



CaCl₂ Stabilization

North Dakota Division Office

Rugged North Dakota Landscape

Mark Schrader
Bridge Engineer
Federal Highway Administration
North Dakota Division Office



Discussion Points

North Dakota Division Office

Rugged North Dakota Landscape

- What is calcium chloride
- Forms of calcium chloride
- Methods and benefits of calcium chloride stabilization
- FHWA history with calcium chloride
- 2020 CaCl_2 projects in ND



Calcium Chloride

North Dakota Division Office

Rugged North Dakota Landscape

- A salt that draws moisture from the air.
- Liquid or Solid
- Liquid has lower concentration rates (<40%)
- Solid has higher concentration rates (>90%)



Liquid Form

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Solid Form

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Chloride Treatment Techniques

North Dakota Division Office

Rugged North Dakota Landscape

- Purpose
 - Reduce dust
 - Reduce rock resource depletion
 - Reduce costs (less blading & rock replacement)
- Annual Dust Treatments
- Heavy Stabilization Treatment



FHWA Use on Projects

North Dakota Division Office

Rugged North Dakota Landscape

- **Western Federal Lands**
 - Test Sections – 2008 & 2009
 - Trial Contract - 2009
 - Implementation – 2010 & 2011
 - Expanded Use – 2012 and 2014



Test Sections

North Dakota Division Office

Rugged North Dakota Landscape

- 2008 – 3 sections of 650 ft length; CaCL₂ rates from 1.7 - 2.7% added to aggregate @ 4" depth



Test Sections

North Dakota Division Office

Rugged North Dakota Landscape

- 2009 – 2 segments of one mile length; CaCL₂ rate of 2% added to aggregate @ 3" depth.



Test Sections

North Dakota Division Office

- 2009 – 12 miles/4 routes; CaCL2 rate of 2% mixed into imported (new) surface aggregate.



Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Plan Cover Sheet

Rugged North Dakota Landscape

North Dakota Division Office

JOB #29
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
ROM-0300(142)

Burke County, Mountrail County, Ward County, McLean County
Various Locations
Gravel Surfacing, Calcium Chloride Stabilization

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	ROM-0300(142)	22448	1	1

GOVERNING SPECIFICATIONS:

2014 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
Site G-11	4.847	4.847
Site G-08N	5.247	5.247
Site G-3	3.945	3.945
Site G-10	4.225	4.225
Site L-02(a)	3.081	3.081
Total	21.345	21.345



STATE COUNTY MAP

OTHER REVIEW

Approval Name _____ Date Signed _____

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Approval Name _____ Date Signed _____

MOORE ENGINEERING, INC.

This document was originally issued and sealed by Jonathan P. Mergenroth, Registration Number PE-6872, on 09/04/19 and the original document is stored at the North Dakota Department of Transportation



