OMRR Updates for Construction Inspectors Concrete Office

Maria Masten, Matt Herbst, Brad Swenson, Rob Golish

and Gordy Bruhn

February 17 and 23, 2021

Agenda

- Introductions
- General Concrete Updates (~ 15 minutes)
- Concrete Pavement Rehabilitation (CPR) Updates (~10 minutes)
- Concrete Paving Updates (~15 minutes)
- Certified Ready-Mix Plant and Mix Design Updates (~ 35 minutes)

Concrete Office Personnel

Maria Masten – Concrete Engineer
651-366-5572
-Specifications and Special Provisions
-Materials Failure Recommendations
-Structural Concrete
-High Performance and Mass Concrete
-Specialty Concrete, Self Consolidating Concrete

Rob Golish – Assistant Concrete Engineer
651-366-5576
-Concrete Paving and Joint Layout Reviews
-Materials Design Recommendations
-Standard Plans and Plates
-Approved/Qualified Products

Concrete Office Personnel

Matt Herbst – Ready-Mix Engineering Specialist
651-366-5423
-General Concrete Mix Designs
-High Performance, Mass and Specialty Mix Designs
-Concrete Aggregates
-Certified Ready-Mix Program – Metro District
-Clarified Water

Gordy Bruhn – Concrete Field Engineering Specialist
651-366-5523
-General Concrete and Structural Concrete Field Issues
-Concrete Pavement Rehabilitation (CPR)
-CPR and Paving Plan Review

Brad Swenson – Greater MN Plant Coordinator
218-232-1012
-Certified Ready-Mix and Bituminous Plants Support – Outstate
-Concrete Plant Tech Certification
-Materials Certification

Concrete Engineering Unit

- 2301 – Concrete Pavement
- 2302 – Concrete Pavement Rehab (CPR)
- 2406 – Bridge Approach Panels
- 2461 – Structural Concrete
- 2519 – Cellular Concrete (CLSM)
- 2520 – Lean Mix Backfill
- 2521 – Concrete Walks
- 2531 – Concrete Curbing
- 2533 – Concrete Median Barrier

MnDOT Concrete Engineering Website

Materials Home | Concrete Home | Contacts

What we do

The Concrete Unit provides leadership and assistance to agencies, contractors, and consultants on specifying, constructing and maintaining long lasting concrete structures and pavements.

Mix Designs

- Mix design submittals
- Approved Contractor mix designs by plant

Approved and Certified Materials and Sources

- Approved/qualified products
- Certified concrete ready-mix plants
- Clarified Water Qualification Procedure
- Pre-qualified colored concrete Contractor/Installer list

Concrete Areas of Interest

- Ready-mix
- Concrete pavement rehabilitation (CPR)
- Bridge and low slump concrete overlays
- Pavement
- Pavement design
- Precast concrete
- Road research

Guidance Documents

Cold Weather Concrete Placement

Concrete Cylinders - Handling and Curing

Gradation Testing and Acceptance

Strength Testing and Acceptance

Aggregates

- Concrete aggregate properties
- New source testing
- Alkali Silica Reactivity (ASR) - Fine aggregate
- Alkali Silica Reactivity (ASR) - Coarse aggregate

Resources

- Concrete manual
- Concrete maturity
- Schedule of materials control
- Standard plans
- Standard plates
- Standard specifications for construction
- Special provisions
- Videos

Always use the most current forms

http://www.dot.state.mn.us/materials/concrete.html

Concrete Office Field Updates

Gordon “Gordy” Bruhn | Sr. Engineering Specialist

Concrete Engineering Unit

Winter 2021

DEPARTMENT OF TRANSPORTATION

Vibration

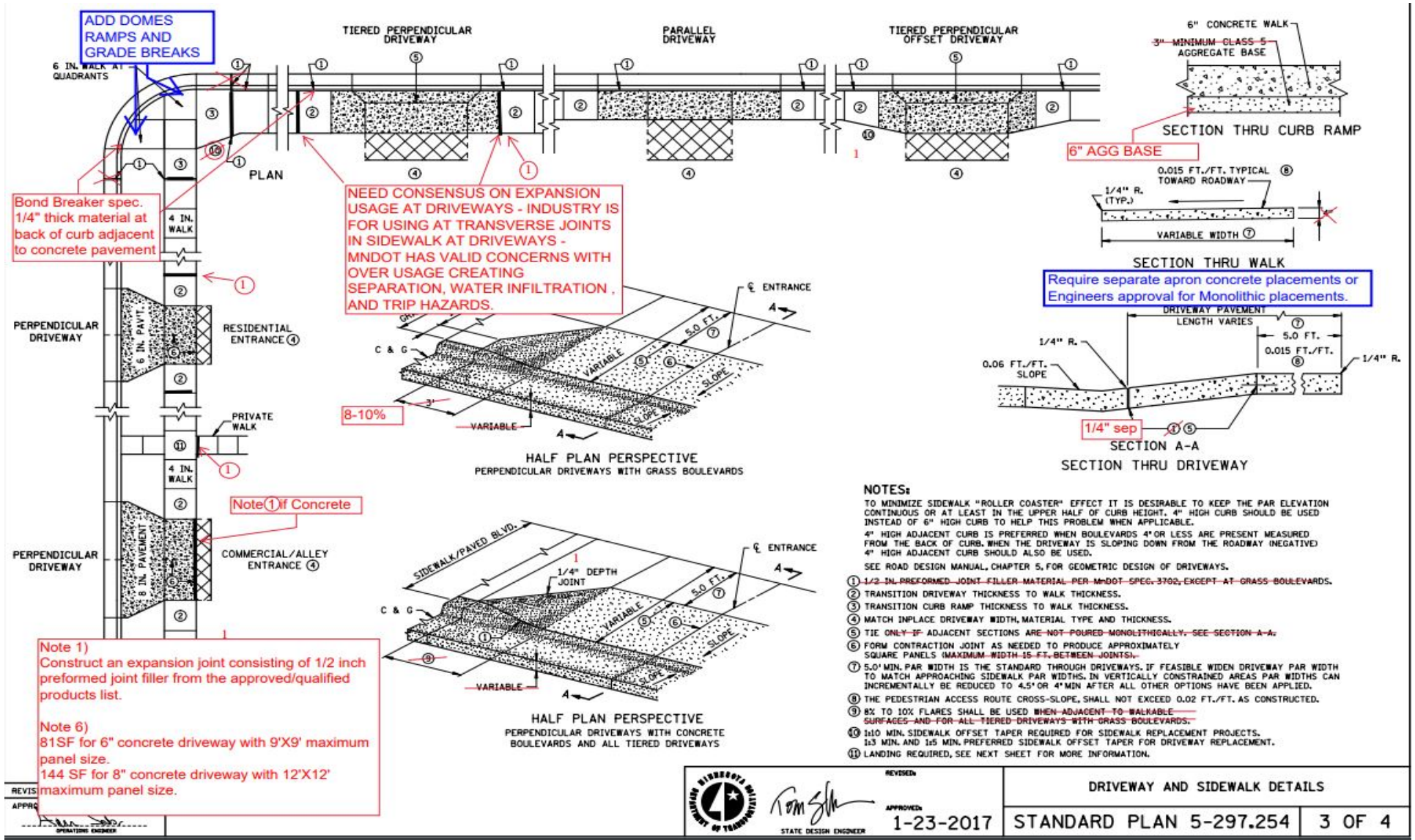
- Protect newly placed concrete from damage by adjacent vibratory or backfilling operations for a minimum of 24 hours.

