

ENGINEERING DIRECTIVES AND STANDARDS

Volume	Chapter	Section	Directive Number	Effective Date
V	1	1	1	1/23/1978

SUBJECT: POLICY FOR USING EMBANKMENT MATERIALS WITH SWELL POTENTIAL

- PURPOSE:** The purpose of this directive is to establish a procedure to make soils having swell potential usable in highway embankments.
- SCOPE:** This directive shall apply to all construction projects where soils having swell potential are encountered and restricted use of the soils is required. Soils having swell potential may be utilized as part of the load bearing embankment when Method A or Method B treatment is provided as described below. Soils having swell potential may be utilized without treatment only when they are not placed as part of the load bearing embankment. The load bearing embankment shall constitute crown width extended on a 1:1 slope for the height of the embankment.
- PROCEDURE:** The many varying traffic and roadway characteristics dictate a consideration of several ways to approach the problem of swelling or potentially swelling soils in embankments. Recognizing these variations, two basic methods of handling potentially swelling soils are described below.

Method A is directed towards those projects which have a low tolerance for soil swell, such as high traffic volume, high speed, numerous or close-spaced bridges and embankments more than several feet in height. In Method A, preventative treatment is applied to the embankment soil to minimize soil swell.

Method B is directed toward those projects which have a higher tolerance for soil swell, such as low traffic volume, low embankment heights, and infrequent bridges.

Design treatments for soils with swell potential are identified by categories of plasticity indices as shown below. Unless indicated on the plans or in the project specifications, Method B shall be used. In the event Method A is not indicated on the project specifications and it is determined that Method A or additional lime is required on all or a portion of the project, then a supplemental agreement will be made to reimburse the contractor for the invoice cost of the additional lime required. No payment will be made for additional processing.

SOIL TREATMENT		
Soil Plasticity Index Range	Method A	Method B
Less than 20	Acceptable as is	Acceptable as is
20 thru 35	5% hydrated lime by volume	Acceptable as is
36 thru 45	8% hydrated lime by volume	4% hydrated lime by volume (Note 1)
46 thru 60	11% hydrated lime	6% hydrated lime by volume (Note 2)
Above 60	Not Acceptable	Not Acceptable

Note 1: The material can be approved without lime treatment with the stipulation that the moisture content at the time of compaction will equal or exceed 2% above the optimum moisture content as determined by DOTD Designation TR 415.

This material may be used in the lower portion of embankments provided it does not constitute more than 20% of the embankment height.

In the event various ranges of PI are found in the same excavation area, and it is felt that proper excavation and mixing procedures would result in a uniform material, then the average plasticity index shall be determined representing this material.

Note 2: The material can be approved without lime treatment for use in the lower portion of embankments provided it does not constitute more than 20% of the embankment height.

In the event various ranges of PI are found in the same area, and it is felt that proper excavation and mixing procedures would result in a uniform material, then the average plasticity index shall be determined representing this material.

The average PI value will be determined by the Laboratory as follows:

- 1) Unclassified Excavation: The average PI value for each general roadway area of soils requiring lime treatment will be determined from the subgrade soil survey data, and the lime content corresponding to this PI value in the foregoing table shall be used.
- 2) Borrow Excavation: The average P1 value will be determined for each borrow source requiring lime treatment, and the lime content corresponding to this P1 value in the foregoing table shall be used. The following procedure will be used to determine the average P1 value for a borrow source.
 - a) Borings: A minimum of one boring per acre will be taken to the depth of the proposed excavation. (Additional borings may be taken as determined by the Laboratory Engineer or his designated representative.)
 - b) P1 Contribution: The P1 value for each sample from each boring will be multiplied by the soil volumes.
 - c) Average P1 for the borrow source will be calculated as follows:

$$\text{Average P1} = \frac{\text{Total P1 Contribution}^*}{\text{Total Soil Volume}^{**}}$$

*Sum of P1 Contribution of all samples

**Sum of Soil Volumes represented by all samples

If the materials from more than one borrow source are placed concurrently in the same embankment area, the required lime content for that embankment area will be the highest lime content determined for the borrow sources involved.

The furnishing and placing of hydrated lime for embankments will be considered as incidental to the embankment work and will not be measured for separate payment. Mixing shall be accomplished with ordinary embankment construction methods and equipment.

4. **OTHER ISSUANCES AFFECTED:** All directives, memoranda or instructions issued heretofore shall remain in effect for projects currently under contract.
5. **EFFECTIVE DATE:** This directive will apply to all projects on which bids are received beginning in March, 1978.

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