LithTec™ Installation Requirements & Technical Advisory

Version: 20260227

1. MANDATORY INSTALLATION REQUIREMENTS

The following protocols are critical to the chemical reaction and structural integrity of **LithTec™**. These steps must be strictly adhered to; failure to meet these requirements may result in product failure.

1. **Environmental Go/No-Go:** Installation must **only** proceed under the following conditions:
    - **Air Temperature:** Must be at least **40°F (4°C) and rising** (measured in shade).
    - **Soil Temperature:** Lowest measured temperature must be above **50°F (10°C)** and expected to remain above 50°F for the subsequent 7 days.
    - **Weather:** Do not install if **freezing temperatures** or **substantial precipitation** are forecast within the 7-day curing window.
    - **Extreme temperatures:** Do not install in extreme heat and low humidity.
2. **Material Consistency & Responsibility:** It is the strict responsibility of the **Contractor, Installer, and/or Owner** to ensure that the material to be treated is homogenous and consistent with the representative samples tested during the design phase.
    - If the import or on-site materials are not a good representation of the samples tested, the installation will be compromised.
    - **Lithified Technologies** assumes no responsibility for verifying soil homogeneity.
3. **Homogenization:** Existing roadway materials (including asphalt/concrete) must be pulverized to pass a **1.5-inch sieve** and reclaimed to create a uniform, uncontaminated, and homogeneous mixture prior to treatment.
4. **Pre-Treatment Moisture:** Prior to the introduction of **LithTec™**, the base material must be moisture-conditioned to **Optimum Moisture Content (OMC) minus 2%**.
5. **Integration & Final Moisture:** Incorporate the specified dosage of **LithTec™** and simultaneously introduce the remaining water required to reach the target OMC.

6. **Thorough Mixing:** The product, soil, and water must be blended until a consistent soil-product matrix is achieved throughout the full depth of the lift.
7. **Compaction:** The mixture must be compacted to the target density specified by the project engineer (typically **95% of AASHTO T-180**) before the hydration window closes.

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2. ADVISORY: EQUIPMENT CONFIGURATION

To meet the mandatory requirements with maximum efficiency and consistency, **Lithified Technologies** recommends the following equipment fleet and configurations:

Primary Installation Fleet

- **Reclaimer/Pulverizer:** Strongly recommended over motor graders to ensure a homogeneous blend. Units should be equipped with **computerized water distribution systems** to ensure moisture is added precisely.
- **Motor Grader:** Operated by an experienced finish grade operator for shaping and final grade.
- **Calibrated Spreader:** A computerized spreader is advised to verify that the **LithTec™** dosage matches the engineered mix design. **Pan tests** are recommended for each load to verify spread rates (lbs/sq. ft.).
- **Water Truck Logistics:** To prevent production delays and moisture inconsistencies, the following allocation is advised:
    - **1 Truck** dedicated solely to the **Reclaimer**.
    - **1 Truck** dedicated to the **Grader** and keeping the previous section moist.
    - **1 Additional Truck** for hot/dry environments.
    - **1 Storage Tanker** if the water source is >30 minutes away.

Compaction Train

- **Sheepsfoot/Padfoot Roller:** Recommended for initial compaction. Must be **vibratory**.
- **Double Drum Roller:** Recommended for intermediate and final compaction.

- **Pneumatic Roller:** Optional, but recommended for optimum surface sealing and compaction.
- **Vibration Requirements:** All compactors must be equipped with fully functioning **high-amplitude standard vertical vibratory systems**.
- **Weight Requirements**:
    - **10–12 Inch Lifts:** 12+ Ton rollers advised.
    - **12–14 Inch Lifts:** 18+ Ton rollers advised.
    - **14–16 Inch Lifts:** 20+ Ton rollers advised.

Material Handling (Pneumatic & Super Sacks)

- **Pneumatic Tankers:** Use a "Pig" or "Guppy" with spreader attachments for projects >150 tons or >250 miles from blending sites.
- **Super Sacks:** Use a **Bulk Bag Unloader** (e.g., DMI BTL-12) or a **Telescopic Forklift** (4000+ lbs capacity) with a stair/platform setup for safe discharge.