- Wait at least 72 hours after placing the concrete or after the concrete reaches a compressive strength of at least 3,000 psi
- (Changed to 2000psi by special provision in April 2020)

  (2000 psi for Concrete Paving)

- Hand operated concrete consolidation equipment and walk behind vibratory plate compactors are allowed 24 hours after placing the concrete, and other equipment as approved by the Engineer, in conjunction with the Concrete Engineer

Driveway and Sidewalk Details
Standard Plan Sheet 5-297.254



Preformed Joint Filler (Type F Separation Material) (Approved Products List)

1. PRODUCT NAME

- PROFLEX® Vinyl Expansion Joint

2. PRODUCT DESCRIPTION

PROFLEX Vinyl Expansion Joints are manufactured from 100% recycled vinyl.

Thickness	¼", ½"
Width	3", 3 ½", 4", 6", 8"
Length	5', 10'

- Special order sizes require a two pallet minimum purchase.

3. ADVANTAGES

PROFLEX is easy to handle, extremely durable and flexible. PROFLEX does not use adhesive binders in the manufacturing process, and can be stored outside.

Structural Concrete Specification 2461

Water Adjustments

- For **all** grades of concrete, no water additions 1 hour after batching,
- For **grades of concrete NOT used for Slip-Forming**, do not make water adjustments after discharging approximately 1 cubic yard.
- **2461.3.G.7.a "Concrete Placed by the Slip-Form Method"**, The Engineer will allow water adjustments as necessary to facilitate slip-form placement.

(Again, NO water additions 1 hour after batch time!)

2401.3.G.2.A.9.d On-site Field Adjustments for Bridge Slab Concrete

In addition to 2461.3G.4, Field Adjustments, if any adjustments are necessary on site:

- Except for Viscosity Modifying Admixtures (VMAs), onsite additions of admixtures are limits to admixtures stated on Certificate of Compliance (aka batch ticket)

- On site water additions is limited to maximum 1 gal per cubic yard of batched concrete.

Test the concrete when an adjustment(s) is made in the field

Strength Material Exceptions Table 2461-6

Table 2461-6
Concrete Mix Design Requirements (Not applicable to Mass Concrete)

Concrete Grade	OLD Mix Number	NEW Mix Number	Intended Use *	Maximum w/c ratio ‖	Maximum Cementitious Content (lbs/yd³)	Maximum %SCM (Fly Ash/ Slag/Ternary)	Slump Range	Minimum 28-day Compressive Strength, f'c	3137 Spec.
B Bridge Substructure	3Y43	3B52	Abutment, stems, wingwalls, paving brackets, pier columns and caps, pier struts	0.45	750	30/35/40	2 - 5"	4000 psi	2.D.1
F Flatwork	3A22 3Y22	3F32	Curb and gutter	0.42	750	30/35/0	½ - 3" #	4500 psi	2.D.1
	3A32 3Y32 3A34	3F52 3F57EX † 3F52CO ‡	Sidewalk, curb and gutter, slope paving, median sidewalk, driveway entrances, ADA pedestrian sidewalk	0.45	750	25/30/0	2 - 5"	4500 psi	2.D.1
G General Concrete	1A43	1G52	Footings and pilecap	0.55	750	30/35/40	2 - 5"	4500 psi	2.D.1
	3A43 3B42 3Y43	3G52	Footings, pilecap, walls, cast-in-place manholes and catch basins, fence posts, signal bases, light pole foundations, erosion control structures, cast-in-place box culverts, culvert headwalls, open flumes, cast-in-place wall stems	0.45	750	30/35/40	2 - 5"	4500 psi	2.D.1
M Median Barrier	3Y12	3M12	Slipform barrier, Median barrier, non-bridge	0.42	750	30/35/40	½ - 1" #	4500 psi	2.D.1
	3Y32	3M52	Barrier, Median barrier, non-bridge	0.45	750	30/35/40	2 - 5"	4500 psi	2.D.1
P Piling	1A43	1P42	MSE and gravity wall leveling pad	0.63	750	30/35/40	2 - 4"	3000 psi	2.D.1
	1C62	1P62	Piling, spread footing leveling pad	0.63	750	30/35/40	3 - 6"	3000 psi	2.D.1
R Pavement Rehabilitation	3A32 3B42	3R52	CPR - Full depth concrete repairs, concrete base	0.45	750	30/35/40	2 - 5"	4000 psi	2.D.3
S Bridge Superstructure	3Y16	3S12	Slipform bridge barrier, parapets, end post	0.42	750	30/35/40	½ - 1" #	4000 psi	2.D.2
	3A32 3A42 3Y43 3Y46 3Y46A	3S52	Median barrier, raised median, pilaster, curb, sidewalk, approach panel, formed bridge barrier, parapet, end post, collar	0.45	750	30/35/40	2 - 5"	4000 psi	2.D.2
X Miscellaneous Bridge	1X62 1X46	1X62	Cofferdam seals, rock sockets, drilled shafts	0.45	750	30/35/40	3 - 6"	5000 psi	2.D.1
	3X46	3X62	Drilled shafts above frost line	0.45	750	30/35/40	3 - 6"	5000 psi	2.D.1
Y Bridge Deck	3Y33 3Y33A 3Y36 3Y36A	3Y42-M § 3Y42-S §	Bridge decks, integral abutment diaphragms, pier continuity diaphragms, expansion joint replacement mix	0.45	750	30/35/40	2 - 4"	4000 psi	2.D.2
	3A37 3Y37	3Y47 **	Deck patching mix	0.45	750	30/35/40	2 - 4"	4000 psi	2.D.2

