IOWA STATE UNIVERSITY
Department of Civil, Construction & Environmental Engineering

Author: Sharif Gushgari
Major Professor: Dr. Halil Ceylan
Co-Authors: Halil Ceylan, Sunghwan Kim, and Kasthurirangan Gopalakrishnan, Charles T. Jahren, and Douglas D. Gransberg

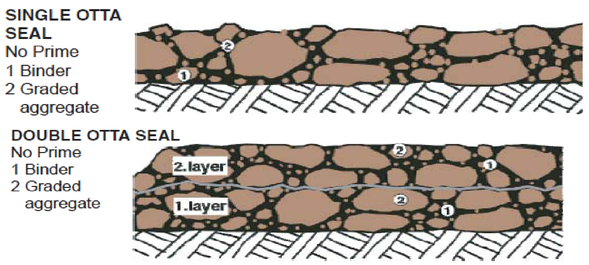
Otta Seal: A Low-Cost Alternative to Traditional Bituminous Surface Treatments for Unpaved Roads

Motivation

- Unpaved roads constitute a significant portion of the national road infrastructure in both developed and developing countries
- Due to exposure to traffic and environment, these roads experience continuous loss of gravel with the need for replacement at regular intervals
- Otta seal as a surface treatment for low volume unpaved roads utilizes local aggregate including a variety of aggregate gradation such as dense, open, and gap graded

Background

- Otta seal (first developed and applied in the Otta valley in Norway) was developed in 1963 by the Norwegian Road Research Laboratory (NRRL) as a low-cost maintenance alternative
- Otta seal is a low-cost alternative to traditional bituminous surface treatment (BST) that has been recently introduced in the United States
- The service life of Otta seal depends on different factors including the followings:
  - ❑ Type of Otta seal
  - ❑ Average daily traffic (ADT)
  - ❑ Quality of surfacing (aggregate strength, binder durability, construction quality, etc.)

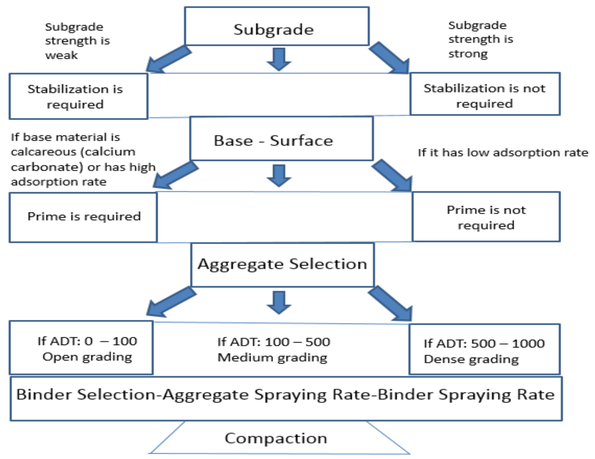


(Charles Overby, 1999)

Objectives

- Evaluate the feasibility of Otta seals as an alternative surface treatment on low volume roads using local aggregates
- Evaluate the cost effectiveness and performance of Otta seals compared to traditional bituminous seal coat surface
- Develop a guide for road selection in regard to the use of Otta seals as an alternative and develop guidelines for construction of Otta seals

Design Procedure



Binder selection

ADT	Aggregate Gradation		
	Dense	Medium	Open
More Than 1000	MC 3000 MC 800 if temp is below 15 C HFMS-2s	150/200 Pen. HFMS-2s	HFMS-2s
100 – 1000	MC 3000 MC 800 if temp is below 15 C HFMS-2s	150/200 Pen. HFMS-2s	150/200 Pen. HFMS-2s
Less than 100	MC 800 HFMS-2s	MC 3000	150/200 Pen.
* HFMS-2s is used in the United States mainly			

Binder Spraying Rate

- If ADT is less than 100 — 1.8-2.2 l/m^2
- If ADT is between 100-500 — 1.8-2.0 l/m^2
- If ADT is more than 500 — 1.6-1.8 l/m^2

(International Focus Group on Rural Road Engineering, 2003)

Aggregate Gradation

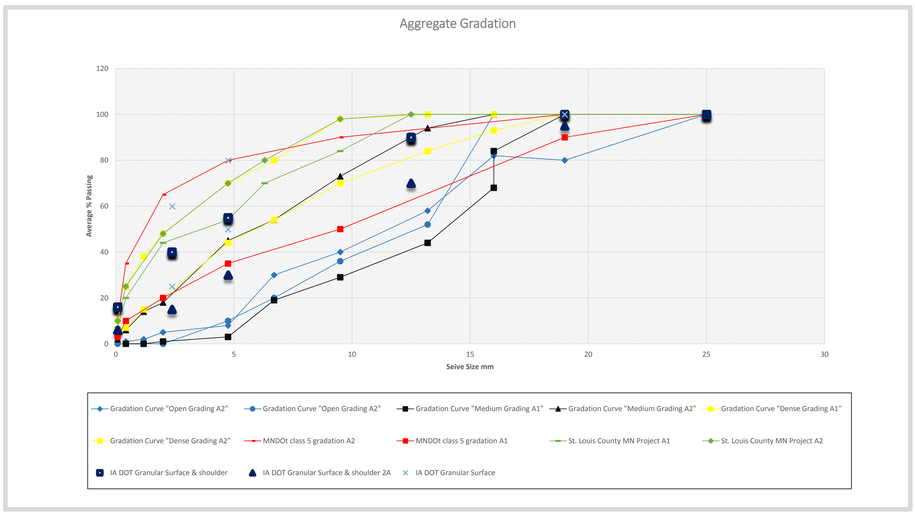


Figure 1. Variety of Aggregate Gradation Used for Otta seals from Different Projects

Importance of Research

Identifying alternative roadways to traditional bituminous seal coat is crucial for enabling practical and cost effective unpaved roadways.

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