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3. ADVISORY: EXECUTION WORKFLOW

- **Reclaiming & Homogenization:** It is advised to pulverize existing asphalt and/or concrete so that **100% of material passes a 1.5-inch sieve**.
    - Perform a **minimum of two (2) passes** with the reclaimer to ensure a homogenous blend of all materials (including any imported aggregate) **prior** to adding water or applying product.
    - Ensure no untreated material is pulled from outside the mixing path.
- **Pre-Wet Mixing:** Prior to spreading **LithTec™**, it is advised to moisturize, mix, and compact the base lift to **OMC minus 2%**. This ensures the computerized water supply can apply a consistent final dosage during the treatment pass.
- **Spreading & Mixing:** Apply **LithTec™** using a calibrated spreader. Thoroughly mix the product and material using the reclaimer while adding the remaining water to reach target OMC.
- **Time Window:** It is advised to complete all mixing and compaction within **four (4) hours** of **LithTec™** application to maximize bond strength.

- **Rolling Pattern:**
    - Begin rolling longitudinally at the sides and proceed toward the center, overlapping successive trips by at least **one-half the width** of the roller.
    - On superelevated curves, begin rolling at the **low side** and progress toward the high side.
    - Operate rollers at a speed between **2 and 6 MPH**.
- **Shoulder Stabilization:**
    - Extend the **LithTec™** treated width at least **1 foot (1')** beyond the planned surface course to provide structural support.
    - Commence rolling passes **beyond the edge** of the shoulder to ensure edge stability.
    - Remove elevated edges that would impede water shedding.
- **Surface Finishing:** Immediately after compaction, **clip, skin, or tight-blade** the surface to a depth of approximately **1/4 inch** to remove loosened material, then perform a final roll with a smooth drum roller.

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4. ADVISORY: ADHESION & CURING

- **Curing Protocol:** The treated section should cure for a minimum of **24 hours** prior to surfacing (asphalt/concrete). If left exposed longer, maintain moisture via continuous sprinkling for at least **3 days**.
- **Moisture Maintenance:** During curing, maintain moisture no lower than **1.5% below OMC**.
- **Prime Coat:** To ensure a robust adhesive bond, the application of a **prime coat** (e.g., **MC-30** or **AE-P**) is strictly recommended for all projects.
    - *Note:* Trial runs may be required to ensure the specific emulsion penetrates the base type.
- **Surface Prep:** Prior to placing the surface course, lightly **broom fines** off the road to allow for direct adhesion to the cured base.

- **Curing :** At the completion of required compaction and finish grading, the LithTec™ treated section will be moist cured for 48 hours by sprinkling with water. Light vehicular traffic is allowed on the curing LithTec™ section after 24 hours. No heavy equipment or trucks (other than sprinkling equipment) are allowed on the curing LithTec™ section for the full 48-hour curing period. Moist curing and restrictions on heavy equipment can be reduced to 24 hours if a surface course is placed.

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5. ADVISORY: QUALITY CONTROL & RISK MITIGATION

- **Moisture Tolerance:** Target moisture should be strictly maintained within **±1.5% of OMC**. Deviations outside this range risk "pumping" (too wet) or delamination (too dry).
- **Contamination Control:** Operators must ensure no **untreated material** (from shoulders or subgrade) is pulled into the mixing path during reclamation.
- **Water Quality:** Use only potable water free of industrial waste. If water quality is in doubt, submit samples for testing prior to installation.
- **Density Verification:** It is advised to engage a third-party geotechnical firm to perform **Densometer** testing (AASHTO T-180) to verify acceptance.
- **Homogeneity Checks:** Random sampling (every **800 sq. yds.**) is recommended to verify that onsite materials remain consistent with the initial geotechnical samples.

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6. CONTEXT & TROUBLESHOOTING

This section provides the engineering context for the requirements listed above, detailing the consequences of non-compliance and offering troubleshooting steps for common field scenarios.

