

MnDOT Aggregate, Base, and Grading Update

Terence Beaudry

MnDOT Aggregate, Base, and Grading Engineer

Wednesday 10th December

2025

Outline

- Recent Specification & Other Changes
- RCA
- Proposed Changes?
- Miscellaneous Topics

Recent Specification Changes

Grading or Base Specification/Special Provisions

2108/3733: Geosynthetics

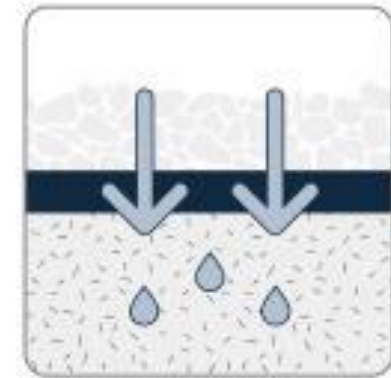
1. Three feet (3') Overlaps is the default, Sewing allowed with prior passing QA test result, no glueing of Types 6 - 13.
2. Added types 9 - 13.
3. Changed

Note the following failures of geotextile tests • Wrong Geotextile placed: Certification did not match Wrapper

- Sewing/Glueing Failures
 - Need prior passing seam test result for sewing/gluing **PRIOR** to installation

Modified Type 5 Geotextile

- Former Type 5 Slit Tape has low permittivity and thus poor performance for filtration
- New Type 5 has better permittivity and improved reinforcement
- BABA Availability



FILTRATION

Geotextile Small Quantities & Qualified List

[Link on front page of G&B Website:](#)

Requirements:

- **Project < 200 SY**
- **Pipe wrap < 1,000 LF**
- **Certificate of Compliance stating meets requirements**

Identifying label on product

Company	Product	MnDOT 3733 Types
ADS	200 W 4"	5
Carriff	Red Stripe	1
Carriff	6" Red Stripe	1
Carthage Mills	FX-45HS	1
Ferguson	DN200	3 or 5

