Optimized Performance Soil Cement (OPSC)
Treated Full Depth Lithification
Installation and Performance Specifications

1. **OBJECTIVE:** Installation of OPSC shall consist of constructing a mixture of soil, and/or soil amendments, and/or asphalt, and all versions of OPSC and water for the optimization and recycling of pre-existing roadway materials. The work shall be performed in conformity with the lines, grades thickness, and typical cross sections shown on the road design plans. When the specified amount of OPSC and water are blended and compacted as specified, it shall result in the OPSC transforming low performing soil to a hard, less permeable layer with increased load bearing capacity and increased ductility. Most of the reaction shall occur within twenty-four (24) hours and should continue to strengthen over time. The resulting matrix shall be permanent and durable with reduced volume change characteristics and result in a structural layer that is both strong and flexible.

2. **CONTRACTOR QUALIFICATION:** The contractor shall (a) have had a minimum of two (2) years' experience in cement and/or lime soil stabilization or modification or be capable of demonstrating sufficient technical expertise in cement and/or lime soil stabilization or modification; and (b) have successfully completed similar projects to the satisfaction of their clients.

3. **MATERIALS:** Furnish uncontaminated materials of uniform quality that meet the requirements of the plans and specifications.

    3.1 **ROADWAY MATERIAL SAMPLING:** Roadway materials to be utilized must be sampled and/or gathered at cross sections provided by the engineer. Sampled roadway materials must be taken at a consistent depth as specified by the engineer. A minimum of ninety-five pounds of actual roadway material per project and/or a minimum of 95 pounds per 3 miles of linear roadway are to be obtained for testing. Additional materials for sampling may be required due to observed material changes, topographical changes, and/or other observed factors during the sampling process. Any material that is intended for import and/or use in the mix design must also be sampled in a similar manner and included in the mix design at the precise quantities as specified by the engineer. (*Ref. 4, Testing Specifications)*

4. **TESTING SPECIFICATIONS:** A battery of testing shall be completed per project and/or per 3 miles of linear roadway. The battery of testing shall include: Sieve Analysis (AASHTO T-27), Liquid Limit (AASHTO T-89), Plastic Limit (AASHTO T-90), Treated Moisture Density Relations of Soils (AASHTO T-99, T-180, ASTM D1557), Treated California Bearing ratio (AASHTO T-193- 13, ASTM D1883), Treated Unconfined Compression Strength (AASHTO T-208-15, ASTM D2166M-16), Treated Modulus Derivative (AASHTO T-208) or Resilient Modulus (AASHTO T- 307).

5. **CUSTOMIZATION OF DRY OPSC MIXTURE:** Based upon the soil classification (AASHTO t- 27, AASHTO T-89, AASHTO T-99, T-180, ASTM D1557) of materials sampled on the roadway (*Ref. 3.1, Roadway Material Sampling)* a custom mixture shall be designed and made up of cementitious materials, and/or pozzolanic materials, and/or organic or inorganic compounds designed to optimize the structural potential of a given roadway material and to meet Lab Performance Testing Requirements *(Ref. Item 6)* and Field Performance Testing Requirements (*Ref. Item 16)* as specified.

6. **LAB PERFORMANCE TESTING REQUIREMENTS:** Treated California Bearing Ratio (AASHTO T-193-13, ASTM D1883) tests shall be performed and must exceed a minimum of a 150 CBR Value with a minimum shrink/swell value of .15%. Treated Unconfined Compression Strength (AASHTO T-208-15, ASTM D2166M-16) test shall be performed and must exceed a minimum of 400 psi and a strain at failure to meet or exceed a minimum of .8%. Treated Modulus Derivative (AASHTO T-208) or Resilient Modulus (ASSHTO T-307) tests shall be performed and must exceed a minimum of 500,000 psi.

7. **WATER:** Water furnished must be free of industrial waste and other objectionable materials.