* If the intended use is not included elsewhere in the Specification or Special Provisions, use mix 3G52, unless otherwise directed by the Engineer.
‖ The minimum water/cement (w/c) ratio is 0.30.
† Mix 3F57EX requires the use of Coarse Aggregate Designation "7", "2" or "3" for the 4th digit in accordance with Table 2461-3.
‡ Identify specific color used on the certificate of compliance. Colored concrete is only allowed when specified in the plans or the Contract.
# Adjust slump in accordance with 2461.3.G.7.a for slipform concrete placement.
§ The "-S" indicates a bridge deck with a structural slab and "-M" indicates a monolithic bridge deck.
** Mix 3Y47 requires the use of Coarse Aggregate Designation "7" or "3" for the 4th digit in accordance with Table 2461-3.

Documenting Material Exceptions
Materials Certification Exception Summary (MCES)

Document All:

- **Failing Tests (All strength Tests > 500psi deficient)**
- **Erroneous Test Results,**

1. **Cylinders remained in the field greater than 7 days**
2. **Improper Curing (Temps greater than 80^{o}F)**

- **Monetary Adjustments on Strength Test Moving Average… Table 2461-19**
- Missing Tests
- *Test Tolerance Between Lab/field or Between QC/QA
- Non-Certified Testers

Moving Average Monetary Adjustment for Compressive Strength Tests

Table 2461-19 All Concrete Grades	
Moving average of 3 consecutive strength tests	**Monetary Reduction for Moving Average Failure ***
> 98.0% of f'c	No deductions for the materials placed as approved by the Engineer.
93.0% to 98.0% of f'c	$20.00 per cubic yard or 10% of the Contractor-provided invoice for quantity represented by test that brought moving average into non-conformance
87.5% to < 93.0% of f'c	$50.00 per cubic yard or 25% of the Contractor-provided invoice for quantity represented by test that brought moving average into non-conformance
< 87.5% of f'c	Remove and replace concrete in accordance with 1503, "Conformity with Contract Documents," and 1512, "Unacceptable and Unauthorized Work," as directed by the Engineer. If the Engineer, in conjunction with the Concrete Engineer, determines the concrete can remain in place, the Engineer will adjust the concrete at a reduction of $100.00 per cubic yard or 50% of the Contractor-provided invoice for quantity represented by test that brought moving average into non-conformance.

Strength Test Material Exceptions

Failing Concrete Strength Test

1. A strength test is considered a **failing** , when the test strength test results shows **greater** than 500psi deficiency in strength,

2. The specification does not contain a monetary adjustment for a single failing strength test (Table 2461-19 is for Moving Average monetary adjustments)

3. A determination must be made as to whether the compressive strength achieved is adequate to perform as intended, (Yes or No)

- **Failing strength tests are required to be documented as Material Exception.**

Moving Average of 3 **Strength Test Results**

Minnesota Department of Transportation

Last revised (1/8/2019)

Cylinder Strength Moving Average

Project #:	SP 8825-88	Mix Design:	3G52
Engineer:	Mrs. Engineer	Minimum 28-day Compressive Strength, f'c (psi):	4500
RM Plant:	Mr. Plant	Total Cubic Yards being Adjusted:	125
Contractor:	The Concrete Guys	Total Monetary Adjustment:	$2,500.00

* See MnDOT Specification 2461.3.G.5.f(1)

** See MnDOT Specification 2461.3.G.5.f(2)

Field ID:	Date Made	Cubic Yards Placed	Strength Test (psi)	Strength Test Deficiency ≤ 500 psi below f'c	Strength Test Deficiency > 500 psi below f'c	Moving Average (psi)	Moving Average % of Req'd	Adjusted Contract Unit Price per Cubic Yard	Cubic Yards being Adjusted	Monetary Adjustment	Action Required for Moving Average Failure per MnDOT Specification 2461.G.5.f(4)
Day-1	1/1/21	100	5340								
Day-2	1/2/21	200	4360	*							
Day -3	1/3/21	62	4250	*		4650	103.33				
Day-4	1/4/21	80	4690			4433	98.52				
Day-5	1/5/21	60	4860			4600	102.22				
Day -6	1/7/21	250	4862			4804	106.76				
Day-6	1/7/21	86	5080			4934	109.64				
Day-7	1/8/21	20	4480	*		4807	106.83				
Day -8	1/9/21	60	4400	*		4653	103.41				
Day-9	1/10/21	5	4450	*		4443	98.74				
Day-10	1/11/21	200	4400	*		4417	98.15				
Day -10	1/11/21	125	3900		**	4250	94.44	$20.00	125.0	$2,500.00	$20/yd3 or 10% of the yd3 invoice price

ONLY MOVING AVERAGE FAILURES HAVE MONETARY DEDUCTIONS

Materials Certification Exception Summary
(Form TP-02171-04)

