



A Guide to Full-Depth Reclamation with LIQUIDOW Calcium Chloride



What is Full-Depth Reclamation?

Full depth reclamation is a road reclamation process in which the existing asphalt surface and the underlying base are pulverized and mixed together to form an upgraded homogenous new base. This offers several advantages over conventional road reclamation techniques. The advantages of full depth reclamation include:

- The process is performed entirely at the job site. This means that the costs of removing, loading, hauling, crushing, and sizing of the old pavement are eliminated, along with the need for disposal.
- Fewer workers and less equipment are required, resulting in lower costs, a less cluttered roadway and better traffic flow.
- Faulty roadway cross sections can be adjusted. For example, grades can be lowered to restore curbs that have been lost due to numerous overlays; or sections that drain poorly can be improved.
- Natural resources are conserved, since all of the existing aggregate and asphalt concrete are reused.
- Reflective cracking, a problem with overlays, is non-existent.
- The structural integrity of the base is increased—a denser, more compact base increases road life and improves riding quality.
- Total pavement thickness can be reduced, resulting in lower material costs.

These benefits provide enormous savings in terms of material and labor. Material costs are reduced because the addition of pulverized asphalts upgrades the previously poor base, thereby reducing or eliminating the need for additional virgin aggregate. Labor costs are minimized because less overall labor is needed.

Typical Reclamation Projects

There are many potential candidates for full depth reclamation. While every roadway is unique, several types are particularly well-suited to full depth reclamation.

BASE FAILURES

Secondary roads often suffer from base failure. In all likelihood, these roads began as wagon paths with surfaces gradually being upgraded to dirt, gravel, and asphalt. Their bases were never designed to support modern axle weight and traffic volume. If the base is not improved, the surface will continue to deteriorate, exhibiting potholes, dips, bumps, heavy rutting, etc.

INSUFFICIENT BEARING CAPACITY

Reclamation allows a road to be substantially strengthened because it involves the thorough restructuring of the road itself. A road's mechanical properties improve with the addition of a stabilizing agent that can be added in a one-pass or multiple-pass operation.

CRACKED ASPHALT SURFACES

Water can enter the base and cause structural problems in roads with cracked asphalt surfaces. While overlays will temporarily seal the surface, reflective cracking usually occurs quickly, causing the water penetration problem to persist. It is much more effective to pulverize the asphalt, add a stabilization agent, or virgin aggregate if needed, and combine this with the old base. This creates a solid foundation for an overlay.

GRAVEL ROADS

Gravel roads also make ideal candidates, since reclamation can provide them with a stable base. Existing aggregates are blended with the underlying soil and the proper additives; shaping and compacting them prepare the way for a wearing surface.

Benefits of Using LIQUIDOW* 38% Liquid Calcium Chloride

Calcium chloride has a number of unique physical properties that make its use beneficial in road reclamation. Compared to plain water, a calcium chloride solution possesses a stronger moisture film, greater surface tension, reduced vapor pressure, and lower freezing point. These properties, calcium chloride's "thirst" for water, and its tenacious retention of water, provide several benefits in a program of roadbase stabilization. Here are nine such benefits:

1 GREATER DENSITY

Research and field application tests have repeatedly shown that adding the proper amount of calcium chloride to the roadbase aggregate results in a greater density in the aggregate than would be achieved by the use of water alone. See Figure 1.

This is due in large measure to a calcium chloride solution's stronger moisture film. It enhances the lubrication effect with less moisture, permitting the aggregate components, under mechanical compaction, to slide easily against each other as they compact.

2 LESS COMPACTIVE EFFORT

In one experiment, a greater density was achieved at the end of four rollings when calcium chloride had been added to the aggregate than had been achieved with nine rollings when only plain water had been added. In a business where time is of the essence, a little calcium chloride can make a big difference. See Figure 2.

3 SURFACE UNIFORMITY

Calcium chloride's moisture-retention properties provide an important benefit. Surface irregularities can be graded out and recompact without affecting the moisture content of the aggregate, resulting not only in a surface which is smooth and hard, but a roadbase which is uniformly dense throughout its depth.

4 MINIMIZE REQUIRED BINDERS

By increasing the strength of the moisture film and the surface tension of water, calcium chloride provides a binding action of its own. This reduces the amount of fines required for satisfactory cohesion, as well as the possibility of softening due to capillary action.