8. **OPSC CONTENT:** A qualified engineer shall designate the percentage of OPSC by dry weight of the soil to satisfy the criteria requirement for the project. The OPSC specified dosage by dry weight obtained from the Maximum Dry Density per AASHTO T-99 or AASHTO T-180 is required for all mix designs, as specified by a qualified engineer.

9. **EQUIPMENT:** Appropriate machinery, tools, and equipment necessary for proper execution of the work are required. Among other applicable equipment, pulverization and spreader equipment are required as follows: (*See attached Installation Equipment Requirements and reference as part of the Specification).*

9.1 **PULVERIZATION EQUIPMENT:** Pulverization equipment that cuts and pulverizes material uniformly to the calibrated proper depth with cutters that will plane to a uniform surface over the entire width of the cut, provides a visible indication of the depth of cut at all times, and uniformly mixes the materials is required. Pulverization equipment must be capable of providing water distribution at calibrated and exact quantities into the mix as pulverization occurs.
(See attached Installation Equipment Requirements).

9.2 **SPREADER EQUIPMENT:** Calibrated spreader equipment to apply the OPSC at the percentage rate specified is required. Spread rates must be tested for each load of OPSC spread atop the section to be treated. The spreader truck shall demonstrate the ability to maintain a consistent spread rate over variable travel speeds. Cement spreader must verify the consistency of the spread rate by conducting multiple pan tests. The pan test consists of placing a 3 square foot pan on the grade in front of the spreader truck. After cement spreader truck has passed over the pan, the cement captured in the pan is weighed to determine the rate of spread in pounds per square foot.

10. **CONSTRUCTION:** Construct each layer uniformly, free of loose or segregated areas and with the required density and moisture content. Provide a smooth finished surface that conforms to the typical sections, lines, and grades shown on the plans and that as is required considering the type of surface course to be placed atop the OPSC treated lift.

11. **PREPARATION OF SUBBASE/SUBGRADE OR EXISTING BASE FOR TREATMENT:** Before treating, remove or pulverize existing asphalt and/or concrete pavement in accordance with the plans. Asphalt and/or concrete pavements should be pulverized down to a maximum of 1.5", whether it be incorporated into the subbase/subgrade and/or base lift and in accordance with the plan. When amendment materials are required to be mixed with existing subgrade, subbase, or base: deliver, place, and spread the new material in the required amount. Any imported material must be identical to materials tested and should be verified per the specification and approved by a qualified

engineer. Manipulate and thoroughly mix all materials to a homogenous blend that will be included in the lift for treatment. The depth of lift specified for OPSC treatment should have aggregate no larger than 1.5". Both the subbase/subgrade and base lifts should be mixed and compacted prior to the OPSC treatment in accordance with the plan and to meet material specifications, density, and stiffness requirements in accordance with the plan.

11.1 MOISTURE PREPARATION OF BASE LIFT PRIOR TO OPSC TREATMENT: Base lift should be moisturized, mixed, compacted, and graded prior to OPSC treatment and in accordance with the plan. Previous to OPSC treatment the base lift moisture content should be at Optimum Moisture Content (OMC) minus 2%. *See 16.1 OPTIMUM MOISTURE CONTENT*

11.1.1 NOTE: For avoidance of doubt, this preparation of the base lift allows for the pulverization equipment with computerized water supply to apply a consistent and achievable dosage of water (ideally 2% by weight) to the OPSC treated mix.

12. **APPLICATION OF OPSC:** Uniformly apply OPSC using dry placement unless otherwise shown on the plans. Start OPSC application only when the air temperature is at least 40°F and rising. The temperature shall be taken in the shade and away from artificial heat. Suspend application when it is determined that weather conditions are unsuitable.