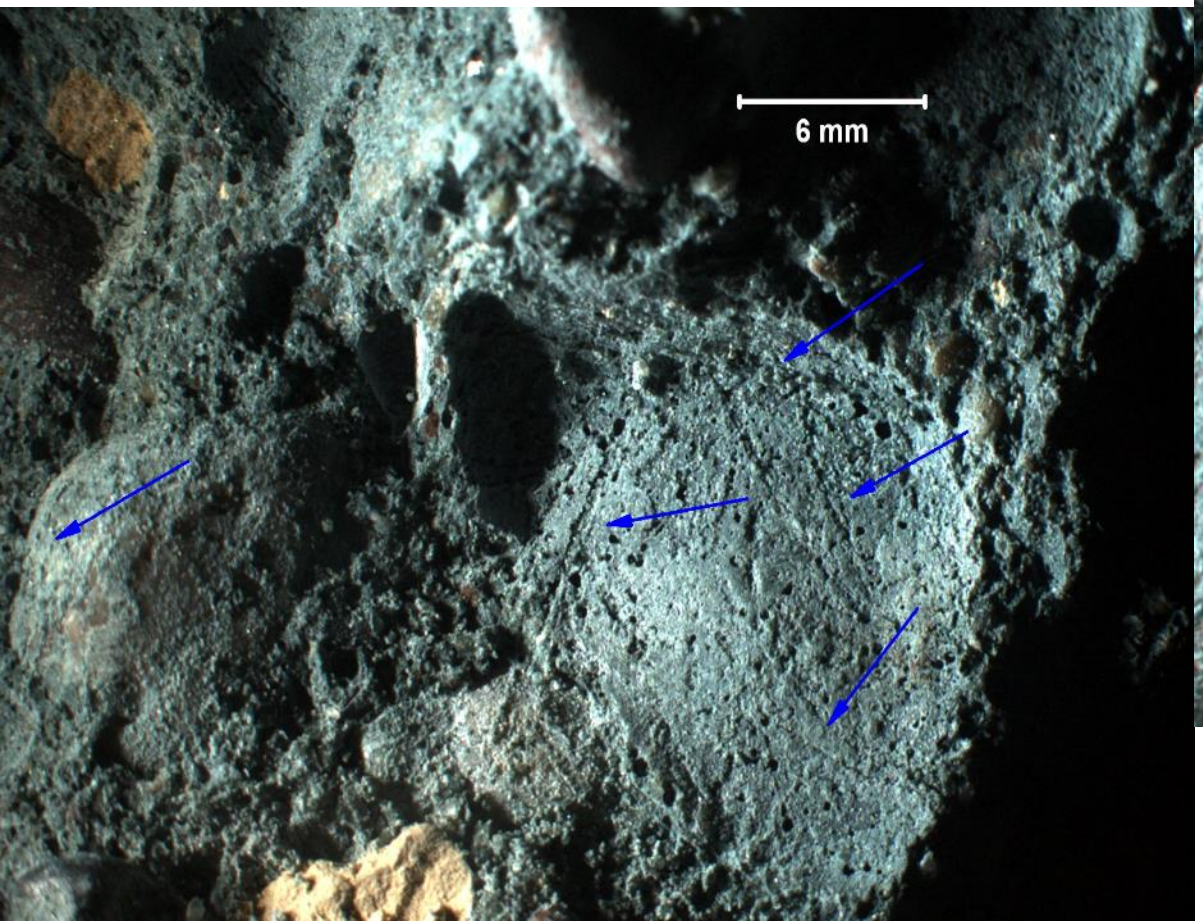
MATERIALS CERTIFICATION EXCEPTIONS SUMMARY					
S.P. No.	Contract No.	Project Description			Const. Year
T.H.	District	Contractor	Project Location		
Project Engineer/Supervisor			Federal No.	Page	of

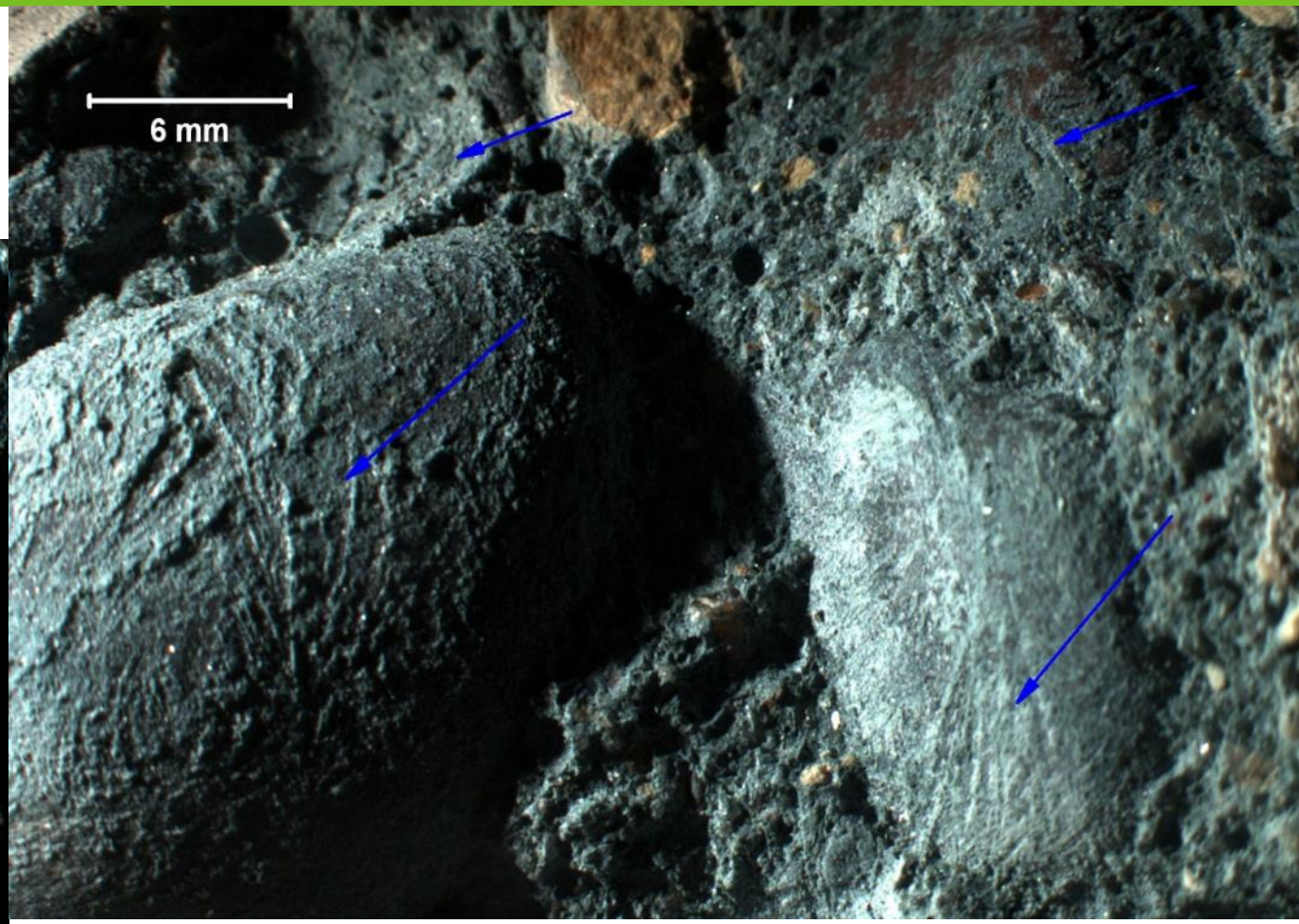
Materials and products used on project: (check all boxes that apply)

