# PRODUCT SPECIFICATION RESOURCE

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

ConduForm is designed and manufactured to bond and protect grounding conductors in exposed rock environments, eliminating safety hazards associated with multi-use corridors and significantly improving grounding system performance where traditional methods are dangerous and ineffective.


CONDU FORM

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SAE

# CONDU FORM

# ConduForm Technical Specifications

## Physical Properties

| Property | Typical Value | Unit | Test Method |
|---|---|---|---|
| Slurry Density | 1075<br>1.075<br>67.11 | $kg/m^3$<br>$g/cm^3$<br>$lb/ft^3$ | SAE Inc. Standard 104 |
| Volume (per pail) | 0.010<br>0.371 | $m^3$<br>$ft^3$ | SAE Inc. Standard 104 |
| Water Permeability | $6.5 \times 10^{-6}$ | cm/sec | ASTM D5084 (2.6 psi) |
| Electrical Corrosion Resistance<br>Copper<br>Steel<br>Galvanized Steel | <br>100<br>99.87<br>98.51 | % | SAE Inc. Standard 100 |
| Compatibility<br>Copper<br>Steel<br>Galvanized Steel | <br>Yes<br>Yes<br>Yes | | SAE Inc. Standard 100 |
| Environmental Impact | Neutral | | Ontario Regulation 558/00 (Leachate Testing) |
| Freeze-thaw Withstand | 30 | Years | SAE Inc. Standard 102 |
| Physical State (Kit Components) | Black Granular Solid (Part 1)<br><br>White Liquid (Part 2) | | |
| Physical State (Cured) | Black Solid | | |
| Odor | None | | |
| Working Time | 10-30 | minutes | |
| Setting Time | 3 | hours | |
| Cure Time | 28 | days | |

## 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

# ConduForm Freeze-Thaw Testing

## 1. INTRODUCTION

1.1 The behaviour of the ConduForm material 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 ConduForm indicate that physically 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 were determined not to be a cause for concern since the samples are all within 3 g of the initial mass conditions for the dry samples and within 6 g of the initial mass conditions for the wet samples. 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.

1.3 The resistance results of the ConduForm 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. Any spikes in the resistance of the dry and wet samples were during freeze measurements and the resistance always dropped during the subsequent thaw measurement. An increase in the conductivity of the ConduForm samples after freeze-thaw testing is a very positive outcome and indicates that ConduForm improves as freeze-thaw cycling occurs.

1.4 Both the mass and resistance results strongly indicate that the ConduForm will continue to perform in situ for at least 30 years with no 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 ConduForm 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 ConduForm 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 ConduForm 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 ConduForm Samples

| Sample | Condition |
|---|---|
| 17, 18 | Dry |
| 19, 20 | Soaked in water, removed prior to freeze cycle |
| 21, 22 | Completely submerged in freshwater |
| 23, 24 | 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 19 and 20 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

3.11 ConduForm is expected to 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 17 through 24 were half-disc samples of the ConduForm 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 ConduForm Samples