13. **DRY PLACEMENT:** Before applying OPSC, bring the prepared area to be treated to the approximate Optimum Moisture Content obtained per AASHTO T-180, AASHTO T-99 or TxDOT Tex-113-E, as may be specified by qualified engineer. Minimize dust and scattering of OPSC by wind. Do not apply OPSC when wind conditions cause blowing of OPSC as it may become dangerous to traffic or objectionable to adjacent property owners.

14. **MIXING:** Thoroughly mix the material and OPSC using approved equipment. Mix until a homogeneous mixture is obtained. Sprinkle with water the treated materials during the mixing operation, as directed, to maintain Optimum Moisture Content as specified by the plans. Spread and shape the completed mixture in a uniform layer. After mixing, the roadway mixture shall be sampled and tested to insure it is in accordance with the OPSC Material Specification.

15. **COMPACTION:** Roll with approved compaction equipment, or as directed by the engineer. Compact the mixture in one lift using density control unless otherwise shown on the plans. Complete compaction shall be achieved within four (4) hours after the application of OPSC. Begin rolling longitudinally at the sides and proceed towards the center, over-lapping on successive trips by at least one-half the width of the roller unit. On steep sloped curves, begin rolling at the low side and progress toward the high side. Offset alternate trips of the roller. Operate rollers at a speed between two (2) and six (6) MPH, or as directed by the engineer. Areas that lose required stability, compaction, or finish shall be removed and replaced and/or re-treated and recompacted with OPSC treated mixture at the Contractor's expense. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and recompacting.

15.1 SHOULDERS: All requirements found within this specification are similarly required for the shoulders of the roadway. It is recommended to commence rolling beyond the shoulder of the OPSC treated lift to make sure that the far edge of the shoulder receives necessary compaction in accordance with the plan.

15.1.1 NOTE: It is recommended that the plan call for a minimum of 1' of OPSC treated width that extends beyond the surface course onto the shoulder. This improves assurance that the entirety of surface course placed is atop a OPSC treated section and is structurally supported.

16. **FIELD PERFORMANCE TESTING REQUIREMENTS:**

16.1 OPTIMUM MOISTURE CONTENT: Utilize pulverization equipment capable of providing water at calibrated and exact quantities and sprinkle or aerate the treated area, sprinkling to adjust the moisture content during final compaction so that it is within a range of 1.5 percentage points above or below Treated Optimum Moisture Content gathered from Treated Moisture Density Relations of Soils (AASHTO T-99, AASHTO T-180, ASTM D1557) as specified by the plans (i.e., if Optimum Moisture Content is 14, then the range would be 12.5 to 15.5).

16.2 DENSITY: Compact to at least ninety percent (90%) of the Maximum Dry Density determined in accordance with AASHTO T-180, (95%) of the Maximum Dry Density determined in accordance with AASHTO T-99 or (95%) Maximum Dry Density determined in accordance with AASHTO TxDOT Tex- 113-E, as may be specified by the qualified engineer. Remove, re-treat, and/or recompact areas that lose required stability, compaction, or finish. Re-treat or replace with OPSC treated mixture and compact and test in accordance with density control methods.

16.3 STIFFNESS: Lightweight Deflectometer Tests shall be performed at a minimum of 3 tests per 800 square yards of treated material. The aggregate average of the stiffness readings taken per 800 square yards of treated material must meet the minimum of 90% of the Treated Unconfined Compression test (AASHTO T-208-15, ASTM D2166M-16) elastic modulus at 4 hours and at 24 hours from the finished treated section.

17. **QUALITY CONTROL:** All irregularities, depressions, or weak spots which develop shall be corrected immediately, while treated soil is still moist, by scarifying the areas affected, adding or removing material as required, and reshaping and re-compacting. The surface of the OPSC treated layer/lift shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed there upon or the work is accepted. Compaction and finishing shall be done in such a manner as to produce a smooth, dense surface free of compaction planes, cracks, ridges or loose materials. Throughout this entire operation, the shape of the course shall be maintained by blading.The surface upon completion, shall be smooth and shall conform with the typical section as specified by the customer's project engineer and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and/or finish before the next course is placed or the work is accepted, it shall be re-compacted and refinished. Failure to perform quality control as specified will be considered default of contract and non-compliant with proper installation.