Figure 1 — Density Comparison of Stabilized Surface Materials with Various Amounts of Calcium Chloride Added

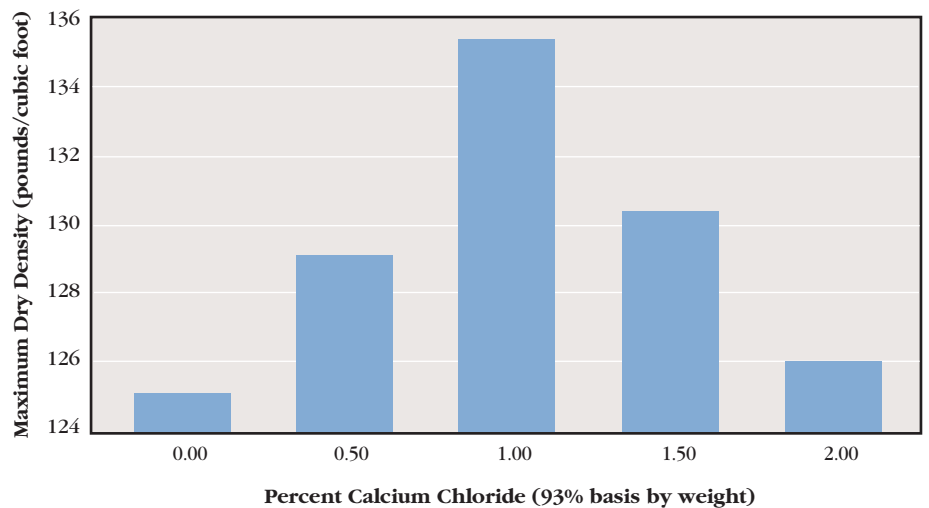
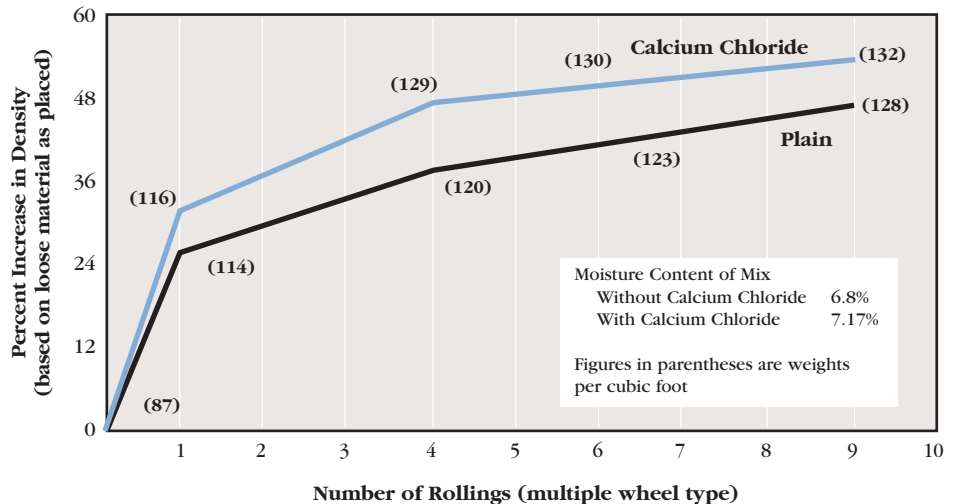


Figure 2 — Competition test. The use of calcium chloride greatly reduces the compactive effort required to achieve specific densities.



5 OPTIMUM MOISTURE CONTROL

Calcium chloride's hygroscopic qualities, together with its ability to lower the vapor pressure of water, work to inhibit evaporation. Unless moisture is held within optimum limits, adequate densities will not be achieved, resulting in an unstable roadbase. See Figure 3.

6 FROST PROTECTION

Calcium chloride's ability to depress the freezing point of water results in a roadbase with considerable resistance to frost heave. And it takes very little to be effective. In a well-graded aggregate, for example, only one half of one percent calcium chloride by weight is enough to virtually eliminate frost heave. See Figure 4.

7 EFFECTIVE STAGE CONSTRUCTION

As construction costs rise and highway funds shrink, there has been a growing tendency—especially in rural locations—to build new roads in interrupted stages over long periods of time, sometimes several years.

An unpaved wearing surface can be a maintenance nightmare, requiring frequent blading and constant replacement of aggregate.

Stabilizing surfaces through the use of calcium chloride in the base aggregate greatly reduces these maintenance expenses. Moreover, interim calcium chloride treatments in the spring and fall can further inhibit surface deterioration which can lead to large savings in aggregate replacements. And, when the time comes for paving, there's a hard, fully-cured and stabilized roadbase ready and waiting.

8 IMPROVED BOND

It is well known that a moist surface more readily absorbs priming materials than a dry surface. In fact, most engineers will wet the roadbase surface before applying any primers. Such pre-wetting practices are often unnecessary when calcium chloride has been used in the aggregate mix. Moreover, there is growing evidence that the presence of calcium chloride actually improves the bond strength of bituminous materials to a base course regardless of the extent of penetration.

9 DUST-FREE SURFACE

The use of calcium chloride ensures a tough, moist surface, minimal aggregate loss, and a work environment with plenty of fresh air and visibility. This is especially welcome when a portion of the roadbase is open to traffic.

Figure 3 — Evaporation loss. Calcium chloride results in a dramatic increase of moisture retention.

