 (ConduFlow)	24.64	24.56	- 0.08	- 0.32

Figure 3: Uncoated Samples, Bare Steel #1 (left) and Galvanized Steel #7 (right), After Experiment

Figure 4: ConduFlow Encased Samples, Bare Steel #4 (left) and Galvanized Steel #10 (right), After Experiment

4. CONCLUSIONS

4.1 This experiment compared the consumption rates of bare and galvanized steel in damp soil at low current to the consumption rates of bare and galvanized steel encased in ConduFlow backfill in damp soil at low current. The bare and galvanized steel samples that were in direct contact with the damp soil both experienced a fairly significant loss in mass at the completion of the test. The bare steel in direct contact with the damp soil had a consumption of 7.74% of the sample and the galvanized steel in direct contact with the damp soil had a consumption of 15.89%. In comparison the bare and galvanized steel samples encased in ConduFlow both experienced negligible loss in mass at the completion of the test. The bare steel sample encased in ConduFlow had no consumption and the galvanized steel sample encased in ConduFlow had a consumption of 0.32%. Therefore, this experiment demonstrates that using ConduFlow backfill effectively reduces the rate of corrosion of both bare and galvanized steel in buried grounding applications.

Published Date: October 2022

ConduFlow Permeability Testing

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084 | Constant Volume

Sample Name	ConduFlow
Type	Tube
Permeant Fluid	De-aired distilled water
Orientation	Vertical
Sample Preparation	Placed into permeameter at as received density and moisture content
Assumed Specific Gravity	1.25

Parameter	Initial	Final	Unit
Height	6.97	6.97	inches
Diameter	3.97	3.97	inches
Area	12.4	12.4	inches^2
Volume	86.3	86.3	inches^3
Mass	1390	1670	grams
Bulk Density	61.3	73.6	pcf
Moisture Content	4.4	25.5	%
Dry Density	58.6	58.6	pcf
Degree of Saturation	17	97	%

B Coefficient Determination

Cell Pressure, psi	90.79	Increased Cell Pressure, psi	95.51	Cell Pressure Increment, psi	4.72
Sample Pressure, psi	88.38	Corresponding Sample Pressure, psi	90.96	Sample Pressure Increment, psi	2.58
				B Coefficient	0.55

B value did not increase with increase in pressure. Final degree of saturation > 95%.

Flow Data

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K, @ 20°C, cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
Mar 8 2017	1	90.8	88.4	7.0	4.0	3.0	31	5.0	8.8E-06	19.9	1.003	8.8E-06
Mar 8 2017	2	90.8	88.4	7.0	4.0	3.0	33	5.0	8.4E-06	19.9	1.003	8.4E-06
Mar 8 2017	3	90.8	88.4	7.0	4.0	3.0	35	5.0	4.6E-06	19.9	1.003	4.6E-06
Mar 8 2017	4	90.8	88.4	7.0	4.0	3.0	36	5.0	7.8E-06	19.9	1.003	7.8E-06

PERMEABILITY AT 20° C: 8.3 x 10^{-6} cm/sec (@ 2.6 psi effective stress)

These results are the summary of results generated from testing conducted by GeoTesting Express located in Acton, MA. Testing was performed from March 7, 2017 to March 13, 2017.

Published Date: October 2022

ConduFlow Leachate Data

ConduFlow is environmentally neutral. It sets within 24 hours of installation so it does not leach, dissolve or migrate into the soil or water. A table of toxicity characteristic leaching procedure (TCLP) results for ConduFlow is included below. ConduFlow was tested using EPA Method 6020A (SW-846). TCLP is a soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill. Because the testing methodology is used to determine if a waste is characteristically hazardous, similar conditions are not expected in a typical groundwater environment, and the results overestimate the amount of leaching that would occur.

The TCLP results are compared to the Maximum Contaminant Level (MCL) established by the U.S. Environmental Protection Agency (USEPA) for each constituent in the table below. The MCL is the highest level of a contaminant that is allowed in drinking water. For those constituents detected in the leachate, none exceeded US EPA regulatory standards for drinking water. Additionally, because of TCLP conditions, these constituents would not be expected to present a risk for migration in a typical groundwater environment.