Grading and Base Specification Updates

Special Provision Changes

2215 Reclamation & 2390 Cold In Place Recycling

1. Allowing Blended Cement
2. Foamed asphalt now allowed at 50 degrees F.

Grading and Base Specification Updates

3138 Aggregates for Surface and Base

1. Modified Class 5 gradation for quarried rock.
2. Allowing lime fines in binder for surface gravel.

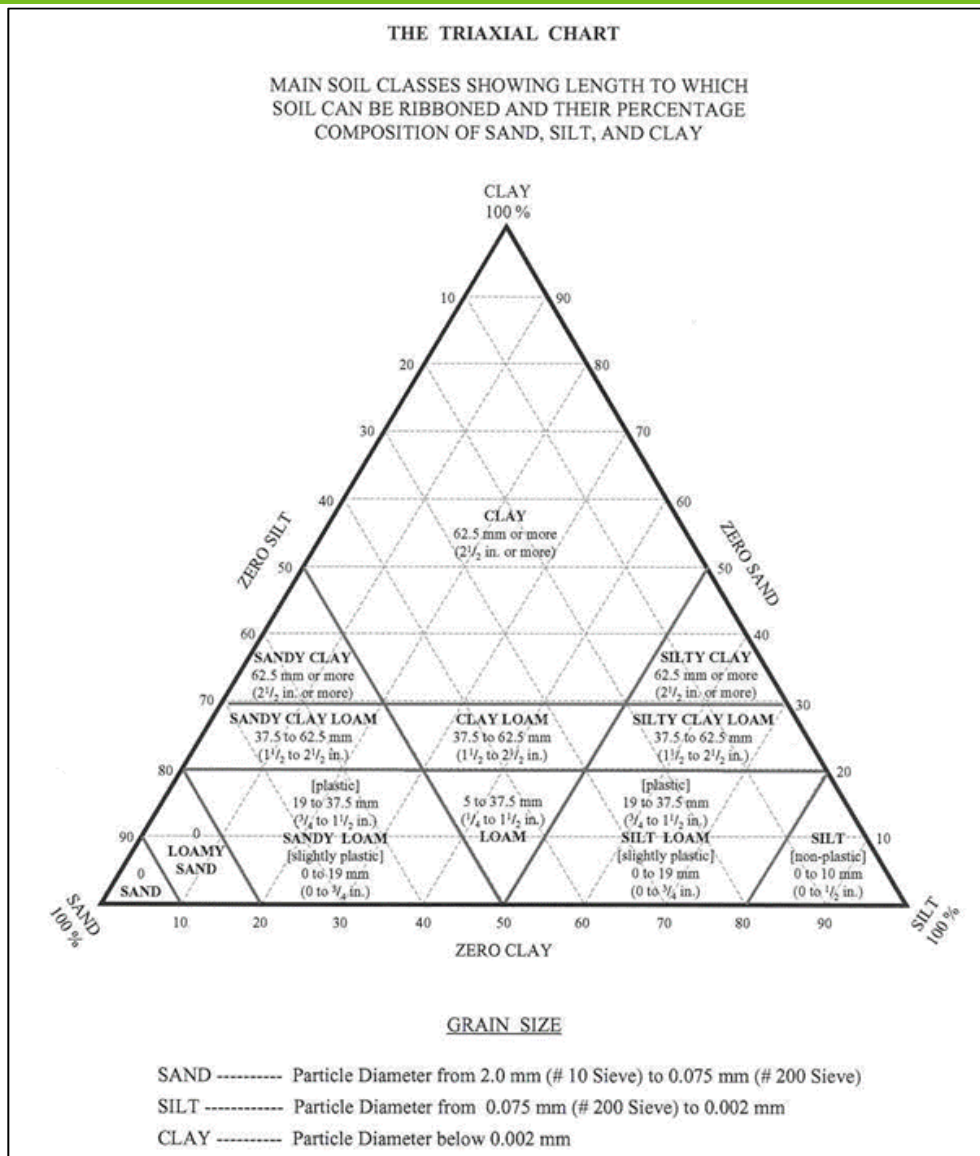
3149 Granular Material

1. Removed Phi angle (ϕ) for structural backfill (note it is still required for some structures by special provisions).

Grading and Base Specification Updates

3245 Thermoplastic Pipe & 3278 Corrugated Polyethylene Drainage Tubing Clarifications

Triaxial Classification: Based Upon the Percentage of Sand, Silt, and Clay



Unified Classification System to be Added

Major divisions			Group symbol	Group name
Coarse grained soils more than 50% retained on or above No.200 (0.075 mm) sieve	gravel > 50% of coarse fraction retained on No.4 (4.75 mm) sieve	clean gravel <5% smaller than No.200 Sieve	GW	well-graded gravel, fine to coarse gravel
			GP	poorly graded gravel
		gravel with >12% fines	GM	silty gravel
			GC	clayey gravel
	sand ≥ 50% of coarse fraction passes No.4 (4.75 mm) sieve	clean sand	SW	well-graded sand, fine to coarse sand
			SP	poorly graded sand
		sand with >12% fines	SM	silty sand
			SC	clayey sand
Fine grained soils 50% or more passing the No.200 (0.075 mm) sieve	silt and clay liquid limit < 50	inorganic	ML	silt
			CL	lean clay
	silt and clay liquid limit ≥ 50	organic	OL	organic silt, organic clay
		inorganic	MH	elastic silt
			CH	fat clay
		organic	OH	organic clay, organic silt
Highly organic soils		PT	peat	

Recycled Concrete Aggregate (RCA)

Use of Recycled Concrete Aggregate (RCA)

- Changes in use of RCA driven by Environmental Office to *minimize negative impacts*(e.g.,highpH, tufaformation, etc.) Gathered
- feedback from (ARM, CPAM, AGC) on proposed changes Continue
- to study/research this issue with Michigan Tech University (MTU) and Michigan State University (MSU)
- Limited project changes by inclusion of special provisions

Use of Recycled Concrete Aggregate (RCA) Boilerplates: *What has changed already*