❑ Grading and Base ❑ Bituminous XX Concrete ❑ Aggregate ❑ Materials/Chemicals

Specialty	Exception Description	Resolution	Document Reference	Name/ Initials
2461	3G52 Cylinder Strength Moving Average Failure	As per Spec 2461 Applied Standard Monetary Adjustment	Change Order 22	GB
2461	3G52 Cylinder Strength Test Greater than 500 PSI deficient (3900 PSI of 4500 PSI Required)	Structures Engineer Determined 3900 PSI is an Adequate Strength to Perform as Intended. Accepted as "Substantial Compliance"	Project File OR See attached Structures Engineers Recommendation	GB

Initial Cure Temps 60º to 80º F





28-Day Cylinders

- **Initial Curing in the Field in Cold/Hot Weather**
  - If field office is nearby, transport sampled concrete to temperature controlled (60º to 80º F) field office and cast cylinders.
  - Begin casting within 15 minutes of obtaining concrete sample.
  - Place caps on molds after final finishing
  - Use insulated coolers with heated water
  - Use insulated coolers with water and/or ice.

Concrete Sampling
ASTM C172

- **Changing Concrete Manual to ASTM C172 Sampling Requirements,**
- **Minimum Sample Size for Strength Testing is 1 Cubic Foot. Which is Around 145 Pounds of Concrete,**
- **Concrete Field Testers Need Wheelbarrows,**
- **Mix sample in wheelbarrow prior to performing tests.**

28-Day Standard Strength Cylinders

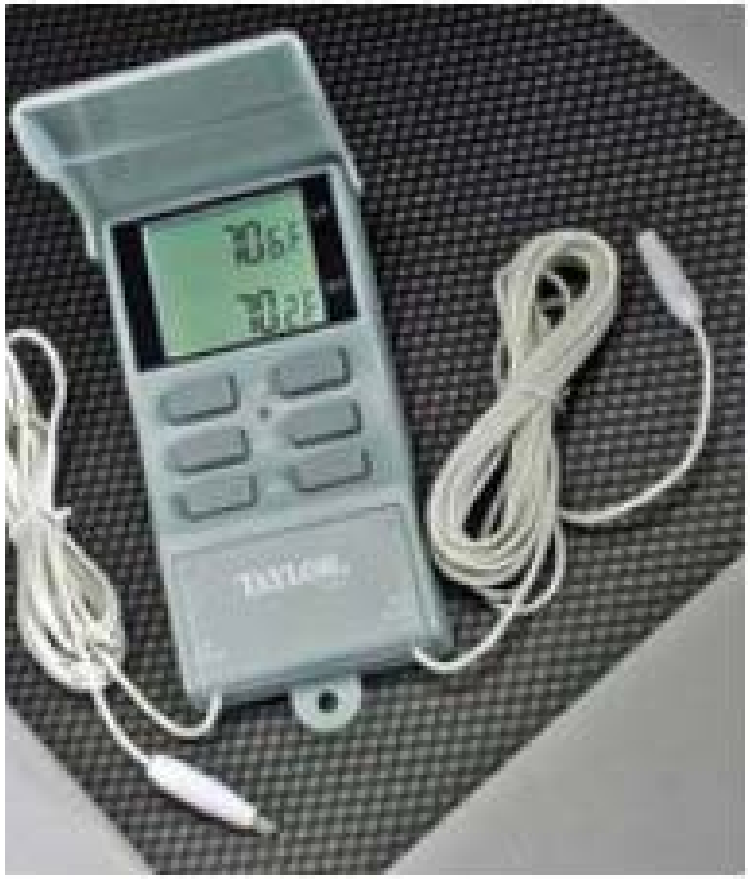
- **Initial curing (Final finish up to 48 hours)**
  - An increase in compressive strength failures historically parallels increases in ambient and concrete temperature
  - The Contractor is required to supply **whatever** it takes to maintain the temperature between 60°F and 80°F.
  - Inspectors please ask for Initial cure environment(s) that will maintain the cylinders between 60°F & 80°F
  - Document requests for initial curing supplies

Low 28-Day Strength Cylinders

- **Initial curing in the field (continued)**
  - **When outside ambient temps are between 60°F and 80°F, store cylinders in shaded area with mold covers affixed**

Structural Concrete (2461)
(2017) Special Provision & 2018 Spec Book

- The Contractor will,
  - For each separate (initial & Intermediate) curing environment, provide a calibrated waterproof digital temperature recording device that records the daily maximum and minimum ambient temperatures for the previous 7 days.
- The Engineer will,
  - Monitor the daily temperatures of the curing environments. Agency monitoring does not relieve the Contractor of the responsibility to maintain the water temperature as specified herein.



Low 28-Day Strength Cylinders

- **Initial curing in the field (continued)**
  - Options for cooling the cylinders include:
    - Have the Contractor supply insulated cooler(s),
    - Add chilled water, and
    - Add ice if needed during hot weather

Transporting from Initial Curing Site

- For all grades of concrete Cure minimum 16 hours after casting
- Mass Concrete, cure minimum of 24 hours after casting.
- High Early Concrete, cure minimum of 12 hours after casting.