Constituent	ConduFlow TCLP Concentration (mg/L)	USEPA Maximum Contaminant Level (mg/L)
Arsenic	BDL	0.010
Barium	0.246	2.000
Boron	0.130	2.000*
Cadmium	BDL	0.005
Chromium	0.026	0.100
Lead	BDL	0.015
Mercury	BDL	0.002
Selenium	BDL	0.050
Silver	BDL	0.100**
Uranium	BDL	0.030

Constituent	ConduFlow TCLP Concentration (mg/L)	USEPA Maximum Contaminant Level (mg/L)
Fluoride	0.376	2.000**
Nitrate (as Nitrogen)	BDL	10.000
Nitrite (as Nitrogen)	BDL	1.000
Cyanide	BDL	0.200

BDL means the result is “Below the Detection Level” of the analytical procedure
* No MCL established; value shown is USEPA’s Lifetime Drinking Water Health Advisory
** No MCL established; value shown is USEPA’s Secondary Drinking Water Standard

Published Date: October 2022

SAFETY DATA SHEET

SECTION 1 | PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Identifier	Two-Part ConduFlow Kit
Synonyms	ConduFlow
Product Description	Solidifying Conductive Pourable Backfill
Recommended Use	Electrical Grounding
Issue Date	February 17, 2022
Total Pages	16 (incl cover page, ConduFlow, Part 1, and ConduFlow, Part 2)

COMPANY IDENTIFICATION

Supplier

SAE Inc
691 Bayview Drive
Barrie, Ontario, Canada L4N 9A5
+1 705 733 3307
www.saeinc.com

This product is a kit or a multipart product which consists of multiple, independently packaged components. A Safety Data Sheet (SDS) for each of these components is included. Please do not separate the component documents from this cover page.

DISCLAIMER

This safety data sheet is believed to provide a useful summary of the hazards of Two-Part ConduFlow Kit as it is commonly used but cannot anticipate and provide all the information that might be needed in every situation. It relates specifically to the product designated and may not be valid for the product when used within any other materials or products in a particular process.

The information provided herein was believed by SAE Inc. to be accurate at the time of preparation or prepared from sources believed to be reliable. However, no representation, warranty or guarantee, express or implied, is made as to its accuracy, reliability or completeness. It is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of product and to determine the suitability of the product for its intended use. We do not accept responsibility for any loss or damage which may occur from the use of this information.

SAFETY DATA SHEET

SECTION 1 | PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Identifier	ConduFlow, Part 1
Product Description	Conductive Carbonaceous Material Containing Curing Agent
Recommended Use	Electrical Grounding

COMPANY IDENTIFICATION

Supplier	SAE Inc 691 Bayview Drive Barrie, Ontario, Canada L4N 9A5 +1 705 733 3307 www.saeinc.com

SECTION 2 | HAZARDS IDENTIFICATION

2.1 CLASSIFICATION OF THE MIXTURE

Skin Irritation Cat. 2; H315
Eye Damage Cat. 1; H318
Specific Target Organ Toxicity, Single Exposure, Cat. 3; H335

LABELLING

Symbols

Signal Word

Warning

Hazard Statements

H315: Causes skin irritation
H318: Causes serious eye damage
H335: May cause respiratory irritation

Precautionary Statements

Prevention

P260: Do not breathe dusts
P264: Wash hands thoroughly after handling
P270: Do not eat, drink, or smoke when using this product
P271: Use only outdoors or in a well-ventilated area
P280: Wear protective gloves, protective clothing and eye protection

Response

P302 + P352:	IF ON SKIN: Wash with plenty of water.
P332 + P313:	If skin irritation occurs: Get medical advice / attention.

P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340:	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P402:	Store in a dry place.
P501:	Recycle and/or dispose of contents / containers in accordance with Local, State / Provincial / Territorial and Federal regulations.

SECTION 3 | COMPOSITION / INFORMATION ON INGREDIENTS

3.1 MIXTURE

Chemical Name	CAS No.	Wt. %	GHS Classification
Calcined Petroleum Coke	64743-05-1	90-99	Not classified
Portland Cement	65997-15-1	1-5	Eye damage 1: H318 / STOT SE 3: H335

SECTION 4 | FIRST AID MEASURES

4.1 EYE

Do not rub eyes. Immediately flush eyes with running water for several minutes while forcing eyelids open during flushing. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation persists or if concerned seek medical attention. Take care not to rinse contaminated water into the unaffected eye or onto face.