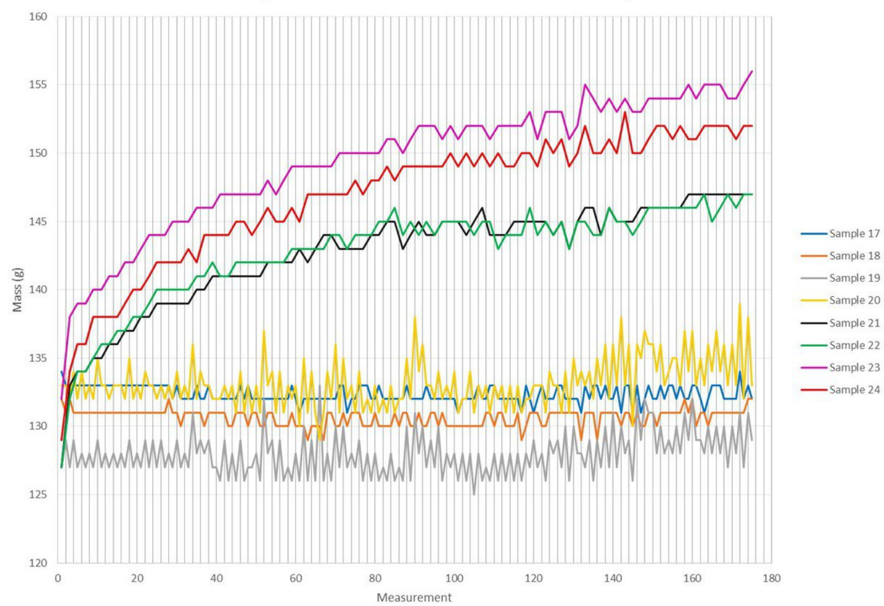
| Sample | Date | Temperature (°C) | Resistance (Ω) | Mass (g) | System Mass* (g) |
|---|---|---|---|---|---|
| 17 | Aug29,2017 | 19.1 | 4.2 | 134 | - |
| 18 | Aug29,2017 | 19.1 | 3.9 | 132 | - |
| 19 | Aug29,2017 | 18.9 | 3.8 | 127 | - |
| 20 | Aug29,2017 | 18.8 | 3.8 | 133 | - |
| 21 | Aug29,2017 | 18.9 | 3.8 | 127 | 827 |
| 22 | Aug29,2017 | 18.8 | 3.9 | 127 | 827 |
| 23 | Aug29,2017 | 19.0 | 3.8 | 132 | 836 |
| 24 | Aug29,2017 | 19.0 | 3.6 | 129 | 836 |

*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 ConduForm 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,

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the samples should not experience extreme deviations in resistance readings. Note that the vertical lines in Figure 1 above indicate data obtained during a freeze period, and the spaces between the vertical lines indicate thaw periods.

322 For the dry samples (17 and 18), the mass did fluctuate on occasion, 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 sample 17 experienced a small loss of mass over the 90 cycles of 2 g or 1.5%. Sample 18 did not experience any loss of mass over the 90 cycles. These results indicate that both samples are not adversely affected by freezing.

323 For the wet samples (19 and 20), the mass generally increased when measured after a freeze cycle, since these samples are soaked in water prior to freezing this indicates that some water is absorbed. The samples expelled the water and returned to approximately their initial mass or lower during thaw periods. There were 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. Sample 19 experienced a small gain in mass over the 90 days of 2 g or 1.6%. Sample 20 experienced no change in mass over the 90 cycles. These results indicate that both samples are not adversely affected by freezing.

324 The two samples submerged in freshwater (21 and 22), demonstrate a relatively steady increase in mass as the samples absorbed water for the first 30 cycles. During the remaining 60 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 the same amount of water after the 90 cycles. Both sample 21 and sample 22 had increased in mass by 20 g or 16%.

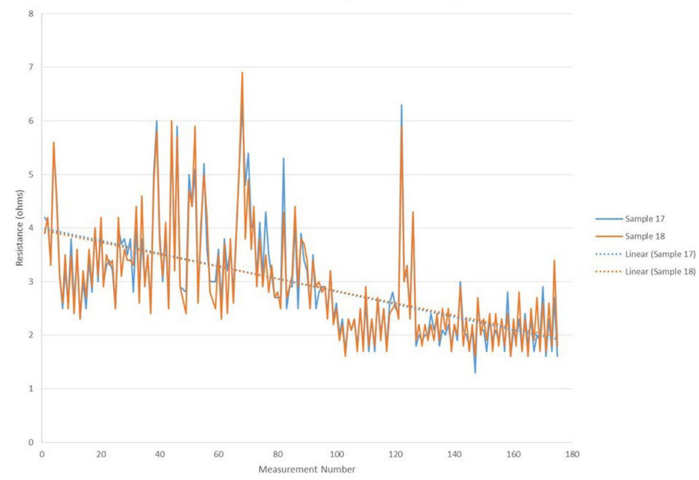
325 The two samples submerged in saltwater (23 and 24), also demonstrate a relatively steady increase in mass as the samples absorbed water for the first 30 cycles. During the remaining 60 cycles the samples still demonstrated an increase in mass as the samples absorbed water however the rate of water 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 23 had increased in mass by 24 g or 18% and sample 24 had increased in mass by 23 g or 18%.