U.S. Department of Transportation
Federal Highway Administration

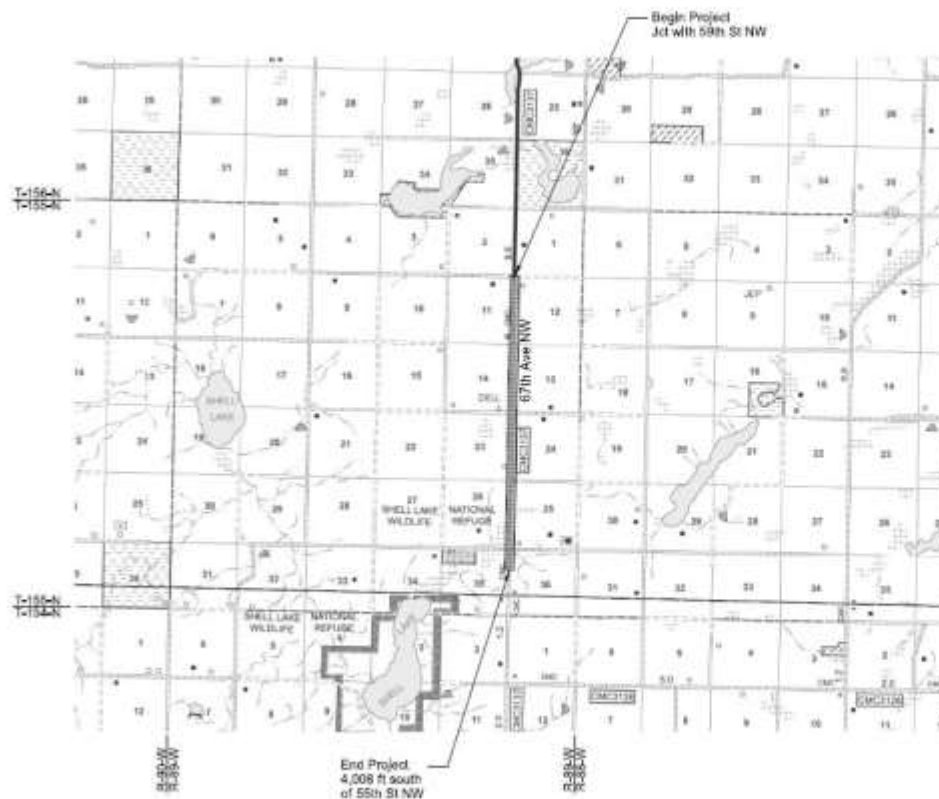
DESIGNER
Jonathan Mergenroth, PE
DESIGNER
Alison Hensley

G-11 – Mountrail



Rugged North Dakota Landscape

North Dakota Division Office

STATE	PROJECT NO.	SHEET NO.	SHEET TOTAL
ND	ROM-0300(142)	4	1



LEGEND

-  Chemically Stabilized Gravel Surfacing
-  4\" Gravel Surfacing and Chemically Stabilized Gravel Surfacing



This document was originally issued and sealed by Jonathan P. Morgenthau, Registration Number PE-8872, on 09/04/19 and the original document is stored at the North Dakota Department of Transportation

Scope of Work

Site G-11
67th Ave NW
Candam Chloride
Mountrail County



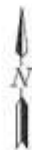
U.S. Department of Transportation
Federal Highway Administration

Rugged North Dakota Landscape

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	ROM-0300(142)	4	2



-  Chemically Stabilized Gravel Surfacing
-  4" Gravel Surfacing and Chemically Stabilized Gravel Surfacing



This document was originally
issued and sealed by
Jonathan P. Morgenthau,
Registration Number
PE-5872,
on 03/04/15, and the original
document is stored at the
North Dakota Department
of Transportation.