4.2 SKIN

Wash affected areas with non-abrasive pH neutral soap and lukewarm running water and remove contaminated clothing. Launder contaminated clothing before reuse.

4.3 INHALATION

If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Seek medical help if coughing or other symptoms persist.

4.4 INGESTION

Rinse mouth. Do NOT induce vomiting. Get medical attention if symptoms occur. If large amounts were ingested seek medical attention.

4.5 MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Dust may cause eye and respiratory tract irritation. May be abrasive and mildly irritating to the skin.

SECTION 5 | FIRE FIGHTING MEASURES

5.1 FLASH POINT

Carbonic matter: May burn if exposed to temperature above 1290 °F (700 °C)

5.2 SUITABLE EXTINGUISHING MEDIA

Use extinguishing media appropriate to the surrounding fire conditions. Water Spray, Dry Chemical, Foam, or Carbon Dioxide.

5.3 SPECIAL HAZARDS

This material may burn but will not ignite easily. Products of combustion may contain carbon monoxide, carbon dioxide and sulfur oxides. Whenever possible, the burning product in a confined storage space should be removed and the material drenched in an open area to extinguish fire. Firefighters must wear full protective equipment including self-contained breathing apparatus with chemical protection clothing when exposed to decomposition products.

5.4 EXPLOSION DATA

Powders and dusts may cause an explosion hazard under certain conditions: these conditions are unlikely during normal use.

SECTION 6 | ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Do not get in eyes, on skin, or on clothing. Wear adequate personal protective equipment, including an appropriate respirator as indicated in Section 8 if there is a risk of exposure to dust at levels exceeding the exposure limits.

6.2 ENVIRONMENTAL PRECAUTIONS

Avoid waste releases to the environment and prevent material from entering sewers, natural waterways or storm water management systems.

6.3 METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP

Wear protective eyewear, gloves and clothing. Refer to Section 8. Avoid dust generation and prevent wind dispersal. Materials can be picked up by sweeping, shoveling or vacuuming. Vacuum dust with equipment fitted with a HEPA filter and place in a closed labelled waste container.

6.4 REFERENCE TO OTHER SECTIONS

See Section 8 for information on selection of personal protective equipment. See Section 13 for information on disposal of spilled product and contaminated absorbents.

SECTION 7 | HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING

Avoid contact with skin, eyes and clothing. Wash thoroughly after handling. Follow good hygiene procedures when handling chemical materials. Wear protective gloves, protective clothing, and eye protection. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances. Do not breathe dusts. Use only outdoors or in a well-ventilated area.

7.2 CONDITIONS FOR SAFE STORAGE

Store in a dry, well-ventilated area, away from incompatible materials, such as strong oxidizing agents; other strong oxidants. Keep containers closed. Protect from moisture / humidity and from damage or water. Do not store near food and beverages or smoking materials.

SECTION 8 | EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 CONTROL PARAMETERS

Occupational Exposure Limits

Ingredient	ACGIH TLV (8-hr. TWA)	U.S. OSHA PEL (8-hr. TWA)	Ontario (Canada) TWA
Calcined Petroleum Coke	10 mg/m³ (total dust) 3 mg/m³ (respirable)	15 mg/m³ (total dust) 5 mg/m³ (respirable)	Refer to ACGIH TLV
Portland Cement (respirable)*	1 mg/m³	15 mg/m³ (total dust) 5 mg/m³ (respirable)	Refer to ACGIH TLV

* value for particulate matter containing no asbestos and less than 1% crystalline silica

8.2 OTHER EXPOSURE LIMITS

Ingredient	NIOSH REL	NIOSH IDLH (Immediately Dangerous to Life or Health)
Portland Cement	10 mg/m³	5000 mg/m³

8.3 EXPOSURE CONTROLS

8.3.1 Engineering Controls

Handle in accordance with good industrial hygiene and safety practice. Ensure regular cleaning of equipment, work area and clothing. If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal protective equipment including approved respiratory protection.

8.3.2 Personal Protection

Workers must comply with the Personal Protective Equipment requirements of the workplace in which this product is handled.

8.3.3 Eye / Face Protection

Wear approved safety glasses with side-shields or chemical safety goggles. The use of contact lenses is not recommended.