Field Office Curing

Strength Test Results

DEPARTMENT OF TRANSPORTATION

Concrete Cylinders Strength Test Report (ASTM C39)

Office of Materials and Road Research
1400 Gervais Avenue
Maplewood, MN, 55109

CO-CY18-3189
Print Date: 1/8/2019

Project Number: [redacted]
Billing Agency:
Project Eng.: [redacted]
Inspector:
Bridge No. :
Part of Structure: Ret. wall
Date Received: 12/12/18
Source: [redacted]
Mix Number: 3G52CF

Cylinder Information

Field ID:	1006
Date Made:	12/11/2018
Days Cured in Field:	1
Ticket Number:	4570156
Air Content :	6.9 % (5.0% to 8.5% Req'd)
Slump:	4 in. (2 to 5 in. Req'd)
Air Temperature:	27 Degrees
Concrete Temperature:	71 Degrees (50 to 90 Degrees Req'd)

Cylinder ID: 1006.1
Date Tested: 1/8/2019 **Avg. Dia. (in.)** 4.00 **Load (lbs)** 39138
Age: 28 **Area (sq. in.)** 12.6 **Actual Strength (PSI)** **3110**
Fracture Type: Short Shear **Defects:**
Comment:

Cylinder ID: 1006.2
Date Tested: 1/8/2019 **Avg. Dia. (in.)** 4.00 **Load (lbs)** 74649
Age: 28 **Area (sq. in.)** 12.6 **Actual Strength (PSI)** **5940**
Fracture Type: Long Shear **Defects:**
Comment:

Cylinder ID: 1006.3
Date Tested: 1/8/2019 **Avg. Dia. (in.)** 4.00 **Load (lbs)** 51475
Age: 28 **Area (sq. in.)** 12.6 **Actual Strength (PSI)** **4100**
Fracture Type: Short Shear **Defects:**
Comment:

Cylinder Strength Summary

Req'd Strength Specification (psi):	4500
28 day Strength Test (psi):	5940 See Note

Note: Adjusted Strength. All individual cylinder strengths that are more than 350 psi below the highest individual cylinder strength were removed from the average.

Comments:

Charge: 3 - 1072
Copies To
Curtis Kallio
engineering@cemstone.com

Report Reviewed By:
Pamela L. Ogden
Pamela L. Ogden

Cylinder:- Version 1

1/8/2019 11:15

Mn/DOT Concrete Cylinder Strength Test Report

Wide Range Between Individual Cylinder Results

DEPARTMENT OF TRANSPORTATION

Concrete Cylinders Strength Test Report (ASTM C39)

Office of Materials and Road Research
1400 Gervais Avenue
Maplewood, MN, 55109

CO-CY18-3189
Print Date: 1/8/2019

Project Number:	[redacted]
Billing Agency:	
Project Eng.:	[redacted]
Inspector:	
Bridge No. :	
Part of Structure:	Ret. wall
Date Received:	12/12/18
Source:	[redacted]
Mix Number:	3G52CF

Cylinder Information

Field ID:	1006
Date Made:	12/11/2018
Days Cured in Field:	1
Ticket Number:	4570156
Air Content :	6.9 % (5.0% to 8.5% Req'd)
Slump:	4 in. (2 to 5 in. Req'd)
Air Temperature:	27 Degrees
Concrete Temperature:	71 Degrees (50 to 90 Degrees Req'd)

Cylinder ID: 1006.1					
Date Tested:	1/8/2019	Avg. Dia. (in.)	4.00	Load (lbs)	39138
Age:	28	Area (sq. in.)	12.6	Actual Strength (PSI)	3110
Fracture Type: Short Shear		Defects:			
Comment:					

3110

Cylinder ID: 1006.2					
Date Tested:	1/8/2019	Avg. Dia. (in.)	4.00	Load (lbs)	74649
Age:	28	Area (sq. in.)	12.6	Actual Strength (PSI)	5940
Fracture Type: Long Shear		Defects:			
Comment:					

5940

Cylinder ID: 1006.3					
Date Tested:	1/8/2019	Avg. Dia. (in.)	4.00	Load (lbs)	51475
Age:	28	Area (sq. in.)	12.6	Actual Strength (PSI)	4100
Fracture Type: Short Shear		Defects:			
Comment:					

4100

Cylinder Strength Summary

Req'd Strength Specification (psi):	4500
28 day Strength Test (psi):	5940 See Note

5940

Note: Adjusted Strength. All individual cylinder strengths that are more than 350 psi below the highest individual cylinder strength were removed from the average.

5940 – 350 = 5590 Plus

Average 4383

Test Report will Remove Individual Results Greater than 350 PSI from the Highest Result of 5940 PSI

