Stormwater Best Management Practice

Chemical Stabilization

Minimum Measure: Construction Site Stormwater Runoff Control
Subcategory: Erosion Control

Description

Chemical stabilizers, also known as soil binders or soil palliatives, provide temporary soil stabilization. They are readily applicable to the surface of the soil, can stabilize areas that cannot establish vegetation, and provide effective protection from wind and stormwater erosion.

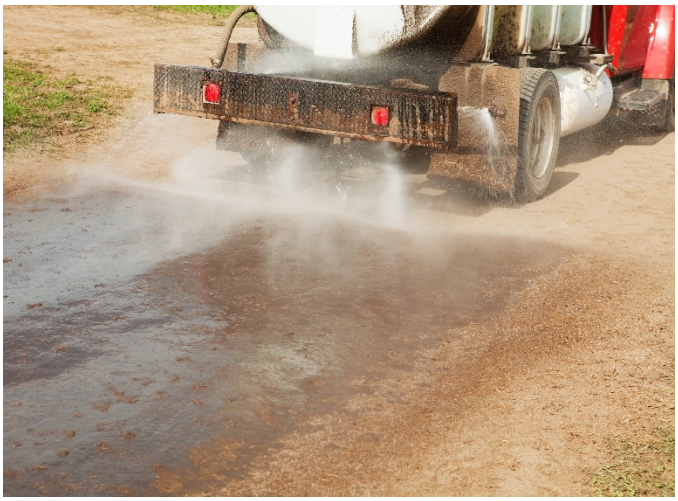
Categories of chemical stabilizers are as follows: water with surfactant, water-absorbing, organic non-petroleum, organic petroleum, synthetic polymer emulsion, concentrated liquid stabilizer and clay additive (Jones, 2017). Examples include calcium chloride, lignosulfonates, guar and polyacrylamide (PAM). In all cases, construction staff should follow local guidance regarding the suitability of individual products for specific applications.

Applicability

Construction staff can use chemical stabilizers in areas where other methods of stabilization are not effective due to site constraints, either alone or in combination with vegetative or perimeter practices to enhance erosion and sediment control.

Siting and Design Considerations

Construction staff should follow manufacturer recommendations for application procedures to prevent products from pooling and to ensure effective soil stabilization. Potential methods include spray-on treatment and mix-in applications. Where appropriate, construction staff should use proper personal protective equipment. Before selecting a chemical for soil stabilization, design engineers should consider environmental concerns, including toxicity and biodegradability. In most cases, local permitting authorities should provide guidance on product suitability, acceptability and use restrictions for environmentally sensitive areas. The latest EPA Construction General Permit also provide insights on the permitting requirements, use and storage of chemicals at construction sites covered under EPA's permit.



A truck applies chemical stabilizers to a roadway for dust suppression.

The following is a list of site and design factors that design engineers should consider before using chemical stabilization for erosion control:

- Chemical/soil compatibility
- Dosage or application rate
- Cure time
- Potential for export of unreacted chemical
- Degradation rate
- Reapplication rate

Limitations

Chemical stabilization is usually more expensive than vegetative practices and generally creates environmental concerns. Cationic polymers can be highly toxic to aquatic organisms and require federal and local approval on a case-by-case basis (U.S. EPA, 2019). Chloride compounds are effective for stabilization but could limit vegetation establishment due to the toxicity of chloride to plants (MPCA, 2019). Glycerin-based stabilizers, lignosulfonates, molasses-based stabilizers and plant oil-based stabilizers can negatively impact aquatic life by increasing biological oxygen

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demand as they degrade in receiving waters (Jones, 2017). Petroleum-based chemical stabilizers adversely affect plants and water resources (MPCA, 2019).

Effectiveness

The effectiveness of chemical stabilization methods varies significantly based on site conditions and the chemical type. For example, chloride-based compounds require humidity for effective performance, and organic petroleum products do not perform as well in high-traffic areas. For any project considering chemical stabilization, its effectiveness depends on the consideration of all possible environmental interactions and close communication with local regulating authorities and chemical manufacturers.

Cost Considerations

The cost of chemical stabilization can vary widely depending on the site, chemical, application technique and application rate. For larger sites, truck-mounted applicators may be more cost-effective despite having higher equipment costs. The cost of the chemicals themselves also varies considerably. Polyacrylamide, one of the more common soil palliatives, costs around $6 per pound. Therefore, when using a minimum suggested application rate of 20 pounds per acre (McLaughlin, 2015), the chemical cost is at least $120 per acre. Calcium chloride costs around $0.50 per pound (RSMeans, 2019) but requires an application rate of 1 to 3 tons per acre, resulting in a chemical cost of $1,000 to $3,000 per acre.

Additional Resources

- District of Columbia Department of Energy and Environment. (2017). *Erosion and sediment control manual*. Prepared for the Department of Energy and Environment, Watershed Protection Division by the Center for Watershed Protection, Inc.
- Mississippi Department of Environmental Quality. (2011). *Handbook for erosion control, sediment control and stormwater management on construction sites and urban areas: Volume I*.
- Montana Department of Transportation. (2015). Chapter 8: BMPs by category, SS-5 soil binders. In *Erosion and sediment control best management practices manual* (pp. 35–38).
- Ohio Environmental Protection Agency. (2014). Chapter 7: Soil stabilization. In *Rainwater and land development manual*.
- U.S. Department of Agriculture. (2016). *Conservation practice standard for anionic polyacrylamide (PAM) application (450-CPS-1)*.

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

References

U.S. Environmental Protection Agency (U.S. EPA). (2015). *Model post-construction stormwater runoff control ordinance.* Washington, DC: U.S. Environmental Protection Agency.

Jones, D. (2017). *Guidelines for the selection, specification and application of chemical dust control and stabilization treatments on unpaved roads* (UCPRC-GL-2017-03). University of California Pavement Research Center.

McLaughlin, R. (2015). *Using polyacrylamide (PAM) to reduce erosion on construction sites*. NC State Extension Publications.

Minnesota Pollution Control Agency (MPCA). (2019). Erosion prevention practices—site stabilization. In *Minnesota stormwater manual*.

RSMeans. (2019). Earthwork data from Gordian [Online data file]. RSMeans data from Gordian.

U.S. Environmental Protection Agency (U.S. EPA). (2019). *2017 Construction General Permit (as modified)*.