

**EXHIBIT A
SCOPE OF SERVICES**

FULL DEPTH RECLAMATION FOR URBAN AND SUBURBAN STREET APPLICATION

BACKGROUND

Full depth reclamation (FDR) is widely recognized as a cost-effective rehabilitation method for road reconstruction and can provide increased structural capacity when additional stabilizing agents are used. While this method has been extensively used and evaluated for higher traffic roads, it has received less attention as a rehabilitation alternative for suburban/urban and local roads that pose a number of challenges and restrictions on the construction process. The objective of the project is to evaluate the advantages and limitations of using FDR for these types of roads and to propose guidelines for implementing FDR as a rehabilitation procedure for these situations. A literature review and survey will be conducted, followed by experimental work and life cycle cost analysis to identify the most suitable and cost effective technology.

OBJECTIVE

Most of the work performed on FDR addresses technological and construction issues related to rehabilitation of highway pavements. There is very limited information on application of FDR to suburban/urban and local roads and are the costs and benefits associated with this technology. Developing guidelines for application of FDR to these types of pavements can offer a cost effective alternative to the current methods used for road repair and preservation. Identifying the right combination of technologies and materials for FDR applications has the potential to offer city and county engineers a rehabilitation tool that has already been proven in highway applications and can provide a more predictable/programmable investment strategy.

SCOPE

This research aims to develop guidelines for implementing FDR as a rehabilitation alternative for city and county roads. FDR is already a mature technology for highway pavements applications. First, a literature review will be performed to identify any case studies describing the use of FDR for these types of roads and to obtain relevant information on the limitations of using FDR in suburban/urban and local roads conditions, such as keeping the elevation constant, avoiding very steep ditches, using stabilizing agents. Secondly, a survey will be performed at the state, and possibly national level to identify current practice. Based on the first two tasks, a limited experimental investigation and a life cycle cost analysis will be performed to identify FDR designs that would provide the most durable and cost effective solutions for typical local pavements. This work will build on the work already in progress at the University of Minnesota on identifying an optimal mix design of full depth reclamation stabilization with cement and emulsion. Lastly, preliminary guidelines will be proposed to help city and county engineers make informed decisions about the use of FDR for their road network.

ASSISTANCE

MnDOT will help with the distribution list for the survey and providing the materials that will be included in the experimental work. The University is already working with MnDOT's materials laboratory as part of another project focused on the development of an optimal mix design for Stabilized Full Depth Reclamation.

WORK PLAN

Task Descriptions

Task 1: Literature Review of Current FDR Practices and Issues

The University will perform a comprehensive literature review to document current FDR practices for city streets and identify potential limitations of FDR technology for city streets conditions.

Task 2: Conduct Survey on FDR Practice in Urban and Suburban Conditions

The University will develop a survey and conduct it to obtain relevant information about current practice in using FDR for cities and counties in Minnesota. The survey will be developed with assistance from the TAP members, who will approve the final version of the survey before distributing it. Distribution will be done with assistance from MnDOT staff using the State Aid distribution list. If possible, the University will collect additional information at the national level using organizations such as American Public Works Association and National Association of County Engineers.

Task 3: Preliminary Testing

Based on recommendations from TAP members, the University will select a set of laboratory test methods, prepare the corresponding specimens and perform preliminary tests.

Task 4: Laboratory Testing and Life Cycle Cost Analysis

The University will perform laboratory test methods selected in Task 3 on the FDR samples selected by the TAP members. The parameters obtained by analyzing the results of this experimental work will be used to run life cycle cost analysis scenarios to determine the most cost effective materials.

Task 5: Develop Preliminary Guidelines for FDR Application Urban/Suburban and Local Roads

Based on the information and results obtained in the first three phases, the University will develop preliminary guidelines for selecting the FDR technology that best fits urban/suburban and local roads.

Task 6: Compile Report, Technical Advisory Panel Review and Revisions

The University will prepare a draft report, following MnDOT's publication guidelines, to document project activities, findings and recommendations. This report will need to be reviewed by the Technical Advisory Panel (TAP), updated by the University's Principal Investigator to incorporate technical comments, and then approved by Technical Liaison before this task is considered complete. Holding a TAP meeting to discuss the draft report and review comments is strongly encouraged. The University may consult TAP members for clarification or discussion of comments.

Task 7: Editorial Review and Publication of Final Report

During this task the Approved Report will be processed by MnDOT's Contract Editors. The editors will review the document to ensure it meets the publication standard. This task must be completed within the contract time because the editors will provide editorial comments and request information from the University's Principal Investigator.

Task Deliverables

Task:	Deliverable(s):
1:	A Bibliography; A Memo, describing the search and what sources were explored to survey the current FDR practices and issues will be prepared; A Publishable Literature Review, documenting the current FDR practices and issues in the format of a MnDOT Research Services Transportation Research Synthesis (TRS)
2:	A Brief Report, documenting the survey content and the results of the survey
3:	A Brief Report, documenting the selection process and the sample preparation procedures and testing
4:	A Brief Report, documenting the experimental work and analysis of the results and the life cycle cost results
5:	A Brief Report, prepared to detail the guidelines developed
6:	A Draft Report and Final Report, approved for publication
7:	Final Published Report

PROJECT SCHEDULE

Task Completion Dates

Task:	Draft Deliverable Due Date:	Final Task Approval Date:
1:	September 30, 2014	November 30, 2014
2:	February 28, 2015	April 30, 2015
3:	April 30, 2015	June 30, 2015
4:	November 30, 2015	January 31, 2016
5:	January 31, 2016	March 31, 2016
6:	February 28, 2016	April 30, 2016
7:		June 30, 2016

Task Durations

Months:	2014						2015												2016					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Task 1	X	X	X	X	X																			
Task 2				X	X	X	X	X	X	X														
Task 3								X	X	X	X	X												
Task 4													X	X	X	X	X	X						
Task 5																X	X	X	X	X				
Task 6																			X	X	X	X		
Task 7																							X	X

Key Milestones

Key Milestones	Target Date	Description
Kickoff Meeting	August 31, 2014	
TAP Meeting	January 31, 2015	Meeting to select laboratory methods and materials to be tested

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