

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND

1.1.1. SHRP 2 R02

Although in existence for several decades, many geoconstruction technologies face both technical and non-technical obstacles preventing broader utilization in transportation infrastructure projects. The research team for Strategic Highway Research Program 2, Project Number R02 (SHRP 2 R02) *Geotechnical Solutions for Soil Improvement, Rapid Embankment Construction, and Stabilization of the Pavement Working Platform* is investigating the state of practices of transportation project engineering, geotechnical engineering, and earthwork construction to identify and assess methods to advance the use of geoconstruction technologies. Such technologies are often underutilized in current practice, and they offer significant potential to achieve one or more of the SHRP 2 Renewal objectives, which are rapid renewal of transportation facilities, minimal disruption of traffic, and production of long-lived facilities. Project R02 encompasses a broad spectrum of materials, processes, and technologies within geotechnical engineering and geoconstruction that are applicable to one or more of the following “elements” of construction (as defined in the project scope): (1) new embankment and roadway construction over unstable soils; (2) roadway and embankment widening; and (3) stabilization of pavement working platforms.

1.1.2. Information & Guidance System

An Information & Guidance System has been developed to provide a framework for applying the technologies, and is contained on the SHRP 2 R02 Geotechnical Solutions for Transportation Infrastructure website, www.GeoTechTools.org. The system will promote more widespread use of soil improvement technologies to achieve SHRP 2 Renewal objectives. This system provides the data necessary for determining the applicability of specific technologies to specific projects, and then guides the user to information needed to apply the selected technology. The Information & Guidance System will guide the user to one or more potential technologies. From these potential technologies, the user can access the catalog which includes information necessary for screening (i.e., depth limits, applicability to different soil types, acceptable groundwater conditions, applicability to different project types, ability to deal with project-specific constraints, general advantages/disadvantages, etc.), as well as design methodologies, quality assurance and control, costs, and specifications.

1.2. SCOPE

The Information & Guidance System has been developed to identify potential technologies to use for general project conditions. However, it does not identify where a combination of technologies should be considered. Such consideration is very project conditions/constraints-specific. Because of this, the engineer needs to identify how different technologies can be combined and where and when they can be combined.

This paper is provided as part of the Information & Guidance System to discuss the use of a combination of two or more ground improvement technologies for a single application and explain the potential benefits of these combinations. It includes possible combinations and the reasons these combinations are efficient based on soil and site parameters. It also includes case histories of the successful use of multiple technologies to stabilize soils under an embankment. This paper does not include design guidelines or procedures, quality control/quality assurance procedures, seismic design considerations or detailed information about specific ground improvement technologies (this can be obtained from the Information & Guidance System). This paper is intended for use in conjunction with the Information & Guidance System. However, if the Information & Guidance System is not available, summary fact sheets for the technologies discussed can be found in an appendix to this paper.

While this paper will give numerous possible and successful combinations, it does not give all the potential ground improvement technology combinations. The engineer should use this paper as a guide only and research other potentially useful combinations. The design of any ground improvement project and especially when combining two or more ground improvement techniques must consider both site and project specific constraints and objectives. The design should also consider constructability as this is often the key to a successful project.

1.3. ORGANIZATION

The first section of this paper discusses the different foundation treatment technologies that can be combined to improve unstable soils and the embankment construction technologies that can be used in conjunction with the foundation treatment technologies. A brief summary of each technology and its applications is provided with links to further information as stated above either in the Information & Guidance System or attached as an appendix to this paper.

The following section discusses the combinations of the technologies found in the literature review. The final section of the paper summarizes successful case history summaries for a number of the combinations, and provides references for additional case histories that were not summarized.