326 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.

Three months after testing of the ConduForm samples was completed the samples were analyzed.
327 The dry samples, 17 and 18, had experienced only negligible changes in mass from their initial values. Both samples were 2 g or 1.5% less than their initial mass. The wet samples, 19 and 20, had also experienced only negligible changes in mass from their initial values. Sample 19 had lost the water mass absorbed during the testing and was 1 g or 0.8% lighter than its initial mass. Sample 20 was 3 g or 2.2% less than its initial mass. All of the submerged samples, freshwater and saltwater, had lost all of the water mass they absorbed during the testing and were slightly lower than their initial mass. Sample 21 was 2 g or 1.6% less than its initial mass, sample 22 was 1 g or 0.8% less than its initial mass. Sample 23 was 1 g or 0.8% less than its initial mass, sample 24 was 2 g or 1.6% less than its initial mass.

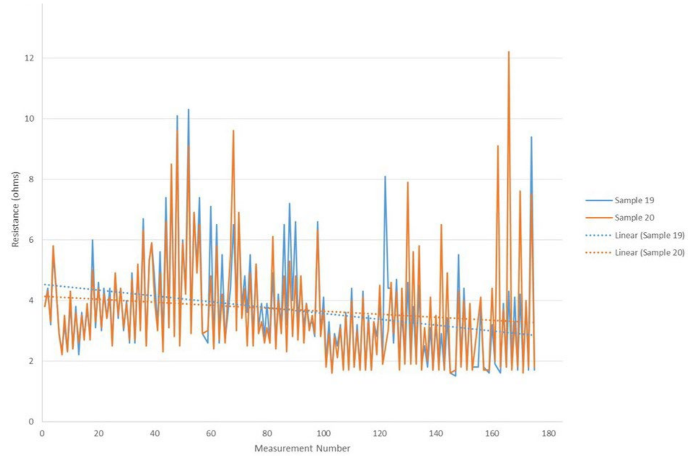
## 3.3 Resistance Measurements Over 90 Freeze-Thaw Cycles

Figure 2: Resistance Trends of the Dry ConduForm Samples



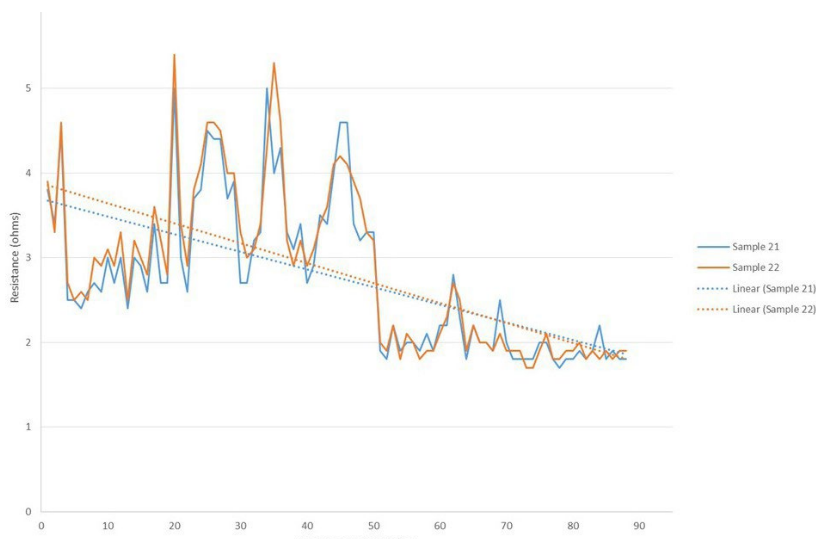

3.3.1 Both dry ConduForm samples demonstrated very similar resistance trends. There were fluctuations between the resistances of the samples when measured during a freeze cycle or a thaw cycle. In general, both dry ConduForm samples were more resistive when frozen and less resistive when thawed. After 90 cycles the resistance of both dry ConduForm samples had decreased by approximately 2.4 ohms from the initial value. This is a very positive result, indicating that the performance of the samples improved when subjected to the freeze-thaw conditions. The less resistive the samples are, the easier the electrons flow through the material to ground. Three months after testing of the samples was complete the resistance was checked. Both samples were still at approximately 2.4 ohms lower than their initial resistance values.