17.1 OPSC RANDOM SAMPLING AND QUALITY CONTROL TESTING: Enough of the OPSC materials should be sampled at random, post spreading, for each 800 square yard section to complete a full battery of testing as specified (in the event of a failure, *refer to 6, Lab Performance Testing Requirements).* Random samples taken from the quantity of OPSC materials collected should be tested to ensure consistency of blended materials as specified by the engineer.

18. **FINISHING:** Immediately after completing compaction, clip, skin, or tight blade the surface of the OPSC treated material to a depth of approximately 1/4 inch. Remove loosened material and dispose of it at an approved location. Roll the clipped surface immediately with a smooth drum roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the sections, lines and grades as specified by the plans.

19. **CURING:** After proper compaction, allow the OPSC treated section to cure for (a) twenty- four (24) hours when installing another layer/lift or surface course (i.e., chip seal, asphalt or concrete); or (b) at least two (2) days, by sprinkling with water in accordance with plan or by maintaining the moisture content during the respective curing period at no lower than 1.5% percentage points below the Optimum Moisture Content (i.e., if Optimum Moisture Content is 14, then the range would be 12.5 to 15.5). Do not allow equipment on the OPSC treated layer/lift during curing except as required for sprinkling, unless otherwise approved. Prior to placing a surface course (e.g., asphalt, chip seal, etc.) lightly broom fines off the road to allow for direct adhesion to the curing OPSC base lift.

20. **MAINTENANCE:** The contractor shall maintain, at their own expense, the entire OPSC treated section in good condition from the start of work until all the work has been completed on the section.

21. **MEASUREMENT:** The quantity of OPSC treated soils shall be measured by the square yard, measured in place, treated, compacted to the proper depth, and verified to be in accordance with the plan.

22. **INSTALLATION EQUIPMENT REQUIREMENTS ADHESION GUIDE AND FAILURE PREVENTION:** For clarification purposes and to further prepare installer regarding OPSC installation, the ***OPSC Installation Equipment Requirements, OPSC Adhesion Guide*** and ***OPSC Failure Prevention Guide*** are hereby incorporated as part of this document by reference. While these documents do not replace any aspect of this specification, they are required to be utilized and considered by the contractor in addition to this specification and therefore remaining in accordance with the information found in this specification, the *OPSC Installation Equipment Requirement*s, *OPSC Adhesion Guide* and the *OPSC Failure Prevention Guide* are required.

Optimized Performance Soil Cement (OPSC)
Installation Equipment Requirements

Disclaimer
This document is designed to provide a summary of the equipment requirements utilized to install OPSC. It is in no way designed to take the place of the *OPSC Treated Full Depth Lithification Installation and Performance Specification.*

Required Equipment to Meet Specification (For Standard Roadway Installation)

- Motor Grader with Experienced Finish Grade Operator
- Reclaimer or Pulverizer (with Computerized Water Distribution System Required)
- Sheepsfoot Compactor (12-ton roller)
- Double Drum Roller (12-ton roller)
- Cement Spreader (Calibrated and Computerized Spread Rate Required)
- 1 Water Truck Dedicated for the Reclaimer
- 1 Water Truck Dedicated for the Grader and Keeping the Previous Completed Section Moist
- 1 Water Tanker for Storage if More Than 30 Minutes from Water Source
- Densometer
- Lightweight Deflectometer
- Speedy® Moisture Meter

Be advised that the use of equipment that does not meet the OPSC specifications will have an impact on the overall performance and longevity of the road. For example, using a grader rather than a reclaimer to mix the product and material together will reduce the homogenous blend of OPSC into the road-base material. Use of light weight rollers will reduce consistency and effectiveness of compaction. Not having the reclaimer's mixer set at the designated depth affects the OPSC dosage requirements. Not having a computerized water distribution system on the reclaimer with hose attached directly to the water truck reduces consistency of moisture content, which leads to not meeting compaction requirements, density requirements, and/or not meeting stiffness requirements, which all increase the risk of failures.

