

Types of FDR Stabilizing Agents Checklist

Full Depth Reclamation (FDR) is a rehabilitation technique in which the full thickness of the asphalt pavement and a predetermined portion of the underlying materials (base, subbase and/or subgrade) are uniformly pulverized and blended to provide an upgraded, homogeneous material.

Often, this blend of material alone, without any additional stabilizing agents, is sufficient to act as the base for a new surface course. However, if after proper project evaluation it is determined that the reclaimed materials need improvement or modification, there are three different methods of stabilization that can be used: mechanical, chemical, and bituminous.

Below is a checklist of these three types of stabilization.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

Sections

- **Mechanical Stabilization**
- **Chemical Stabilization**
- **Bituminous Stabilization**

Mechanical Stabilization

- Involves the incorporation of imported granular material**
 - May consist of crushed rock, recycled asphalt pavement (RAP), crushed concrete, or other types of aggregate approved by the owner agency
- The corrective aggregate gradation will vary depending on the desired effect on the final reclaimed material**
- Additional granular materials can be added by:**

- Mechanical spreader
- Windrows from belly dump trucks
- Tailgate spreading
- Usually spread prior to pulverization (single pass reclamation)**
- Grader cuts and shapes material to grade and cross-slope (can require grade control)**

Chemical Stabilization

- Chemical stabilization uses one or more of the following:**
 - Cement
 - Lime - hydrated or quicklime (dry or slurry)
 - Type C Fly Ash
 - Class F Fly Ash (when used in combination with other additives)
 - Kiln Dust
 - Cement (CKD)
 - Lime (LKD)
 - Calcium Chloride
 - Other chemical products
- Can be performed with a single pass or with multiple passes; multiple passes are most common**
- Dry application:**
 - Applied ahead of the reclaimer with calibrated spreading units
 - Care must be taken to not create excessive dust during placement and mixing of dry additives
- Slurry form:**
 - Applied either ahead of the reclaimer onto the pre-pulverized material, or through a spray bar integrated into the reclaimer's mixing chamber
- Check spread rate by confirming the area of coverage for each truck load using the certified weights and theoretical spread rate**

- Application rates should be checked on a regular basis by the contractor
- Water for compaction is typically added during the mixing pass with cementitious stabilizing agents
- With cementitious stabilizing agents, water is typically added during the mixing pass as there are time limits from the time the water and cement are mixed until compaction and final blading
- FDR processing should not be conducted when the asphalt pavement, base, subbase or subgrade is frozen, or when freezing temperatures are anticipated within 7 days of the end of FDR placement
- Minimum temperatures are typically specified and are based on local climate and owner agency requirements

Bituminous Stabilization

- Bituminous stabilization is accomplished with the addition of emulsified asphalt or foamed (expanded) asphalt
- Foamed (expanded) asphalt
 - Can be performed with a single or multiple passes
 - Multiple pass = more consistent injection when in thick or irregular pavement section
- Bituminous stabilizing agents are added through the reclaimer's liquid injection system
- Check spread rate by using reclaimer's on-board meter
 - The metering system should record the flow rate and total amount of liquid stabilizing agent placed
 - Confirm the rate by comparing the area of coverage for each tanker load using the certified weights and theoretical spread rate
- If a foamed asphalt bituminous stabilizing agent is used, the system should be coupled/interlocked with two microprocessor controlled systems complete with two independent pumping systems and spray bars to regulate

the application of foamed asphalt separate from water that is used to increase the moisture content for compaction

- Spray bars should be fitted with self-cleaning nozzles at a minimum spacing sufficient to ensure adequate application
- If a foamed asphalt bituminous stabilizing agent is used, the system should be equipped with an electrical heating system capable of maintaining the required temperature of the asphalt binder
- The half-life and expansion ratio should be checked by the contractor with each load of asphalt to ensure they meet or exceed the minimum requirements of the project specifications and the mix design
- To ensure optimum foaming characteristics the expansion ratio and half-life are checked in the field
 - Half-life is the time required for the foam to lose half of its maximum volume
- Expansion ratio is the volume of foamed asphalt to residual unfoamed asphalt
- A minimum expansion ratio of 8 and half-life of 6 seconds are typically specified
- The asphalt typically must be above 320 °F to achieve optimum foaming characteristics but should never be heated above 375 °F
- Moisture content should be within $\pm 2\%$ of the amount required by the mix design and project specifications
- Emulsified asphalt stabilizing agents contain water and the water added for compaction needs to take this additional moisture into account
- With foamed asphalt, the majority of the water is required for compaction
- Water for compaction can be added during the pulverization pass or mixing pass with bituminous stabilizing agents
- Water for compaction can be added through the reclaimer's on-board liquid additive system during pulverization

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- Bituminous stabilizing agents are mixed immediately upon application through the mixer/reclaimer's integrated fluid injection system
- Water can be added during the mixing pass if the reclaimer is equipped with two liquid injection bars
- Temperatures should be at least 45 °F (7 °C)
- No freezing weather within 7 days
- Heavy rain must not be occurring