Figure 3: Resistance Trends of the Wet ConduForm Samples



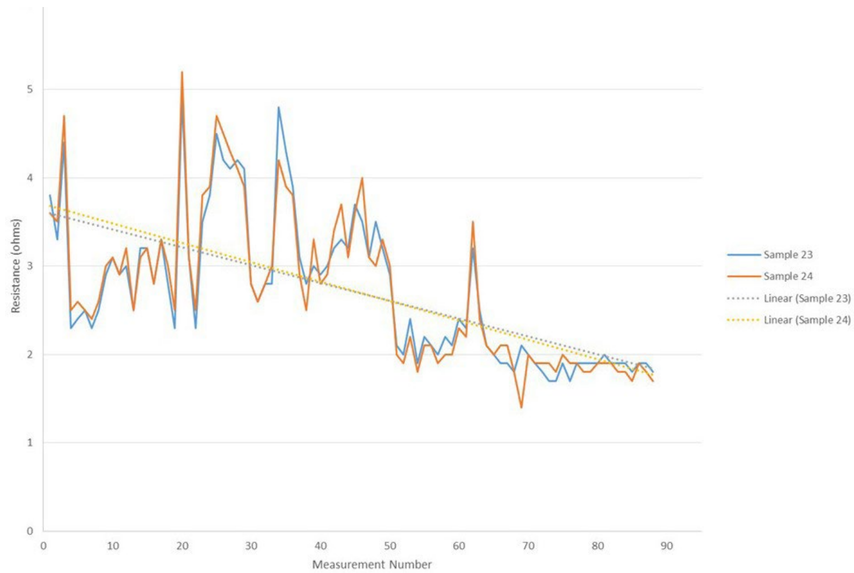

3.3.2 Both wet ConduForm samples demonstrated very similar resistance trends. There were fluctuations between the resistances of the samples when measured during a freeze cycle or a thaw cycle. In general, both wet ConduForm samples were more resistive when frozen and less resistive when thawed. After 90 cycles the resistance of both wet ConduForm samples had decreased by approximately 2.0 ohms. This is a very positive result, indicating that the performance of the samples improved when subjected to the freeze-thaw conditions. The more conductive the samples are, the easier the electrons flow through the material to ground. Three months after testing of the samples was complete the resistance was checked. Both samples were slightly less resistive then they were after the 90 cycles were completed, both samples had decreased by another 0.4 ohms for a total decrease in resistance of 2.4 ohms from the initial resistance values.

Figure 4: Resistance Trends of the Submerged Freshwater ConduForm Samples



3.3.3 Both ConduForm samples submerged in freshwater demonstrated fairly similar resistance trends. The values shown in Figure 4 above are the resistance readings taken during the thaw cycles, the samples were frozen in their containers during the freeze cycles and the resistance could not be measured. There were fluctuations in the resistances of the samples however all of the measured values are within +/- 3 ohms of the initial resistance value. After 90 cycles the resistance of both ConduForm samples submerged in freshwater had decreased by approximately 2.0 ohms from the initial resistance values. This is a very positive result, indicating that the performance of the samples improved when subjected to the freeze-thaw conditions. The more conductive the samples are, the easier the electrons flow through the material to ground. Three months after testing of the samples was complete the resistance was checked. Both samples were slightly less resistive then they were after the 90 cycles were completed, both samples had decreased by another 0.4 ohms for a total decrease in resistance of 2.4 ohms from the initial resistance values.