Optional Equipment to Improve Results and Increase Production

- Additional Water Trucks depending on distance to water source to avoid loss of production
- Pneumatic Roller for optimum compaction

Equipment for Receiving PNEUMATIC TANKERS

- Cement Spreader (w/ attachments and hoses to receive OPSC Product in pneumatic tankers)
- Pig or Guppy (w/ attachments to receive pneumatic tankers; recommended for projects to exceed 150 tons or for projects more than 250 miles from OPSC blending sites.)

Equipment for Receiving and Violating SUPER SACKS

- Bulk Bag Unloader (for example: DMI BTL-12 bulk bag unloader; for rental or purchasing options contact Diversified Mineral Inc. at dmicement.com.)
- Stair and Platform (utilized to violate supersacks above cement spreader or pneumatic tanker when opening is available on top and bulk bag unloader is unavailable.)
- Telescopic Forklift (capable of safely lifting 4000 lbs.)

Optimized Performance Soil Cement (OPSC)
OPSC Adhesion Guide

This document is designed to provide an overview of the installation processes that are criticalto achieving a successful surface course installation over the OPSC treated base. OPSC has been installed in many roadways applying many variant emulsions with many types of materials applied resulting in successful adhesion performance with and without prime coats.Since every installation is different, engineers and experts in surface course preparation shouldbe consulted with and included in the design plan for the surface course adhesion and application.

Using a Primer

OPSC is used to treat countless types of materials in countless mix designs. In consultation with multiple engineers, they recommend the use of a prime coat for all OPSC applications. The primer should be applied prior to the application of the surface course (for example: a chip seal, FAST and/or asphalt) applications to assure quality adhesion. The use of a prime coat or priming is the application of an asphalt binder to the finished base material to provide some waterproofing and enable bonding to a subsequent pavement layer (surface treatment or HMA). Typical materials used are MC-30 and AE-P. MC-30 is a medium-curing, low-viscosity cutback asphalt. MC-30 contains up to 40% kerosene, enabling it to soak into the base material. AE-P and other emulsions with fine asphalt particle sizes are often used as prime with the caveat that some emulsions do not penetrate some bases. Trial runs may be required for the use of certain emulsions. Ultimately,the goal of the primer is to penetrate the base ever so slightly, seal it, and prepare it for additional pavement layers. The use of the types of products listed above and/or their equivalents is recommended for all Lit OPSC installations.

Disclaimer

In no way does this guide take the place of the *OPSC Treated Full Depth Lithification Installation and Performance Specification.* OPSC treats the base or subbase **only** and is not to be designed as a surface course. Because proper adhesion to the OPSC base surface is a material dependent process and the responsibility of the contracted installer, the manufacturer of the OPSC cannot be held responsible for any lack of adhesion.

Optimized Performance Soil Cement (OPSC)
Installation Failure Prevention Guide

Disclaimer
This document is designed to provide an overview of the installation processes that are critical to achieving a successful installation. It is in no way designed to take the place of the *OPSC Treated Full Depth Lithification Installation and Performance Specification.*

Road Material Changes – Failure

OPSC is a custom engineered product that is pretested with materials sampled from the roadway and/or in combination with materials that are intended to be imported to the project and to be incorporated in the mix design. Therefore, moisture content and all lab testing and onsite performance testing are correlated to the laboratory test results from the precise materials sampled and tested. In addition, the battery of performance testing involving the custom mix design, previous to installation, already passed the OPSC High Performance Standards, (which are significantly higher than Industry Standards). With proper installation procedures being followed, the field results will closely mirror the laboratory results. If the import or onsite materials are changed and are not a good representation of the materials that were sampled and tested, then the installation will be greatly compromised. When a material change occurs and it is decided that installation should proceed without initiating additional testing, there is no correlated testing at that point. Therefore, moisture content, compaction / density and required dosage are simply a guess. Material changes can lead to a failure as there is no prior testing of the new material and the discrepancies of the original material tested may vary greatly even in cases where the material appears to be similar.

