Pavement & Materials Partnering Committee
Decision Document
Use of Lime or Cement to Dry Up Soils
August 6, 2022

Problem Statement

Soil drying up or modification of subgrade has been used by Caltrans on a limited basis, but there are no Standards to specify its application for the use on the construction of Caltrans pavements and related embankments. Modification is commonly used to provide all-weather access during construction activities. Current specifications for lime and cement treatments are for stabilization of subgrade and used for permanent structural pavement design purposes which requires mix design testing for approval. Due to the unforeseen and time sensitive nature of mitigation of unsuitable materials, the additional testing entailed in mix design is prohibitive to the effective application of lime and cement to modify the in-placed materials.

Background

Minnesota, Iowa, Texas, Ohio and other States allow soil modification for drying up pavement foundation materials to expedite construction without considering any structural benefits. Cement, as well as Hi-Cal and Dolomitic quick lime are the common reagents used in California. Industry stated that hydrated lime is not as effective due to limited quantities for soil modification purposes.

Lime or cement modification of subgrade is used to mitigate subgrade instability, aid in reducing excess moisture in the basement soils in efforts to achieve the specified relative compaction and/or achieve a stable working platform to support subsequent pavement construction operations.

Modification is also commonly used to provide all-weather access during construction activities. Current specifications for lime and cement treatments are for stabilization of subgrade and used for permanent structural pavement design purposes which requires mix design testing for approval.

Due to the unforeseen and time sensitive nature of mitigation of unsuitable materials, the additional testing entailed in mix design is prohibitive to the effective application of lime and cement to modify the in-place materials. Contractual efforts to utilize modification on Caltrans projects through the Value Engineering Cost Proposal (VECP) process have been unsuccessful due to schedule delays resulting from additional time required to conduct the mix design testing.

Current construction practices consist of removing unsuitable/unstable materials and replacing them with suitable/stable materials, or over excavating and drying subgrade materials which takes considerable construction time. In addition to increased construction costs and time, this practice also increases greenhouse gas (GHG) emissions and construction-related trucking of materials.

Drying up or modification of in-placed materials reduce costs and construction time delays and reduces the environmental and community impacts due to construction-related trucking of materials.

The development of a Caltrans specification for lime or cement modification is needed to realize the beneficial impacts on construction process and GHG footprint reduction.

Recommendation

Add new section 24-4 Drying Soil in Standard Specification section 24:

> 24-4 Drying Soil
>
> If you request and engineer approves, you can dry basement soils with the amount of lime or cement required to dry up the soils and create a firm and unyielding working platform to support subsequent construction operations.
>
> Lime must comply with section 24-2.02 and lime should not be used in slurry.
>
> Cement must comply with section 24-3.01.
>
> Mixing of lime with soil comply with section 24-2.03D, compaction comply with section 24-2.03F, and finish grading comply with 24-2.03F.
>
> Mixing of cement with soil comply with section 24-3.03D, compaction comply with section 24-3.03E, and finish grading comply with 24-3.03F.
>
> The drying up or modification of soil should not be considered if sulfate content is more than 0.3 percent dry weight of soil tested under CT 417.
>
> The department does not pay for drying up or modification of soil.

Fiscal Impact

There will be no fiscal impact for Caltrans and contractor as this will reduce construction time delays and save cost of idling equipment and labors.

Stakeholder Impact

Contractor will have option to use lime or cement to dry basement soils and expedite construction and reduce impact of construction on traffic.

Policy Impact

The is an option for contractor to request to use lime or cement for drying wet basement soils and need to update Standard Specification section 24 and Construction Manual.

Risks

There is possibility that lime, or cement and basement soil may not be mixed thoroughly and could have differential vertical movement that could impact pavement performance. The use of lime to dry or modify basement soils with plasticity index less than 10 may not be effective and could negatively impact construction process.

The use of cement for drying of soil will not be appropriate as applying, mixing, and compaction could take more time than 4 hours and it could be difficult to compact to required compaction after hydration of cement which starts before 4 hours of mixing cement with soil and water.

Proposed Implementation Schedule

Drying up provision could be used immediately as an NSSP after approval.

Implementation Coordinator(s)

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