Figure 5: Resistance Trends of the Submerged Saltwater ConduForm Samples




3.3.4 Both ConduForm samples submerged in saltwater demonstrated fairly similar resistance trends. The values shown in Figure 5 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. There were fluctuations in the resistances of the samples however all of the measured values are within +/- 3 ohms of the initial resistance value. After 90 cycles the resistance of both ConduForm samples submerged in saltwater had decreased by approximately 2.0 ohms from the initial resistance values. This is a very positive result, indicating that the performance of the samples improved when subjected to the freeze-thaw conditions. The more conductive the samples are, the easier the electrons flow through the material to ground. Three months after testing of the samples was complete the resistance was checked. Both samples were slightly less resistive then they were after the 90 cycles were completed, both samples had decreased by another 0.4 ohms for a total decrease in resistance of 2.4 ohms from the initial resistance values.

## 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 were determined not to be a cause for concern since the samples are all within 3 g of the initial mass conditions for the dry samples and within 6 g of the initial mass conditions for the wet samples. 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 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 than their initial resistance values over the 90 freeze/thaw cycles which is a very positive result. This indicates that the performance of the ConduForm will actually improve when subjected to freeze-thaw conditions.

4.3 The results of this study strongly indicate that the ConduForm 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 ConduForm to Electrolytic Corrosion

## 1. INTRODUCTION

1.1 SAE Inc. has developed ConduForm, a low slump, formable product that sets up within three hours of installation and forms a strong bond to the native material. ConduForm is designed for applications where overburden is shallow or non-existent. It provides superior corrosion and theft protection and can be installed on exposed rock surfaces to protect conductors and improve grounding where trenching is not possible.

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

## 2. TEST SETUP

2.1 Four 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 ConduForm. The cylinder was allowed to cure for three weeks prior to the start of the experiment. Each sample was placed in the center of 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 twenty grams of sodium sulfate was added to each container. The pair of samples was connected in series in a DC circuit and energized by a 60 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 basis to ensure that 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 ConduForm Experiment

| Date | Voltage (V) | Current (A) | Circuit Resistance (Ω) |
|---|---|---|---|
| Nov 11, 2016 | 3.56 | 0.003 | 1186.667 |
| Nov 14, 2016 | 5.08 | 0.003 | 1693.333 |
| Nov 15, 2016 | 4.63 | 0.003 | 1543.333 |
| Nov 17, 2016 | 5.29 | 0.003 | 1763.333 |
| Nov 18, 2016 | 4.85 | 0.003 | 1616.667 |
| Nov 21, 2016 | 6.16 | 0.003 | 2053.333 |
| Nov 22, 2016 | 6.27 | 0.003 | 2090.000 |
| Nov 23, 2016 | 5.21 | 0.003 | 1736.667 |
| Nov 24, 2016 | 4.96 | 0.003 | 1653.333 |
| Nov 25, 2016 | 4.86 | 0.003 | 1620.000 |
| Nov 28, 2016 | 4.78 | 0.003 | 1593.333 |
| Nov 29, 2016 | 5.08 | 0.003 | 1693.333 |
| Dec 1, 2016 | 5.94 | 0.003 | 1980.000 |
| Dec 2, 2016 | 8.35 | 0.003 | 2783.333 |
| Dec 5, 2016 | 8.63 | 0.003 | 2876.667 |
| Dec 7, 2016 | 5.80 | 0.003 | 1933.333 |
| Dec 8, 2016 | 10.84 | 0.003 | 3613.333 |
| Dec 9, 2016 | 60.00 | 0.001 | 60000.000 |
| Dec 12, 2016 | 6.93 | 0.003 | 2310.000 |

3.2 After 32 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 ConduForm was removed from the cylinder for examination. Images of the copper encased in ConduForm before and after the experiment can be seen in Figures 1 and 3. The copper encased in the ConduForm 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 just over 92% of its mass during the 32-day test running at 3 mA, whereas the ConduForm encased copper sample experienced no change in mass.