Scope of Work

Site G-08N
67th Ave NW
Caldera Chloride
Mountrail County



U.S. Department of Transportation
Federal Highway Administration

Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



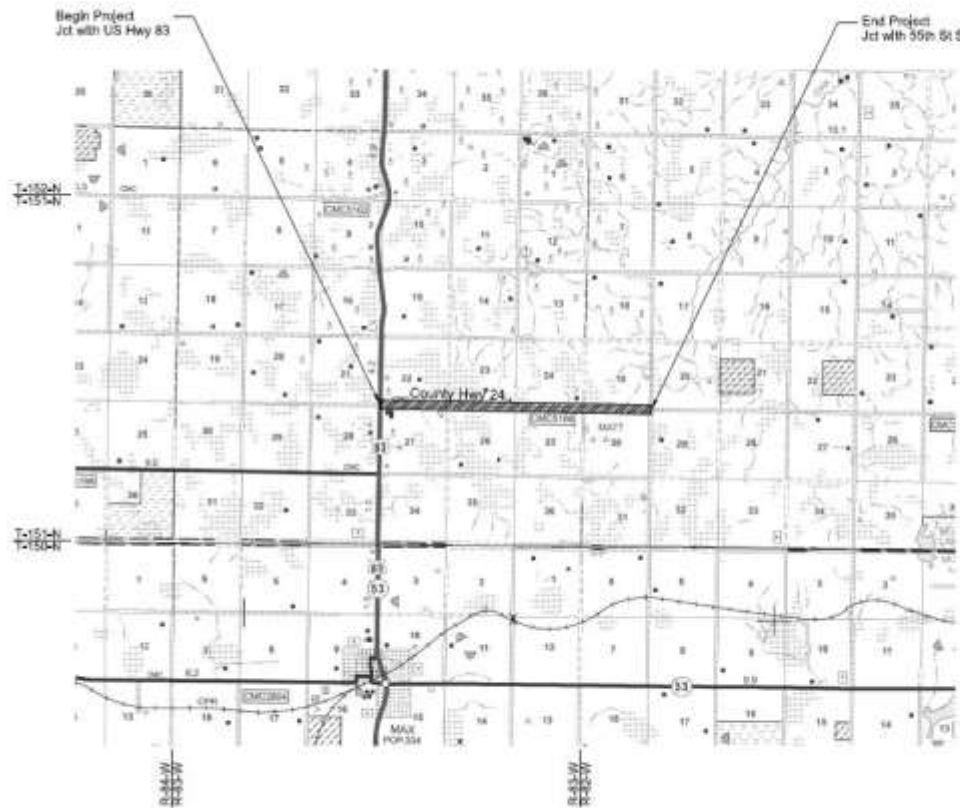
U.S. Department of Transportation
Federal Highway Administration

D-03 - Ward

North Dakota Division Office

Rugged North Dakota Landscape

STATE	PROJECT NO.	SHEET NO.	SHEET TOTAL
ND	RCM-0300(142)	4	3



LEGEND

-  Chemically Stabilized Gravel Surfacing
-  3" Gravel Surfacing and Chemically Stabilized Gravel Surfacing Option 1 - Additional 1" Gravel Surfacing and Chemically Stabilized Gravel Surfacing

3 inches total



This document was originally issued and sealed by Jonathan P. Morgenthau, Registration Number PE-6872, on 08/24/18 and the original document is stored at the North Dakota Department of Transportation

Scope of Work

Site D-3
County Hwy 24 (345th Ave SE)
Gravel Surfacing and Calcium Chloride
Ward County



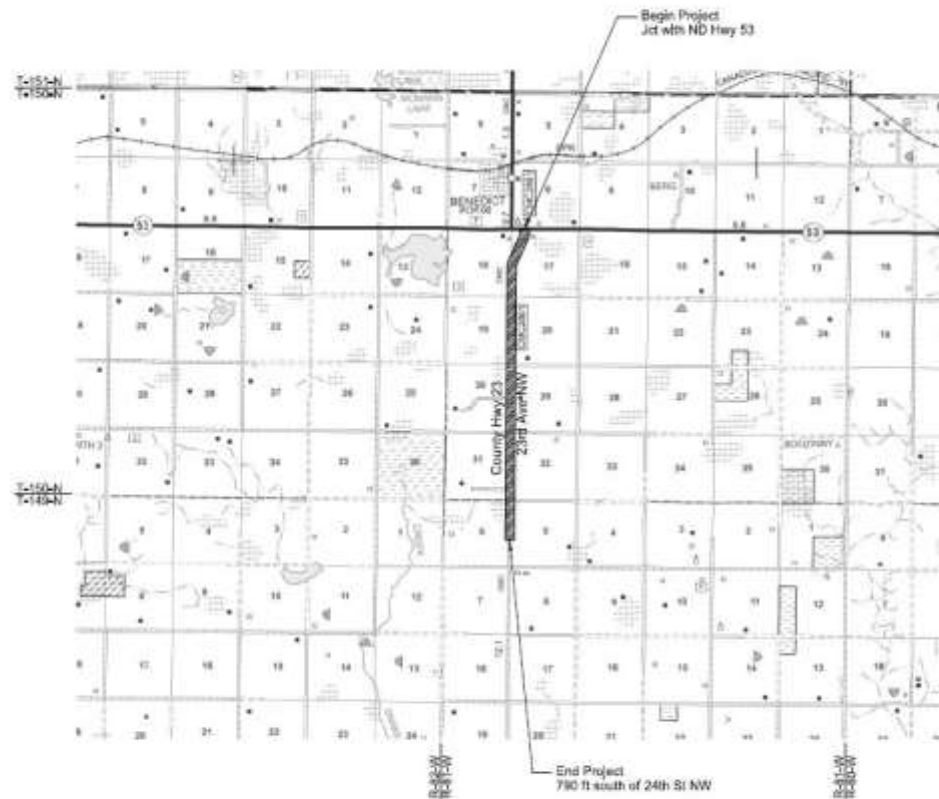
U.S. Department of Transportation
Federal Highway Administration

