General Information

A. Introduction

The performance of pavements depends upon the quality of subgrades and subbases. A stable subgrade and properly draining subbase help produce a long-lasting pavement. A high level of spatial uniformity of a subgrade and subbase in terms of key engineering parameters such as shear strength, stiffness, volumetric stability, and permeability is vital for the effective performance of the pavement system. A number of environmental variables such as temperature and moisture affect these geotechnical characteristics, both in short and long term. The subgrade and subbase work as the foundation for the upper layers of the pavement system and are vital in resisting the detrimental effects of climate, as well as static and dynamic stresses that are generated by traffic. Furthermore, there has been a significant amount of research on stabilization/treatment techniques, including the use of recycled materials, geotextiles, and polymer grids for the design and construction of uniform and stable subgrades and subbases.

However, the interplay of geotechnical parameters and stabilization/treatment techniques is complex. This has resulted in a gap between the state-of-the-art understanding of geotechnical properties of subgrades and subbases based on research findings, and the design and construction practices for these elements. The purpose of this manual is to synthesize findings from previous and current research in Iowa and other states into a practical geotechnical design guide for subgrades and subbases. This design guide will help improve the design, construction, and testing of pavement foundations, which will in turn extend pavement life.

The primary consideration for this chapter is that new and reconstruction projects of pavement require characterization of the foundation soils and a geotechnical design. This chapter presents definitions of the terminology used and summarizes basic soil information needed by designers for different project types for pavement design and construction, including embankment construction, subgrade and subbase design and construction, subsurface drainage, and subgrade stabilization.

B. Definitions

Atterberg Limits:

- **Liquid Limit (LL):** The moisture content at which any increase in the moisture content will cause a plastic soil to behave as a liquid. The limit is defined as the moisture content, in percent, required to close a distance of 0.5 inches along the bottom of a groove after 25 blows in a liquid limit device.
- **Plastic Limit (PL):** The moisture content at which any increase in the moisture content will cause a semi-solid soil to become plastic. The limit is defined as the moisture content at which a thread of soil just crumbles when it is carefully rolled out to a diameter of 1/8 inch.
- **Plasticity Index (PI):** The difference between the liquid limit and the plastic limit. Soils with a high PI tend to be predominantly clay, while those with a lower PI tend to be predominantly silt.

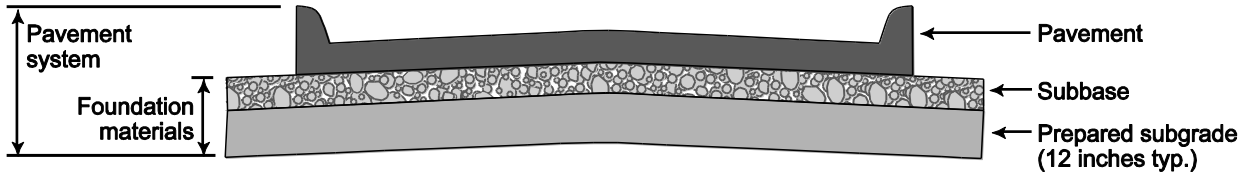
Flexible Pavement: Hot Mix Asphalt (HMA) pavement, also commonly called asphalt pavement.

Pavement System: Consists of the pavement and foundation materials (see Figure 6A-1.01).

Foundation Materials: Material that supports the pavement, which are layers of subbase and subgrade.

Pavement: The pavement structure, the upper surface of a pavement system, or the materials of which the pavement is constructed, including all lanes and the curb and gutter. Consist of flexible or rigid pavements, typically Hot Mix Asphalt (HMA) or PCC, respectively, or a composite of the two.

Figure 6A-1.01: Typical Section



Rigid Pavement: PCC pavement, also commonly called concrete pavement.

Subbase: The layer or layers of specified or selected material of designed thickness, placed on a subgrade to support a pavement. Also called granular subbase.

Subgrade: Consists of the naturally occurring material on which the road is built, or the imported fill material used to create an embankment on which the road pavement is constructed. Subgrades are also considered layers in the pavement design, with their thickness assumed to be infinite and their material characteristics assumed to be unchanged or unmodified. Prepared subgrade is typically the top 12 inches of subgrade.