Table 2: Summary of Loss of Copper Mass

| Sample | Initial Mass (g) | Final Mass (g) | Mass Difference (g) | Percentage Loss (%) |
|---|---|---|---|---|
| Copper #1 (Bare) | 3.93 | 0.3 | - 3.63 | 92.37 |
| Copper #2 (ConduForm) | 3.84 | 3.84 | 0 | 0 |

Figure 1: Copper Samples, Before Experiment


Figure 2: Copper #1, After Experiment

Figure 3: Copper #2 Encased in ConduForm Before (left) and After (right) Experiment

Figure 4: Copper #2 After Experiment

## 4. CONCLUSIONS

4.1 As seen in Table 2 above the bare copper sample experienced complete consumption of the copper directly in contact with the soil, losing 92.37% of its original mass. Copper #2, the copper strip encased in the ConduForm was unaffected by the electrolysis process and lost no copper mass. These results are similar to previous experimentation with ConduCrete and demonstrate that ConduForm will effectively prevent the corrosion of buried copper.

Published Date: October 2022

# Resistance of Encased Steel and Galvanized Steel in ConduForm to Electrolytic Corrosion

## 1. INTRODUCTION

1.1 SAE Inc. has developed ConduForm; a low slump, dust free, conductive carbonaceous backfill. ConduForm is designed for applications where overburden is shallow or non- existent. It provides superior corrosion and theft protection since it can be applied to exposed rock surfaces to protect conductors and improve grounding where trenching is not possible. It solidifies and provides corrosion resistance and strength.

1.2 In order to determine the effectiveness of ConduForm as a low slump formable backfill, the following experiment measuring the electrolytic corrosion resistance of steel and galvanized steel when encased in ConduForm 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 9. These samples were Hot Dip Galvanized at Supreme Galvanizing in Burlington so Rustoleum Cold Gavlanzing Compound was only applied to the edges of the samples that had been cut with the angle grinder. Samples 1 and 3 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 7. Samples 1 and 7 were left bare in the soil, while samples 3 and 9 were encased in ConduForm. 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 ConduForm, samples #3 and #9 respectively, experienced minimal changes in mass and there was only a small amount of visible corrosion on sample #3, none on sample #9.

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 #3 (ConduForm) | 22.46 | 22.43 | - 0.03 | - 0.13 |
| Galvanized Steel #7 (Soil) | 24.99 | 21.02 | - 3.97 | - 15.89 |
| Galvanized Steel #9 (ConduForm) | 25.57 | 25.19 | - 0.38 | - 1.49 |

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

Figure 4: ConduForm Encased Samples, Bare Steel #3 (left) and Galvanized Steel #9 (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 ConduForm 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 significantloss 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 ConduForm both experienced minimal loss of mass at the completion of the test. The bare steel sample encased in ConduForm had a consumption of 0.13% and the galvanized steel sample encased in ConduForm had a consumption of 1.49%. Therefore, this experiment demonstrates that using ConduForm backfill effectively reduces the rate of corrosion of both bare and galvanized steel in buried grounding applications.

Published Date: October 2022

# ConduForm Permeability Testing

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

| | |
|---|---|
| **Sample Name** | **ConduForm** |
| 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 | 1.45 |

| Parameter | Initial | Final | Unit |
|---|---|---|---|
| Height | 5.03 | 5.03 | inches |
| Diameter | 3.92 | 3.92 | inches |
| Area | 12.07 | 12.07 | inches$^2$ |
| Volume | 60.7 | 60.7 | inches$^3$ |
| Mass | 1006 | 1299 | grams |
| Bulk Density | 63.0 | 81.3 | pcf |
| Moisture Content | 1.7 | 31.4 | % |
| Dry Density | 61.9 | 61.9 | pcf |
| Degree of Saturation | 5 | 99 | % |

## B Coefficient Determination

| | | | | | |
|---|---|---|---|---|---|
| Cell Pressure, psi | 92.03 | Increased Cell Pressure, psi | 96.80 | Cell Pressure Increment, psi | 4.77 |
| Sample Pressure, psi | 89.35 | Corresponding Sample Pressure, psi | 93.06 | Sample Pressure Increment, psi | 3.71 |
| | | | | B Coefficient | 0.78 |