C-10 - McLean



North Dakota Division Office

Rugged North Dakota Landscape

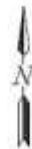
STATE	PROJECT NO.	SHEET NO.	SHEET NO.
ND	RCM-0300(142)	4	4



LEGEND

-  Chemically Stabilized Gravel Surfacing
-  3" Gravel Surfacing and Chemically Stabilized Gravel Surfacing Option 2 - Additional 1" Gravel Surfacing and Chemically Stabilized Gravel Surfacing

4 inches total



This document was originally issued and sealed by Jonathan P. Morgenthau, Registration Number PE-1672, on 03/04/13 and the original document is stored at the North Dakota Department of Transportation

Scope of Work

Site C-10
County Hwy 23 (23rd Ave NW)
Gravel Surfacing and Calcium Chloride
McLean County



U.S. Department of Transportation
Federal Highway Administration

Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Calcium Chloride Application

North Dakota Division Office

Rugged North Dakota Landscape



U.S. Department of Transportation
Federal Highway Administration

Special Provision

North Dakota Division Office

SP 892(14)
Page 1 of 10

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

CHEMICALLY STABILIZED GRAVEL SURFACING

PROJECT ROM-0300(142) - PCN 22448

Description

This work consists of constructing a stabilized aggregate layer with imported gravel surfacing aggregate or in-place aggregate. The aggregate layer is stabilized by incorporating a solid form of calcium chloride.

Equipment

Conform to the following:

Pugmill. Use a stationary pugmill with weighing or metering equipment capable of accurately controlling the material entering the mixer.

Reclaimer. Section 153.01

Calcium Chloride Spreading Equipment. Use distributor equipment capable of closely metering the application rate from the operator's cab. As an alternative, rotary mixing machines capable of closely metering calcium chloride and additional mixing water into the mixing process may be used, provided the required application rates are met and the application rates can be continuously monitored from the operator's cab.

Pneumatic Tired Rollers. Section 151.01A

Smooth Faced Steel Wheel Rollers. Section 151.01B

Trucks. Section 152.01

Material

Conform to the following:

Calcium chloride flake. Conform to ASTM D98 Type S, Grade 3, Class B

Imported Gravel Surfacing aggregate. SP 714 (14)

Water. Section 216



U.S. Department of Transportation
Federal Highway Administration

This document was originally issued and sealed by Ezra Ballinger, Registration Number PE-7328, on 09/04/19 and the original document is stored at the North Dakota Department of Transportation

Special Provision

North Dakota Division Office

SP 892(14)
Page 2 of 10

Construction Requirements

A. Proportioning

1. Imported gravel surfacing aggregate. Determine the maximum density and optimum moisture content according to ND T 180, Method D for the imported surface course aggregate in two ways; first for the aggregate without calcium chloride, and second for the aggregate mixture including calcium chloride at the target percentage. The proctor with calcium chloride will be used to monitor yield and final compaction of the mixture. The target calcium chloride content, based on flakes with 100 percent salt, is 1.85 percent by weight of the aggregate mixture at 95 percent of the maximum dry density. The target water content at the time of mixing is from 2 percent below the optimum moisture content to optimum moisture content.