- **1717 Air, Land, and Water Pollution:** Temporary use and stockpiling of RCA must be isolated from surface water and ground water; runoff must be monitored and managed for pH and turbidity
- **2412 Precast Concrete Box Culverts:** No RCA bedding or backfill for box culverts
- **2451 (SB) Structural Backfills and Excavations:** No RCA in water or where dewatering is needed. **2501 Pipe Culverts:** No RCA bedding or backfill for pipe culverts
- **2515 Revetment Systems:** No RCA bedding for revetment systems

Use of Recycled Concrete Aggregate (RCA) *Changes in Special Provisions a few projects*

Proposed changes to **2106, 2118, 3138, and 3149**

- Restricting RCA in aggregate shouldering within 100 feet of surface waters, similar to how concrete grinding slurry is handled.
- Increase the top aggregate size for class 5 and 6 base from 1-1/2" to 2"
- Restrict RCA to the top third or 6" in subbase for locations with edge drains.
- Cap the proportion of RCA at 75% in Base.
- Prohibit RCA from Select Grading Material (Soil)

Proposed Changes?

Class 5, 6, and 5Q MnPAVE Inputs

StiffnessAggregateBase Resilient Moduli (ksi)

MnPave (Pavement Software) Inputs

<u>Material</u>	<u>Fall</u>	<u>Winter</u>	<u>Early Spring</u>	<u>Late Spring</u>	<u>Summer</u>
Class 5	27	50	9	22	26
Class 6	30	50			30
Class 5Q	29	50	10	24	29
			10	24	

Very little or no change in HMA requirements between these bases.

If Class 5 Gives The Same Design Results as Class 6

- Then:
- We consume more resources, energy, and shipping
- Alternatives in lieu of Class 6 should be considered:
 - Gravel stabilizers Geosynthetics
 - Stabilizing Subgrade with Cement
 -

Los Angeles Rattler (LAR)

- Currently: 40 for all aggregates, except Class 6 = 35
- AASHTO (M147) and Wisconsin = 50 for Bases
- Study this a bit more and look at some other state's criteria. Submitted to Idea Scale in DOT

Miscellaneous Topics

RIPRAP Gradation

- gradations than actual).