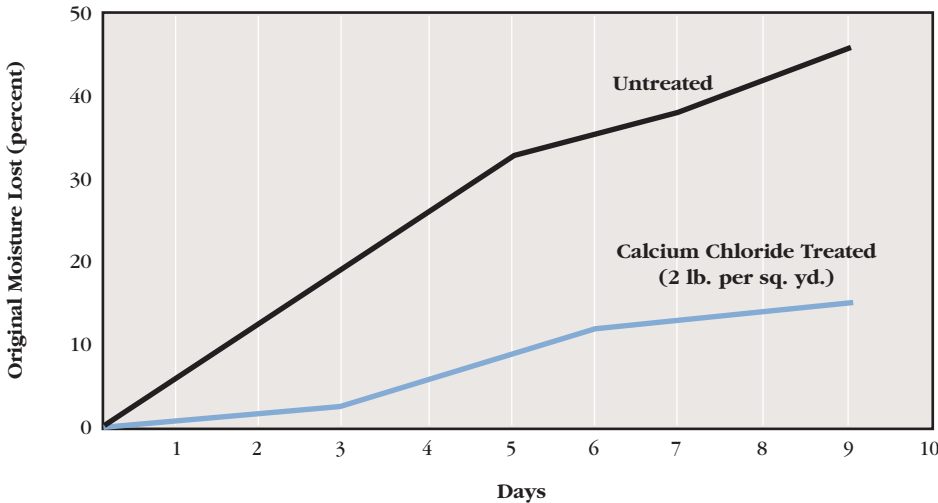
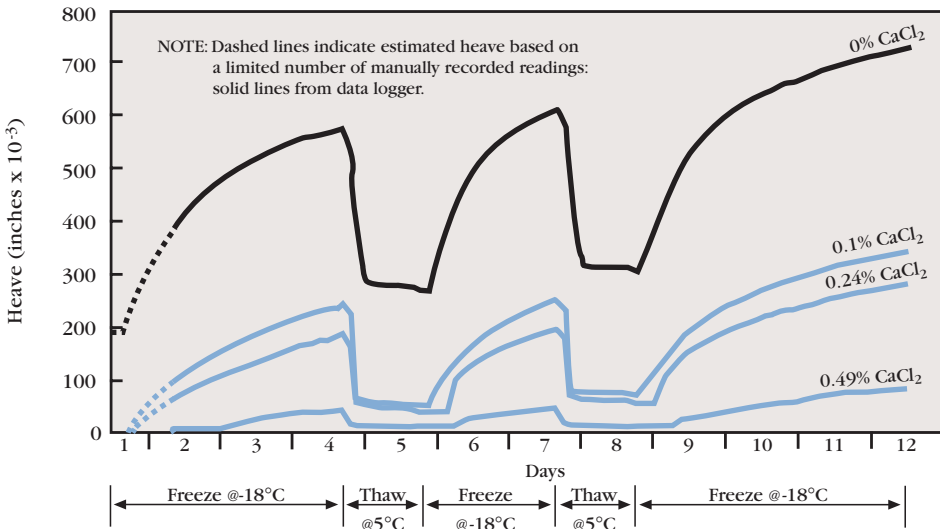


Figure 4 — Effect of calcium chloride on frost heave



Application Procedure



- 1 Pulverize the existing bituminous surface with the underlying base to desired depth with simultaneous addition of LIQUIDOW 38% liquid calcium chloride to the milling drum.* The application rate of 0.75 gal/yd² should be accurately controlled relative to ground speed and reclamation depth to assure uniform coverage of the stabilizing agent.



- 2 Grade and shape the road to the desired profile. An A-shaped crown is typically used to ensure proper drainage.



- 3 Roll the surface to compress the materials together. Typically, a single steel drum vibratory compactor is used.



- 4 Top-dress the compacted surface with a second application of LIQUIDOW 38% liquid calcium chloride at a rate of 0.25 gal/yd². For some projects, it may be appropriate to eliminate this step by incorporating the additional liquid calcium chloride into the pulverization step.



- 5 Final wearing surface may be applied after curing. Exact curing times are difficult to predict because environmental conditions and weather vary. However, experience indicates that 1–2 weeks is typical.

* Note: If available equipment is not capable of liquid addition at the milling drum, it is equally effective to apply the liquid calcium chloride from a truck-mounted spray bar after milling by the reclaimer. Following this liquid application, a second pass by the reclaimer is used to thoroughly blend the mix.

***Full-Depth Reclamation with
LIQUIDOW 38% Liquid Calcium Chloride***

From roads plagued by potholes, dips, cracks, and buckling, to deteriorating parking lots and small airport runways, full depth reclamation with LIQUIDOW 38% liquid calcium chloride is the answer. The improvements are long lasting, because basic structural defects are corrected, not just the superficial symptoms. Enhanced compaction, bonding, curing and moisture control, combined with reduced labor and material cost, make full-depth reclamation with LIQUIDOW 38% liquid calcium chloride the ultimate solution to many road maintenance problems.

For more information, call
1-800-447-4369

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