LL-TEQ

Standard scope of work

Proudly made in Québec

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01 1. Purpose

This specification defines the technical requirements applicable to the *in-place rehabilitation of an existing asphalt pavement* by *Cold In-Place Reclamation (CIR) or Full Depth Reclamation (FDR)*, with integration of **LL-TEQ™ (LANDLOCK)** technology into the recycled materials.

The process aims to recover the existing pavement materials in order to rebuild a stable, durable and water-resistant structure that can serve as an improved recycled base for subsequent surfacing or, depending on the project, as a temporary wearing surface.

02 2. Scope of work

The work includes:

- Pulverization of the *existing asphalt pavement* and, if needed, part of the granular base
- Recovery and in-place treatment of the recycled materials from the existing pavement
- Uniform integration of a stabilizing agent into the recycled mix
- Reprofiling, grading and compaction of the retreated layer
- Preparation of the recycled structure to receive an asphalt surfacing or for temporary traffic, as required by the project
- Any work required to correct weak or non-conforming zones before or during the work

03 3. Reference standards

The work must be carried out in accordance with the applicable standards, including in particular:

- ASTM D698 / D1557 – Proctor
- ASTM D1883 – CBR
- ASTM D5084 – Hydraulic conductivity
- ASTM C39 / C42 – Unconfined compressive strength (UCS)
- AASHTO T-324 – Hamburg Wheel Tracking
- Applicable provincial standards (CCDG)
- Project-specific plans and specifications

04 4. Materials

4.1 Stabilizing agent

LL-TEQ™ polymer-emulsion product, intended for the stabilization of the recycled materials from the asphalt pavement and the base.

The stabilized recycled mix must achieve an unconfined compressive strength (UCS) ≥ 1,500 psi at 28 days per ASTM C39/C42, a hydraulic conductivity ≤ 1×10^{-7} cm/s per ASTM D5084, and exhibit thermal stability with no softening at 60 °C.

4.2 Recycled materials

Materials recovered by pulverizing the existing asphalt pavement (RAP) and, where applicable, part of the granular base.

4.3 Adjustment aggregates (if required)

Materials added for gradation correction, increased cohesion or restoration of structural thickness.

4.4 Water

Clean water, used for conditioning and moisture adjustment.

05 5. Work preparation

Before stabilization, the following operations must be carried out:

- Pulverization or milling of the *existing asphalt pavement* to the depth specified in the project
- In-place recycling of the asphalt and granular materials targeted by the design
- Preliminary shaping of the recycled material
- Verification of bearing capacity by proof-roll or equivalent method
- Identification, excavation and correction of weak zones, pumping or instability
- Adjustment of the recycled material's moisture to near the optimum compaction value

As an indication, the treatment depth may typically be in the order of *100 to 150 mm*, or as per the adopted design.

06 6. Mixing and stabilization

- Mixing must be performed using a *reclaimer* or a soil stabilizer suited to asphalt-pavement recycling work
- The LL-TEQ™ agent must be integrated uniformly throughout the full treated thickness
- The mixing passes must ensure adequate pulverization of the existing asphalt material, homogeneous distribution of the stabilizer, a uniform texture and the absence of untreated zones
- Adjustment aggregates or fines may be added if required to improve the structure or correct the gradation of the recycled mix
- The final mix must show a homogeneous appearance in colour, texture and moisture

07 7. Shaping and compaction

The recycled and stabilized material must be graded to re-establish the longitudinal profile, crown, cross-slopes and transitions.

- Compaction must be carried out immediately after mixing
- The compaction equipment must be suited to the material and site conditions
- The number of passes, the sequence and the compaction methods must achieve the density required by the project, namely a minimum of 95% of standard Proctor
- Particular attention must be paid to edges, joints and tie-ins

08 8. Finishing and interface with the asphalt surfacing

Depending on the project requirements:

- The recycled and stabilized layer may be kept as an improved base
- An asphalt surfacing may be applied after sufficient curing of the retreated layer
- A light surface treatment using LL-TEQ™ may be applied to stabilize the surface fines, seal voids, improve surface cohesion and limit water penetration before paving or during a transitional phase

09 9. Opening to service

- Light traffic may be permitted once the retreated surface is judged stable; as an indication, reopening to light traffic is possible as early as *12 hours*, depending on the site and field conditions
- Full opening to service depends on weather conditions, moisture content and the development of stiffness in the recycled material
- As an indication, a curing period in the order of *24 to 72 hours* may be required
- Sharp turns and aggressive manoeuvres must be avoided early in curing

10 10. Quality control

10.1 Density

Measurement of in-situ density by an approved method; minimum compaction of 95% of standard Proctor.

10.2 Moisture

Control of the recycled material's moisture before and during compaction.

10.3 Uniformity

- Visual verification of mix homogeneity
- Absence of segregation
- Absence of untreated zones

10.4 Final geometry

- Verification of the profile
- Compliance with the crown
- Compliance with slopes and drainage

10.5 Initial behaviour

- Observation under initial traffic
- Verification of surface stability
- Absence of premature rutting or rapid disintegration

11 11. Environmental requirements

The work must favour the reuse of the existing pavement materials in order to:

- reduce excavation
- limit off-site hauling
- decrease the use of new materials
- reduce the environmental impacts associated with conventional reconstruction

The available testing also shows that, under the conditions tested:

- the migration of contaminants into water is reduced
- water in contact with the treated materials shows no measurable toxicity

(reference: runoff testing – EPA-type protocols)

12 12. General conditions

- The work applies specifically to *existing asphalt pavements to be rehabilitated in place*
- The treatment parameters must be adjusted according to the condition of the existing pavement, the nature of the recycled materials, the site conditions and the project requirements
- The acceptance criteria are defined in the project-specific specification, the plans and by the engineer of record

13 13. Expected results

The process aims at:

- the structural rebuilding of an existing asphalt pavement by in-place recycling
- the improvement of the bearing capacity of the recycled material
- the reduction of permeability
- the improvement of durability against water and freeze/thaw
- the optimization of the reuse of existing materials
- the creation of a stable recycled base able to receive an asphalt surfacing or to serve as a transitional surface depending on the project

14 14. Execution methods and procedures (SOP)

The work must be carried out in accordance with:

- recognized industry practices for in-place asphalt-pavement recycling
- the manufacturer's recommendations
- the applicable execution procedures (SOP)

The contractor must ensure that the crews master the retreatment, mixing, compaction and finishing methods related to the process.

15 15. Municipal and provincial applications

This specification is intended for projects involving:

- rehabilitation of existing asphalt pavements
- in-place retreatment of municipal roads
- optimization of bases before asphalt surfacing
- work on main roads or other segments targeted by the project requirements

16 16. Benefits

- Reduced reconstruction costs
- Reuse of existing materials
- Reduced hauling and use of new materials
- Improved structural performance
- Reduced environmental impacts associated with the work

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