Fix: Make sure all onsite materials to be mixed into the OPSC treated section are represented by the materials sampled and tested previous to the installation. If there is a material change required for the import source, make sure all participants are notified immediately and restart the material sampling and laboratory testing process, prior to installation.

Subgrade and Subbase Performance - Failure

OPSC is designed to be incorporated in the base lift directly below the roadway's surface to drastically improve structural performance and load bearing capacity. The subgrade and subbase lift must also meet performance standards including density requirements and load bearing capacity. If the subgrade or subbase does not meet or exceed the performance specifications of the plan provided by a qualified engineer, then the entire road is at risk of failure.

Fix: Make sure that the subgrade and subbase meets the proper density and other related structural performance requirements of the plan provided by a qualified engineer. This will ensure that the subbase is capable of properly supporting the compaction and load bearing capacity of the OPSC treated base on top of it.

Moisture Content Inconsistencies - Failure

OPSC must be installed within 1.5% plus or minus the **O**ptimum **M**oisture **C**ontent (OMC), which is determined during the pretesting and indicated in the *OPSC Geotechnical report* and *OPSC Installation Requirements.* When moistures are inconsistent and outside of the 1.5% tolerance, the material is either too dry and does not bond properly together or it is too wet, resulting in pumping. In both cases the optimum performance of the material, strength, water resistance and load bearing capacity are compromised, which can lead to failure.

Fix: **1.** Prepare the road and condition the material one or two days prior to the OPSC treatment by bringing the moisture content to OMC minus 2%. Complete this process by spraying the top of the untreated surface and grading the materials from one side of the road back to the other to ensure consistency of moisture across the roadway. This will ensure that OPSC and the additional water required can be incorporated rapidly and without the need of large quantities of water being incorporated during installation, which can lead to slow production rate and inconsistent moisture contents.

2. Utilize a reclaimer or pulverizer with a calibrated and computerized water supply with clean and functioning jets. This will make water incorporation simple and consistent across the full width of the mixing path.

3. Switch water trucks out when connecting to the reclaimer. Do not attempt to add water into water truck already attached as this leads to spillage on the roadway which may lead to flooded areas which may turn into soft spots.

Shoulder Compaction - Failure

OPSC requires compaction, density, and stiffness across the full width of the roadway including the shoulder. Not providing proper shoulder compaction will lead to shoulder softness and possible failure.

Fix: Commence roller passes past the edge of the OPSC treated lift and all the way across the road following the specified compaction information in the OPSC specification.

Pulling Untreated Materials onto the Roadway - Failure

OPSC is mixed directly below the path of the reclaimer or pulverizer. Materials that are off the edge of the path of the reclaimer or pulverizer are therefore untreated. Pulling in any untreated materials into or onto the OPSC treated materials will change the mix design, incorporate unbound materials, and will likely lead to base failure or adhesion failure to the surface course.

Fix: Never bring untreated materials onto the roadway. When cutting shoulders and/or moving the blade outside of the edge of the treated material, move materials off the road, not on to the road.

Water Contamination - Failure

OPSC is a custom engineered product that is tested with water free of industrial waste and other objectionable materials. Incorporating contaminated water will likely lead to failure as it may affect the chemical reactions.

Fix: Utilize water that is clean and not contaminated. If there is any doubt about the quality of the water to be used onsite during the project, you can send the water samples to be tested in OPSC lab along with the material from that project. Allow plenty of time to complete the testing well in advance of the installation.