8.3.4 Skin Protection

Wear chemical protective gloves, suit, and boots to prevent skin exposure. Avoid skin contact with used gloves. Select glove material impermeable and resistant to the substance.

8.3.5 Respiratory Protection

Not required under normal conditions of use. Approved respiratory protective equipment (RPE) is required if other controls are unable to maintain occupational exposure below the legislated limits. An approved respirator, NIOSH N95 rating or higher, must be available in case of accidental releases. Proper respiratory selection should be determined by adequately trained personnel and based on the contaminant(s), the degree of potential exposure and published respirator protection factors. A respiratory protection program that meets the regulatory requirement, such as OSHA's 29 CFR 1910.134, ANSI Z88.2 or Canadian Standards Association (CSA) Standard Z94.4, must be followed whenever workplace conditions warrant a respirator's use.

8.3.6 Other Protection

Have a safety shower and eyewash station readily available in the work area.
Every attempt should be made to avoid skin and eye contact. Do not get powder inside boots, shoes, or gloves.
Do not eat, drink, or smoke where this material is handled, stored and processed. Wash hands thoroughly before eating, drinking, and smoking. Remove contaminated clothing and protective equipment before entering eating areas.

SECTION 9 | PHYSICAL / CHEMICAL PROPERTIES

9.1 INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Granular solid; black or grey powder
Odor	Odorless
Odor Threshold	Not applicable
pH	Not applicable
Melting Point / Freezing Point	Not applicable
Initial Boiling Point and Boiling Range	Not applicable
Flash Point	Not applicable
Flammability	Not flammable or combustible
Auto-ignition temperature	>1292 °F, >700 °C
Upper / Lower Flammability or Explosive Limits	Not applicable
Explosive Properties	Not applicable
Oxidizing Properties	Not applicable
Sensitivity to Mechanical Impact	Not applicable
Sensitivity to Static Discharge	Not applicable
Vapor Pressure	Not applicable
Vapor Density	Not applicable
Relative Density	0.72-1.28
Solubility	Slightly soluble in water
Partition Coefficient (n-octanol / water)	Not applicable
Decomposition Temperature	>2400 ° F, >1316 °C
Viscosity	Not applicable

SECTION 10 | STABILITY AND REACTIVITY

10.1 REACTIVITY

Reacts slowly with water forming hydrated compounds, releasing heat and forming an alkaline solution.

10.2 CHEMICAL STABILITY

This product is stable in a closed container under normal conditions of storage and use.

10.3 POSSIBILITY OF HAZARDOUS REACTIONS

Aqueous solutions are alkaline and may corrode aluminum.

10.4 CONDITIONS TO AVOID

Avoid unintentional contact with water / moisture and with strong acids, strong oxidizing agents and other incompatible materials. Avoid generation of dust. Avoid extreme heat and open flames. May burn if exposed to temperature above 1290 °F (700 °C).

10.5 INCOMPATIBLE MATERIALS

Oxidants	Incompatible with strong oxidizing agents
Strong Acids	Incompatible with strong acids; may react vigorously
Water	Reaction generates heat
Aluminum	Calcium oxide is corrosive to aluminum metal
	May react with Ammonium salts

10.6 HAZARDOUS DECOMPOSITION PRODUCTS

In the event of a fire, products of combustion may include carbon monoxide, carbon dioxide, various hydrocarbons, and smoke. There are no hazardous decomposition products during recommended handling and storage.

SECTION 11 | TOXICOLOGICAL INFORMATION

11.1 LIKELY ROUTES OF EXPOSURE

Eye and skin contact. Inhalation of dust.

11.2 ACUTE TOXICITY DATA

Data not available for the mixture.

11.2.1 Skin Corrosion / Irritation

May cause skin irritation. May be irritating to mouth, throat and gastro-intestinal tract.

11.2.2 Serious Eye Damage / Irritation

Based on information for Portland cement: Causes serious eye damage and possible blindness. Damage may be permanent if treatment is not immediate.

11.2.3 Specific Target Organ Toxicity Single Exposure

Possible mechanical irritation of the respiratory tract, may aggravate pre-existing respiratory conditions.