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

CONDU FORM

## 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 | Z1 | Z2 | Z1-Z2 | | | | | | |
| Jan 20 2017 | 1 | 92.0 | 89.4 | 7.0 | 4.0 | 3.0 | 35 | 6.9 | 6.6E-06 | 19.7 | 1.008 | 6.7E-06 |
| Jan 20 2017 | 2 | 92.0 | 89.4 | 7.0 | 4.0 | 3.0 | 36 | 6.9 | 6.4E-06 | 19.7 | 1.008 | 6.5E-06 |
| Jan 20 2017 | 3 | 92.0 | 89.4 | 7.0 | 4.0 | 3.0 | 36 | 6.9 | 6.4E-06 | 19.7 | 1.008 | 6.5E-06 |
| Jan 20 2017 | 4 | 92.0 | 89.4 | 7.0 | 4.0 | 3.0 | 37 | 6.9 | 6.3E-06 | 19.7 | 1.008 | 6.3E-06 |

PERMEABILITY AT 20° C: 6.5 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 January 19, 2017 to January 23, 2017.

Published Date: October 2022

# ConduForm Leachate Data

ConduForm is environmentally neutral. Since it sets within 3 hours of installation it does not leach, dissolve or migrate into the soil or water. A table of toxicity characteristic leaching procedure (TCLP) results for ConduForm is included below. ConduForm 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 (US EPA) 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 | ConduForm TCLP Concentration (mg/L) | USEPA Maximum Contaminant Level (mg/L) |
|---|---|---|
| Arsenic | BDL | 0.010 |
| Barium | 0.29 | 2.000 |
| Boron | 0.11 | 2.000* |
| Cadmium | 0.0018 | 0.005 |
| Chromium | 0.023 | 0.100 |
| Lead | BDL | 0.015 |
| Mercury | BDL | 0.002 |
| Selenium | BDL | 0.050 |
| Silver | BDL | 0.100** |
| Uranium | BDL | 0.030 |

| Constituent | ConduForm TCLP Concentration (mg/L) | USEPA Maximum Contaminant Level (mg/L) |
|---|---|---|
| Fluoride | 0.16 | 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

# ConduForm Adhesion to Rock

Eight samples of ConduForm were applied to rocks at various angles, surface preparation, and moisture level in order to evaluate the adhesion of ConduForm to rock surfaces. The ConduForm samples were applied to the rocks on September 28, 2016 and were monitored regularly for almost 3 years, until July 25, 2019. After exposure to three Ontario winters all eight ConduForm samples remained bonded to the rock surfaces they had been applied to. Surface preparation, angle of the rock and moisture level of the rock did not negatively affect the adhesion of the ConduForm to the rock surface.

Table 1: ConduForm Samples – Initial Conditions – September 28, 2016

| Sample | Rock Surface Condition | Rock Surface Angle (º) | Material Resistance – After 7 Day Cure (Ω) |
|---|---|---|---|
| 1 | Clean and Dry | 30 | 9.9 |
| 2 | Clean and Dry | 45 | 4.7 |
| 3 | Clean and Dry | 90 | 6.6 |
| 4 | Clean and Dry | 60 | 6.1 |
| 5 | Clean and Dry | 60 | 3.8 |
| 6 | Clean and Dry | 0 | 3.5 |
| 7 | Dusty, Dirty and Dry | 0 | 5.1 |
| 8 | Clean and Wet | 0 | 5.5 |