Charge: 3 - 1072
Copies To
Curtis Kallio
engineering@cemstone.com

Report Reviewed By:
Pamela L. Ogden

Cylinder:- Version 1

Page 1 of 1

1/8/2019 11:15

Test Pours

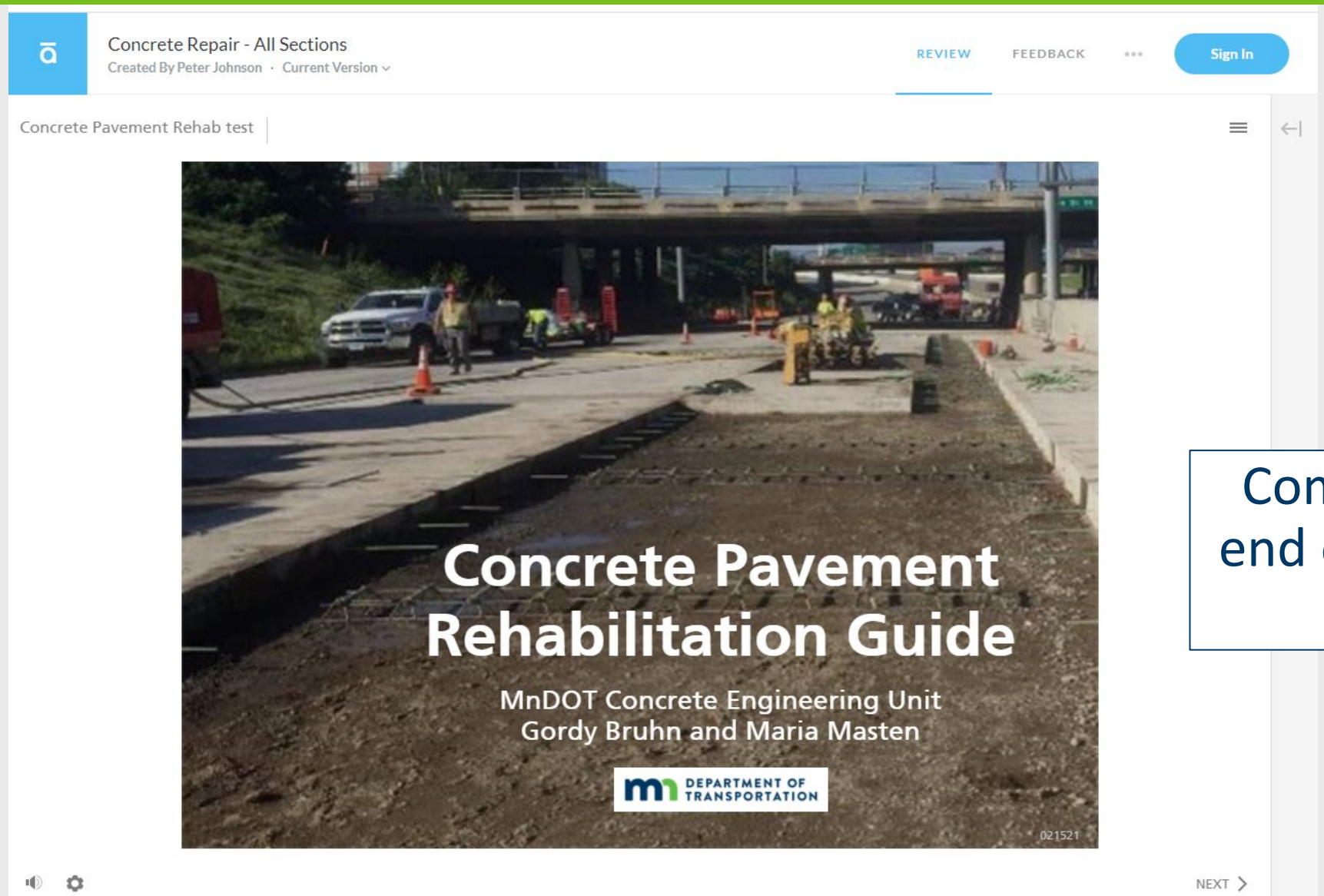
- Self Consolidating Concrete / Self Compacting Concrete (SCC)
- Bridge Decks with High Performance Concrete (HPC)
- Colored Concrete

If the Concrete is going to be pumped to place the concrete into the newly constructed structures, pump the concrete on the test pour…