Homogenous Mixture - Failure

OPSC is tested in advance of installation with the soil sampled on site. That soil is mixed thoroughly to achieve a homogenous mixture of materials incorporated that includes onsite materials such as failing asphalt and/or basecourse, OPSC, and water. Previous to compaction a homogenous mixture of materials incorporated in the mix design must be achieved that meets the requirements of the OPSC specification and engineered design plan. Not achieving a homogenous mixture can lead to a failure.

Fix: Make sure that materials onsite are pre-pulverized to meet the specification. Failing asphalt must be pulverized and incorporated into fine pieces 1½" minus so that there are no large chunks remaining and all large rock must be removed. A pre-pulverized base should be graded across the roadway and compacted prior to OPSC treatment to ensure a homogenous mix.

Time to Completion - Failure

Per the specification, contactors are provided 4 hours to complete the compaction of the roadway. This is 2 hours more than traditional soil cement specifications. However, going over this 4-hour window post OPSC incorporation and hydration can lead to reduced performance and therefore failure.

Fix: Do not bite off more than you can chew. Complete OPSC in manageable sections that can be completed in the time allotted. In addition, be aware of environmental conditions. Hot and windy days will dry out the material faster, so you may have less time to compact at OMC.

Surface Adhesion - Failure

OPSC is designed for the base lift of roadways and requires a surface course for optimal performance. OPSC does not impede surface adhesion and has been installed and tested with a various number of emulsions and surfaces. However, much of the adhesion performance is based on the materials onsite, and therefore the contractor or entity that applies the surface layer must provide their own expertise related to adhesion and a prime coat may be required for optimum results. For recommendations, please *SEE Surface Adhesion Guide included in the OPSC Specification.*

Improper Dosage - Failure

OPSC is specified for a particular dosage in each project. That dosage is provided in the *Installation Requirements* prior to the installation taking place. Be advised that quality controls are required and should be standard to any contractor providing spreading. OPSC must be spread atop the entirety of the roadway to the very edge of the treated width in consistent quantities and at the right dosage. It must also be mixed down to consistent depths to achieve the correct dosage. Not complying to dosage requirements may lead to failure.

Fix: Utilize pan tests on every spread to insure correct spread rate. Measure the width of spread and measure the depth of lift consistently through installation. Make sure that contractors installing the spread are quality controlling the spread rate by taking regular pan tests to weigh the amount of OPSC being placed and are meeting regular spreading weights per section in accordance with the plan.

Environmental Conditions - Failure

OPSC requires a minimum of 40 degrees Fahrenheit and rising to properly cure. In addition, OPSC must be installed within 1½% of the specified OMC. Therefore, significant rain or weather could affect moisture content and lead to failure. OPSC has a reduced flow rate in comparison to ordinary cement, however OPSC can still be blown off the road due to wind which can lead to failure, safety hazards, and property damage which can lead to failure and liabilities.

Fix: Check local weather and make sure that the installation window falls within appropriate weather conditions.

No Engineered Design Plan - Failure

A OPSC treated lift is an excellent component to be added into any roadway design. However, be advised that every OPSC treated lift has different performance based on geotechnical testing. Proper roadway construction requires a properly completed design by a certified engineer that considers the subgrade/subbase, base lift, surface course, drainage plan, traffic, and more. Not having a properly completed design by a certified engineer can lead to failure.

Fix: Always have an engineered design before you build a road.

No Density Control - Failure

OPSC is specified for a Density Control type of installation. This means that density must be taken to ensure the specification is being met. Be advised, are nuclear devices and are not allowed across state lines without documentation per entry and exit. Therefore, it is recommended that a third-party Geotechnical firm be engaged to provide density testing as this is an important aspect of achieving a high-performance road and meeting the specifications.

Fix: Always schedule densities to be taken onsite during installation to assure that appropriate densities are being achieved in the field.