Figure 1: ConduForm Samples – Initial Pictures – September 28, 2016

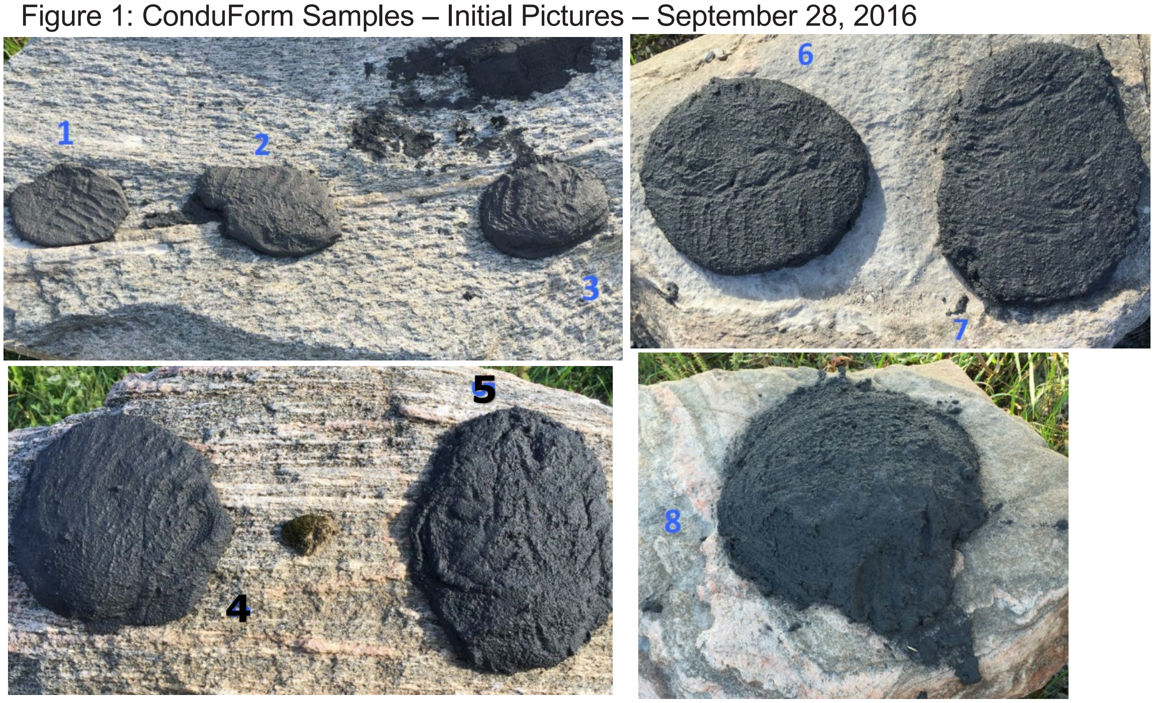


Table 2: ConduForm Samples – July 25, 2019

| Sample | Material Resistance (Ω) | Time Since Initial Application (days) | Notes |
|---|---|---|---|
| 1 | 5.1 | 1030 | No peeling, delamination or disbondment from the rock. |
| 2 | 2.2 | 1030 | No peeling, delamination or disbondment from the rock. |
| 3 | 2.4 | 1030 | No peeling, delamination or disbondment from the rock. |
| 4 | 2.8 | 1030 | No peeling, delamination or disbondment from the rock. |
| 5 | 2.7 | 1030 | No peeling, delamination or disbondment from the rock. |
| 6 | 5.8 | 1030 | No peeling, delamination or disbondment from the rock. |
| 7 | 6.3 | 1030 | No peeling, delamination or disbondment from the rock. |
| 8 | 4.1 | 1030 | No peeling, delamination or disbondment from the rock. |

Figure 2: ConduForm Samples After 2 Winters (Spring 2018)


Published Date: May 2024

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info@saeinc.com

# SAFETY DATA SHEET

| SECTION 1 | PRODUCT AND COMPANY IDENTIFICATION |
|---|---|

PRODUCT

| | |
|---|---|
| Product Identifier | Two-Part ConduForm Kit |
| Synonyms | ConduForm |
| Product Description | Solidifying Conductive Formable Backfill |
| Recommended Use | Electrical Grounding |
| Issue Date | September 28, 2022 |
| Total Pages | 16 (incl cover page, ConduForm, Part 1, and ConduForm, 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 ConduForm 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 | ConduForm, 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
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## 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/m$^3$ (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

September 28, 2022

16.2 ADDITIONAL INFORMATION

This safety data sheet is believed to provide a useful summary of the hazards of ConduForm, 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 ConduForm, 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 |
| 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

September 28, 2022

16.2 ADDITIONAL INFORMATION

This safety data sheet is believed to provide a useful summary of the hazards of ConduForm, 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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