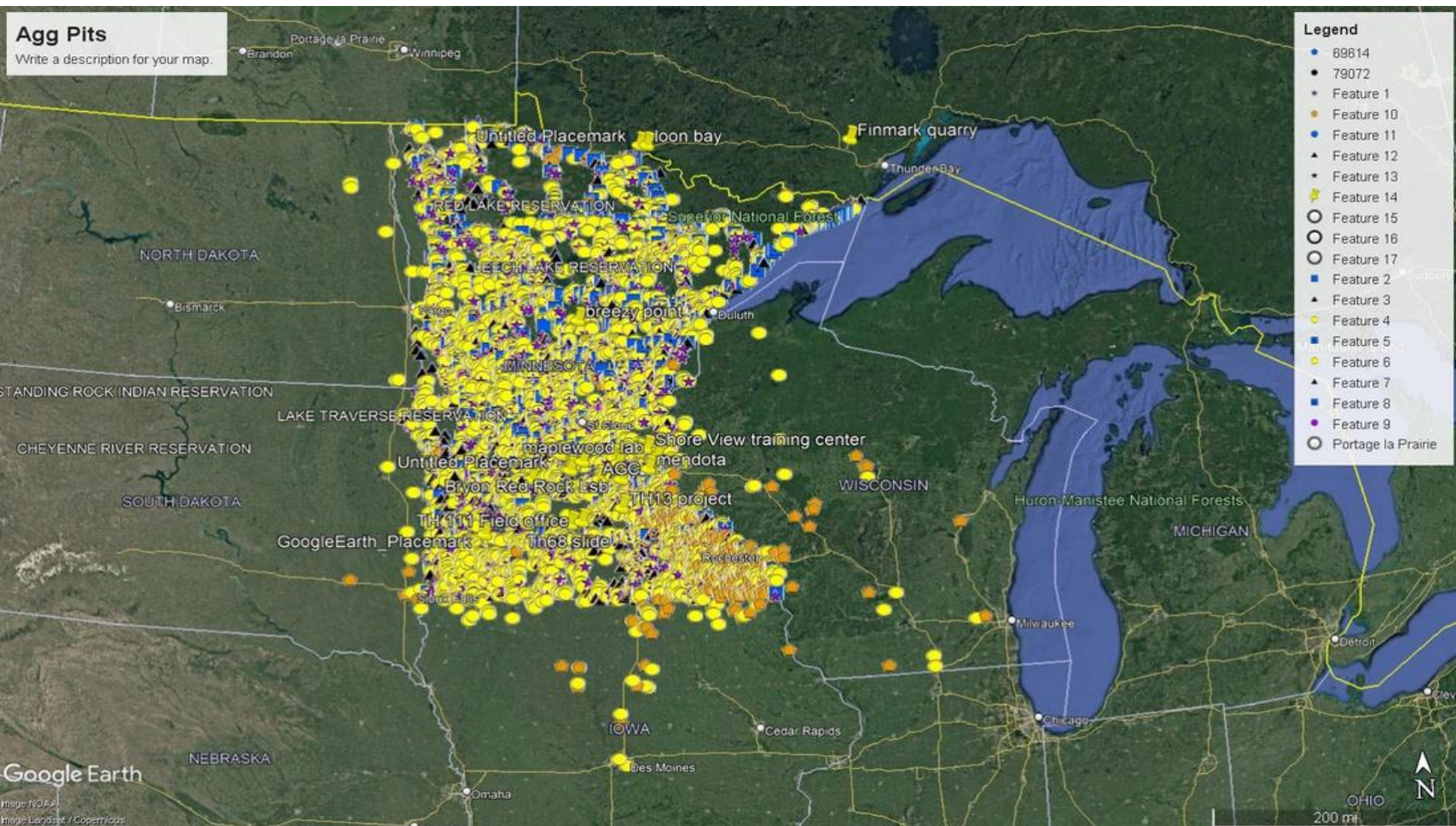
Looking at alternative => I-RIPRAP

- - Promising results but still some issues that need to be addressed (e.g., computing time, crashing of app)
 - At this time, not planning to accept I-RIPRAP results from producers but will continue use internally
- For questions, please reach out spec owner (Bridge Office):

Block, Thomas (DOT) Thomas.Block@state.mn.us



In AASHTOware Aggregate Sources need a pit

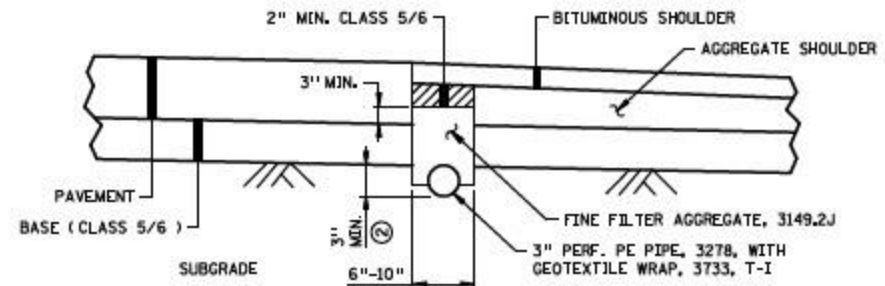


Placing Geotextile into Reclaim Material with a Mill



Reviewing *HMA shoulders and PCC Road Design*

- Grading and Base Unit preliminary assessing and investigating influence of some of materials/specs with this observed failure
- Potentially proposing revising standard plan to minimize failures



SUBSURFACE DRAIN, PAVEMENT EDGE DRAIN TYPE ①

NOTES:

- ① SEE SPECIAL PROVISIONS FOR MATERIAL AND CONSTRUCTION DETAILS.
- ② DESIGN FOR 15" COVER FROM TOP OF PIPE TO TOP OF SHOULDER (12" MINIMUM).

subsurface standard plan sheets .430 - .433

Grading and Base Manual

- Revised Grading and Base Manual redline version available
- Changes to sections:
 - Sampling from a Stockpile, Embankment, Base/Surface Agg.
 - Dynamic Cone Penetrometer (DCP) • Light
Weight Deflectometer – LWD Procedure • Soil-
Cement Laboratory Design Procedure • SFDR
Mix Design Procedure

Finis