11.3 CHRONIC TOXICITY

11.3.1 Specific Target Organ Toxicity Repeated Exposure

Repeated overexposure to any dusts may result in irritation of the respiratory tract, pneumoconiosis (dust congested lungs), pneumonitis (lung inflammation), coughing, and shortness of breath.

11.3.2 Respiratory and/or Skin Sensitization

Not known to be a respiratory or skin sensitizer.

11.3.3 Germ Cell Mutagenicity

Not available.

11.3.4 Reproductive Effects

Not available.

11.3.5 Developmental Effects

Not available.

11.3.6 Carcinogenicity

Calcined petroleum coke and Portland cement have not been identified as human carcinogens.

SECTION 12 | ECOLOGICAL INFORMATION

12.1 ECOTOXICITY

The environmental hazard of the product is considered to be limited.

12.2 PERSISTENCE AND DEGRADABILITY

High persistence in soil as degradation is not expected to be a significant fate in organisms or the environment.

12.3 BIOACCUMULATION POTENTIAL

Low bioaccumulation potential as negligible water solubility restricts route of exposure to the aquatic environment.

12.4 MOBILITY IN SOIL

Mobility is insignificant due to negligible water solubility and vapor pressure. May incorporate within soil for extended periods of time.

12.5 OTHER ADVERSE EFFECTS

None known.

SECTION 13 | DISPOSAL CONSIDERATIONS

13.1 WASTE DISPOSAL

Reuse or recycle material and containers whenever possible to minimize the generation of waste. All Local, State / Provincial / Territorial, and Federal regulations regarding health and pollution must be followed for disposal.

13.2 CONTAMINATED PACKAGING

Since emptied containers may retain product residue, follow label warnings even after container is emptied.

SECTION 14 | TRANSPORT INFORMATION

This product is not classified as a Hazardous Material under U.S. DOT or Canadian TDG regulations. This material is not classified as dangerous under ADR, RID, ADNR, IMDG and IATA regulations.

SECTION 15 | REGULATORY INFORMATION

SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS / LEGISLATION SPECIFIC FOR THE SUBSTANCE OR MIXTURE

15.1 USA

15.1.1 TSCA Status

Substances are listed on the TSCA inventory or are exempt.

15.1.2 California Proposition 65

None of the components are listed on the California Proposition 65 list.

15.1.3 OSHA HazCom 2012 Hazards

Eye Damage Cat. 1

Specific Target Organ Toxicity, Single Exposure, Cat. 3

15.2 CANADA

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the SDS contains all the information required by the *Controlled Products Regulations*.

15.2.1 WHMIS 1988 Classification

E - Corrosive

15.2.2 NSNR Status

Substances are listed on the DSL or are exempt

SECTION 16 | OTHER INFORMATION

16.1 REVISION DATE

February 16, 2022

16.2 ADDITIONAL INFORMATION

This safety data sheet is believed to provide a useful summary of the hazards of ConduFlow, Part 1 as it is commonly used but cannot anticipate and provide all the information that might be needed in every situation. It relates specifically to the product designated and may not be valid for the product when used within any other materials or products or in a particular process.

The information provided herein was believed by SAE Inc. to be accurate at the time of preparation or prepared from sources believed to be reliable. However, no representation, warranty or guarantee, express or implied, is made as to its accuracy, reliability or completeness. It is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of product and to determine the suitability of the product for its intended use. We do not accept responsibility for any loss or damage which may occur from the use of this information.

SAFETY DATA SHEET

SECTION 1 | PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Identifier	ConduFlow, Part 2
Product Description	Polymeric Binder
Recommended Use	Electrical Grounding

COMPANY IDENTIFICATION

Supplier

SAE Inc
691 Bayview Drive
Barrie, Ontario, Canada L4N 9A5
+1 705 733 3307
www.saeinc.com

SECTION 2 | HAZARDS IDENTIFICATION

2.1 CLASSIFICATION OF THE MIXTURE

Not classified for physical or health hazards under GHS.