2. In-place aggregate course. Determine the maximum density and optimum moisture content according to ND T 180, Method D for the in-place surface course aggregate in two ways; first for the aggregate without additional calcium chloride, and second for the aggregate mixture including additional calcium chloride at the target percentage. The Proctor with calcium chloride will be used to monitor yield and final compaction of the mixture. The target calcium chloride content, based on flakes with 100 percent salt, is 1.85 percent by weight of the aggregate at 95 percent of the maximum dry density. The target water content at the time of mixing is from 2 percent below the optimum moisture content to optimum moisture content.

B. General.

Store calcium chloride in closed, weatherproof containers. Schedule the work according to Section 108.03 to have all calcium chloride placed onto the roadway before September 15. Begin application or mixing operations only when the ambient air temperature is 40 °F or above, and is not expected to fall below 40 °F within 48 hours. Do not construct the stabilized aggregate layer when the underlying surface is frozen, muddy, during precipitation, or if precipitation is forecasted within 24 hours. Do not discharge calcium chloride into any waters of the U.S.

Prior to calcium chloride placement, schedule a review of the project with the Engineer to determine areas that need calcium chloride content adjustments due to environmental or drainage conditions. Site specific calcium chloride content adjustments within the specification range provided in Subsection D.1 will be considered if requested in writing after the review and prior to calcium chloride placement.

The Engineer will arrange an off-site informational session prior to stabilization work to discuss aggregate stabilization practices. The attendance of the project superintendent, work foreman, key stabilization personnel, and Engineer is required at the informational session. Conduct an on-site pre-work meeting, prior to beginning work on calcium chloride stabilization.

1.85 percent
By weight
Of aggregate



Special Provision

North Dakota Division Office

SP 892(14)

Page 7 of 10

1. Stabilization agent. Calcium chloride will be evaluated by visual inspection of the material and a review of submitted certificates from the supplier.

2. Imported gravel surfacing aggregate. Aggregate gradation, plasticity index, fractured faces, liquid limit and other aggregate quality properties will be evaluated based on conformance to SP 714(14).

3. Construction. Aggregate stabilization construction will be observed and evaluated by the Engineer.

4. Project Inspections. An intermediate inspection of each road will take place within 15 days of aggregate stabilization completion. The results of the intermediate inspection are not to be interpreted as final acceptance of the road. Correct all defects that arise after the intermediate inspection and prior to final acceptance by the Engineer, according to Subsection E.5.

5. Reshaping Roadway. Preparation of the surface for imported surface course aggregate placement or in-place stabilization will be observed and evaluated by the Engineer.

G. Pre-Installation Meeting. Hold a pre-installation meeting at minimum 1 month before beginning installation with Steve Monlux (406)-544-1919 (stevemonlux@gmail.com) and the Engineer to discuss the following:

- Installation Procedures
- Manufacturer's instructions, and
- A list of services to invite to further trainings

H. Training. Hold classroom and field training sessions with Steve Monlux (406)-544-1919 (stevemonlux@gmail.com) Contact the Engineer 1 week before the training to allow the Engineer to invite the appropriate agencies. Provide the Engineer an electronic copy of the training material and any videos or links showing repair techniques. Supply each participant a complete set of course handouts and the manufacturer's installation and maintenance manual.

Measurement

Measure the Section items listed in the bid schedule and the following as applicable.

When measuring surface course aggregate by the ton, deduct the computed mass of calcium chloride from the measured quantity, if the material is pugmill mixed and weighed as a mixture. In this case, compute the mass of calcium chloride using the actual percentage added to accepted quantities of surface course aggregate.

Measure water as provided for under Section 216.

Training and Pre-installation Meeting



Monitoring

North Dakota Division Office

Rugged North Dakota Landscape

- Counties will maintain as recommended in the training.
- Counties will monitor the success



Questions

North Dakota Division Office

Rugged North Dakota Landscape

Thank you



U.S. Department of Transportation
Federal Highway Administration