A. RATIONALE & CONSEQUENCES OF NON-COMPLIANCE

Requirement	Context (Why it matters)	Consequence of Non-Compliance
Material Homogeneity	**LithTec™** is a custom-engineered product based on specific lab tests of	**Complete Failure.** If the field material differs from the lab sample (e.g., imported fill, different soil

Requirement	Context (Why it matters)	Consequence of Non-Compliance
	site materials. The dosage and moisture targets are calibrated to that specific soil chemistry.	classification), the "recipe" is invalid. This leads to improper chemical reaction, resulting in soft spots or lack of structural strength.
Moisture Control (±1.5%)	The chemical hydration of the product requires a precise water-to-product ratio. Moisture also acts as a lubricant to achieve density.	**Structural Weakness.** • **Too Dry:** The material will not bond, leading to delamination and "biscuiting" (crumbling surface). • **Too Wet:** Causes "pumping" and instability, preventing compaction and density.
4-Hour Compaction Window	Product hydration begins immediately upon contact with water. The crystalline bonds that provide strength begin to form within hours.	**Reduced Load Capacity.** Compacting material after the 4-hour window breaks the chemical bonds as they are forming. This permanently degrades the strength of the layer, often requiring removal and replacement.
Shoulder Extension	The edge of a roadway is the most vulnerable point for structural failure due to lack of lateral support.	**Edge Cracking.** Failure to compact beyond the paved width results in soft shoulders that erode, leading to rapid deterioration of the pavement edge.

Requirement	Context (Why it matters)	Consequence of Non-Compliance
Prime Coat	A prime coat penetrates the base to lock in fines and provides a chemical "bridge" between the rigid base and flexible asphalt.	**Delamination.** Without a primer, the asphalt may bond to loose dust rather than the base. High-shear forces (braking/turning) can cause the asphalt to slide or peel off the base.

B. COMMON TROUBLESHOOTING SUGGESTIONS

Scenario 1: On-Site Material Does Not Match Lab Samples

- **Condition:** You encounter unexpected clay pockets, large aggregate, or imported fill that looks different from the design samples.
- **Mitigation: Stop work immediately. Do not guess on dosage or moisture. Notify the project engineer for direction.**

Scenario 2: Material is Drying Out Too Quickly (Hot/Windy Conditions)

- **Condition:** Moisture content is dropping below OMC before compaction is complete.
- **Mitigation:**
    - **Shorten Work Sections:** Reduce the size of the treatment area to what can be mixed and compacted in a shorter timeframe.
    - **Increase Water Dosage:** Adjust the computerized water distribution to compensate for evaporation (while staying within the +1.5% limit).
    - **Continuous Fogging:** Use a water truck to keep the surface damp between roller passes.

Scenario 3: "Pumping" or Soft Spots During Compaction

- **Condition:** The ground feels "spongy" or moves under the roller, indicating excess moisture.
- **Mitigation:**

- **Aeration:** If within the 4-hour window, scarify and aerate the soil to lower moisture content, then re-compact.
- **Removal:** If the material is too wet and cannot be dried in time, or if the subgrade below is failing, the material must be removed and replaced.
- **Check Water Trucks:** Ensure trucks are not leaking or "flooding" the connection point with the reclaimer.

Scenario 4: Untreated Material Contamination

- **Condition:** The reclaimer or grader has pulled loose, untreated soil from the shoulder or ditch onto the mixed roadway.
- **Mitigation: Remove it immediately.** Never blend untreated material into the **LithTec™** lift. Move all cuts and loose material *away* from the treated section, not onto it.

Scenario 5: Poor Surface Finish (Loose Material/Shearing)

- **Condition:** The surface looks rough, or the top layer is flaking off after final rolling.
- **Mitigation:**
  - **Tight Blade:** Perform a "clip" or "skin" cut (approx. 1/4 inch) with the motor grader to remove the loose tension layer.
  - **Final Roll:** Immediately follow the blade with a smooth drum roller (static or low vibration) and a light water spray to seal the surface.
  - **Brooming:** Prior to priming, lightly broom off any remaining loose fines to ensure the prime coat penetrates the solid base.

Disclaimer: This document is provided for advisory purposes to outline best practices for **LithTec™** installation. The provision of these recommendations does not absolve the Contractor of their contractual obligation to perform the work in accordance with the project-specific design plans and specifications. **Furthermore, while the Owner or Project Engineer may elect to adopt these advisory recommendations as mandatory contract specifications, they assume full ownership and risk for the application and enforcement of said requirements.**