LABELLING

Symbols
None

Signal Word
None

Hazard Statements
Not applicable

Precautionary Statements
Observe good industrial hygiene practices
P264: Wash hands thoroughly after handling
P281: Use personal protective equipment as required

Trade Secret
A trade secret is being claimed for specific chemical identity and exact percentages

SECTION 3 | COMPOSITION / INFORMATION ON INGREDIENTS

3.1 MIXTURE

Chemical Name	CAS No.	Wt. %
Proprietary Styrene Butadiene Polymer	00000-00-0	35-45

Chemical Name	CAS No.	Wt. %
Deionized Water	7732-18-5	35-45
Propylene Glycol	57-55-6	1-8
Non-Hazardous Components are Proprietary		

SECTION 4 | FIRST AID MEASURES

4.1 EYE

Protect unexposed eye. Immediately flush eye with running water for a minimum of 15 minutes by the clock while forcing eyelids open during flushing. Remove contact lenses, if present, and easy to do. Continue rinsing. If eye irritation persists or you are concerned, seek medical attention.

4.2 SKIN

Wash hands and exposed skin with soap and plenty of water. Seek medical attention if irritation persists or concerned.

4.3 INHALATION

No significant irritation expected. If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. If problems persist, seek medical attention.

4.4 INGESTION

Rinse mouth thoroughly. Do NOT induce vomiting. Immediately give water. Never give anything by mouth to an unconscious person. Seek medical attention if irritation persists or concerned.

4.5 MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Irritation, headache, nausea, shortness of breath.

4.6 INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.

SECTION 5 | FIRE FIGHTING MEASURES

5.1 SUITABLE EXTINGUISHING MEDIA

Use Water, Dry Chemical, Chemical Foam, Carbon Dioxide, or Alcohol Resistant Foam.

5.2 UNSUITABLE EXTINGUISHING MEDIA

None known.

5.3 SPECIAL HAZARDS

None known.

5.4 ADVICE FOR FIREFIGHTERS

5.4.1 Protective Equipment

Wear protective eyewear, gloves, and clothing. Refer to Section 8. Wear chemical protective clothing and positive pressure self-contained breathing apparatus (SCBA).

5.4.2 Additional Information (Precautions)

Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

SECTION 6 | ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Ensure adequate ventilation. Ensure that air-handling systems are operational.

6.2 ENVIRONMENTAL PRECAUTIONS

Should not be released into environment. Prevent from reaching drains, sewer, or waterway.

6.3 METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP

Wear protective eyewear, gloves, and clothing. Refer to Section 8. Dike spill and containerize for disposal, use appropriate absorbent (sand, earth or vermiculite, etc). Material is not toxic and can be picked up by sweeping or shoveling. Refer to Section 13.

6.4 REFERENCE TO OTHER SECTIONS

See Section 8 for information on selection of personal protective equipment. See Section 13 for information on disposal of spilled product and contaminated absorbents.

SECTION 7 | HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING

Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling. Follow good hygiene procedures when handling chemical materials. Wear protective gloves, protective clothing and eye protection. Refer to Section 8. Follow proper disposal methods. Refer to Section 13. Do not eat, drink, smoke, or use personal products when handling chemical substances.

7.2 CONDITIONS FOR SAFE STORAGE

Store in a cool location in a corrosive resistant container. Keep away from food and beverages. Protect from freezing and physical damage. Keep container tightly sealed. Store away from incompatible materials such as strong oxidizing agents. Ideal storage temperature is 10-30 °C. Do not allow the product to freeze.

SECTION 8 | EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 CONTROL PARAMETERS

No applicable occupational exposure limits.

8.2 EXPOSURE CONTROLS

8.2.1 Engineering Controls

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Ensure adequate ventilation, especially in confined areas.

8.2.2 Personal Protection

Workers must comply with the Personal Protective Equipment requirements of the workplace in which this product is handled.

8.2.3 Eye / Face Protection

Wear approved safety glasses with side-shields or chemical safety goggles.

8.2.4 Skin Protection

Wear chemical protective gloves, and protective clothing to prevent skin exposure. Avoid skin contact with used gloves. Select glove material impermeable and resistant to the substance.

8.2.5 Respiratory Protection

Not required under normal conditions of use. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle type respirator with N100 respirator cartridges as a backup to engineering controls. When necessary, use a NIOSH approved breathing equipment.

8.2.6 General Hygienic Measures

Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing. Do not eat, drink, or smoke in work areas.

SECTION 9 | PHYSICAL / CHEMICAL PROPERTIES

9.1 INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Liquid, white
Odor	Slight, sweet
Odor Threshold	Not determined
pH	7-11.8
Melting Point / Freezing Point	Approximately 32 °F, 0 °C
Initial Boiling Point and Boiling Range	212 °F, 100 °C at 17mm Hg
Flash Point	Not determined
Flammability	Not determined
Auto-ignition temperature	Not determined
Upper / Lower Flammability or Explosive Limits	Not determined
Explosive Properties	Not applicable
Oxidizing Properties	Not applicable
Sensitivity to Mechanical Impact	Not applicable
Sensitivity to Static Discharge	Not applicable
Vapor Pressure	Not applicable
Vapor Density	< 1
Relative Density	No data
Solubility	Miscible
Partition Coefficient (n-octanol / water)	Not applicable
Decomposition Temperature	>350 °F, >177 °C
Viscosity	Not applicable
Density	1.00-1.03
Recommended Storage Temperature	34-120 °F, 1.0-49 °C

SECTION 10 | STABILITY AND REACTIVITY

10.1 REACTIVITY

Non-reactive under normal conditions.

10.2 CHEMICAL STABILITY

Stable under normal conditions.

10.3 POSSIBILITY OF HAZARDOUS REACTIONS

None under normal processing.

10.4 CONDITIONS TO AVOID

Incompatible materials.

10.5 INCOMPATIBLE MATERIALS

Strong oxidizing agents

10.6 HAZARDOUS DECOMPOSITION PRODUCTS

Carbon oxides.

SECTION 11 | TOXICOLOGICAL INFORMATION

11.1 ACUTE TOXICITY DATA

No additional information

11.2 CHRONIC TOXICITY

No additional information

11.2.1 Corrosion Irritation

No additional information

11.2.2 Sensitization

No additional information

11.2.3 Single Target Organ (STOT)

No additional information

11.2.4 Numerical Measures

No additional information

11.2.5 Reproductive Toxicity

No additional information

11.2.6 Carcinogenicity

No additional information

SECTION 12 | ECOLOGICAL INFORMATION

12.1 TOXICITY

Non-toxic.

12.2 PERSISTENCE AND DEGRADABILITY

Not available

12.3 BIOACCUMULATION POTENTIAL

Not expected to bio-accumulate in environment.

12.4 MOBILITY IN SOIL

Not available.

12.5 OTHER ADVERSE EFFECTS

No other adverse environmental effects are expected.

SECTION 13 | DISPOSAL CONSIDERATIONS

13.1 WASTE DISPOSAL

Reuse or recycle packaging whenever possible to minimize the generation of waste. All Local, State / Provincial / Territorial and Federal regulations regarding health and pollution must be followed for disposal. Avoid dispersal of spilled material and runoff, and contact with soil, waterways, drains and sewers.

SECTION 14 | TRANSPORT INFORMATION

14.1 UN NUMBER

Not regulated.

14.2 UN PROPER SHIPPING NAME

Not regulated.

14.3 TRANSPORT HAZARD CLASS(ES)

Not applicable.

14.4 PACKING GROUP

Not regulated.

14.5 ENVIRONMENTAL HAZARDS

Not available.

14.6 SPECIAL PRECAUTIONS FOR USER

Not available.

14.7 U.S. HAZARDOUS MATERIALS REGULATION (DOT 49CFR)

Not regulated.

14.8 CANADA TRANSPORTATION OF DANGEROUS GOODS (TDG)

Not regulated.

SECTION 15 | REGULATORY INFORMATION

SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS / LEGISLATION SPECIFIC FOR THE SUBSTANCE OR MIXTURE

15.1 USA

15.1.1 TSCA Status

Substances are listed on the TSCA inventory or are exempt.

15.1.2 California Proposition 65

None of the components are listed on the California Proposition 65 list.

15.2 CANADA

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the SDS contains all the information required by the *Controlled Products Regulations*.

15.2.1 NSNR Status

Substances are listed on the DSL or are exempt

SECTION 16 | OTHER INFORMATION

16.1 REVISION DATE

February 16, 2022

16.2 ADDITIONAL INFORMATION

This safety data sheet is believed to provide a useful summary of the hazards of ConduFlow, Part 2 as it is commonly used but cannot anticipate and provide all the information that might be needed in every situation. It relates specifically to the product designated and may not be valid for the product when used within any other materials or products or in a particular process.

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