When a SCC Test Pour goes Wrong

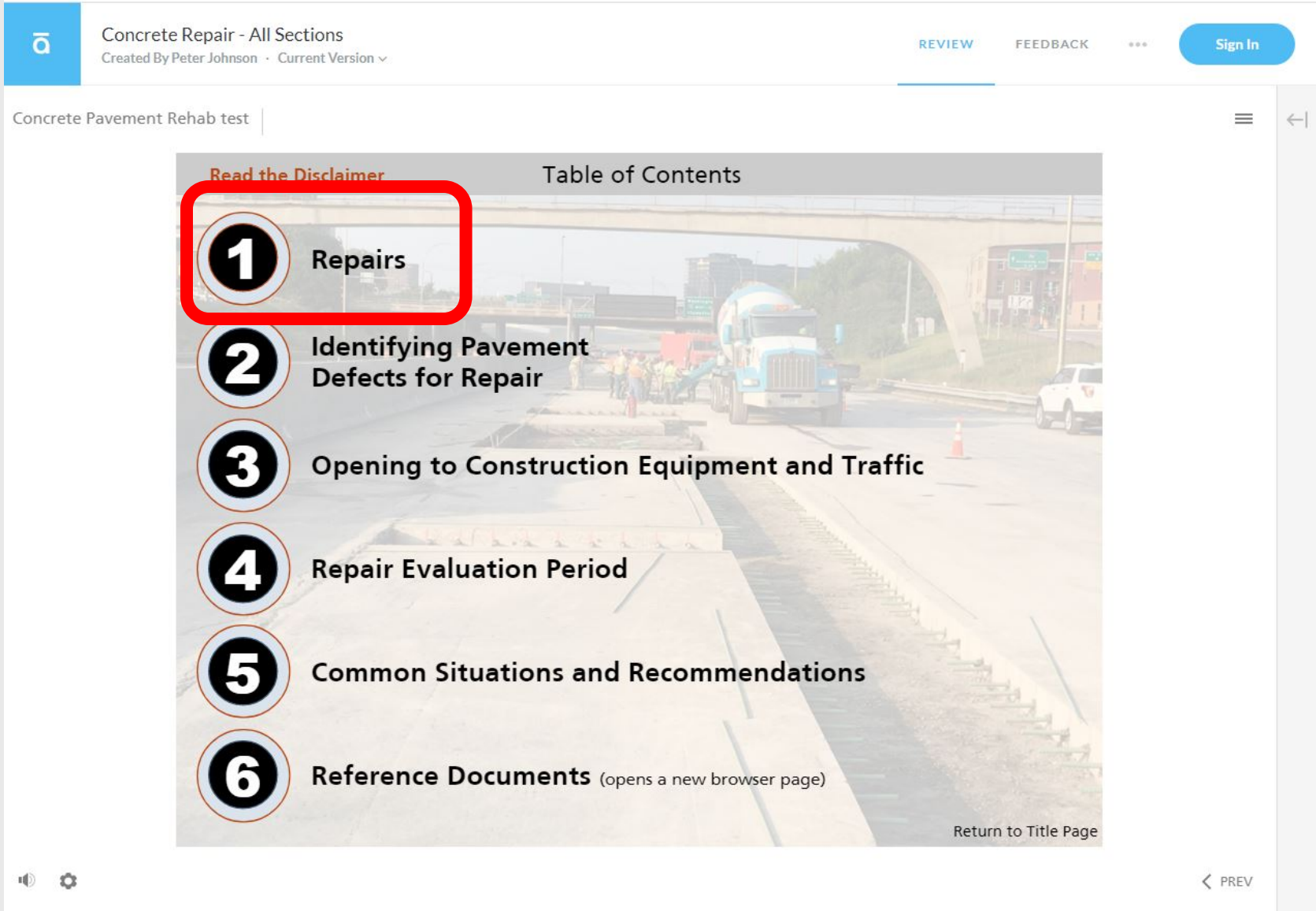
Wall Infills using SCC

Concrete Pavement Rehabilitation Guide



Completed by end of February 2021

Types of Pavement Repairs



Concrete Repair - All Sections

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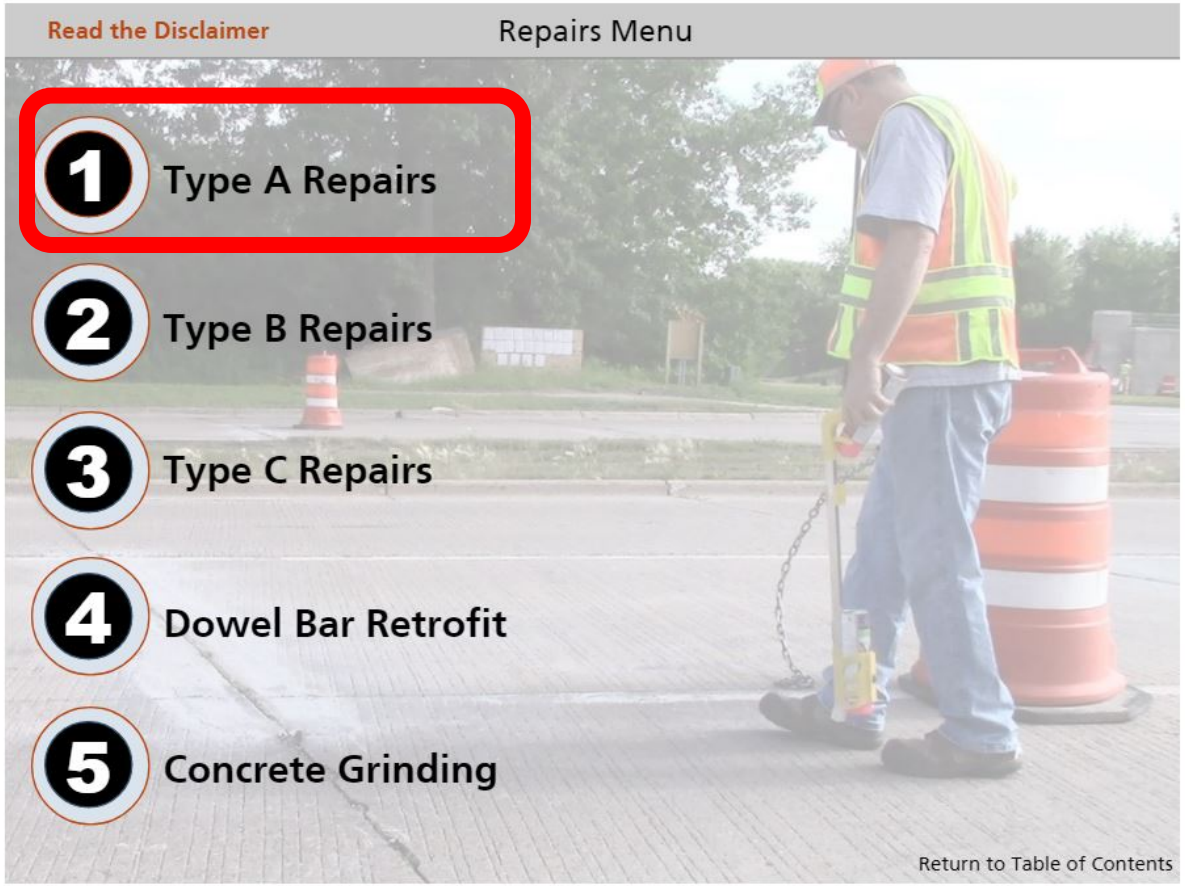
REVIEW FEEDBACK ••• Sign In

Concrete Pavement Rehab test



PREV

Saw & Seal (Type A1)

Type A1 Repairs

How to Perform Joint Repair Type A1

Click on a button to view that step

Type A1 repairs are incidental or paid by linear foot.

Type A1 repairs are used in two different ways:

1. Sawing and sealing new and re-established joints in Type B and Type C repairs.
2. When the agency wants freshly sawn joint faces prior to resealing the joints. This type of repair results in increasing the existing joint width.

- 1. Repair Details
- 2. Sawing
- 3. Joint Measurements
- 4. Sandblast and Final Cleaning
- 5. Install a Backer Rod
- 6. Fill with a Hot Pour Sealer
- 7. Measurement for Payment

Concrete Unit Recommendation:

The purpose of sealing joints is to protect the repairs from water and to prevent the accumulation of incompressible debris such as sand and dirt.

Seal all concrete pavement repairs in accordance with the Saw and Seal Joint Repair (Type A1).

- Roadways ≤ 45mph, seal/reseal transverse and longitudinal joints in accordance with Saw and Seal Joint Repair (Type A1) repair detail, or the Clean and Seal Joint Repair (Type A2) repair detail.
- Roadways > 45 mph, saw and sealing or clean and sealing joints outside of the full or partial depth repairs is not recommended.

However, it is recommended that the performance of the in-place joints be evaluated on a case by case basis. Contact the Concrete Engineering Unit to discuss further.

Saw & Seal (Type A1) and Clean & Seal (Type A2)

Concrete Repair - All Sections
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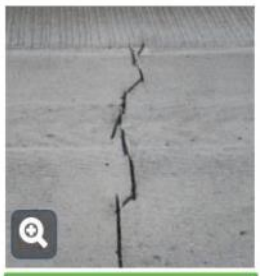
Concrete Pavement Rehab test

Type A1 Repairs Sawing

Click on an image for a larger view.

Produce 2 freshly sawn faces no greater than 1/8" wider than the existing joint.

The Contractor needs to stack the blades to determine the correct width for the saw cut.



Concrete Unit Recommendations
MnDOT discourages sawing and sealing random cracks due to the difficulty of widening as shown in the photo.

Return to A1 Sequence Slide 3 of 13

PREV NEXT

Concrete Repair - All Sections
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REVIEW FEEDBACK

ıvement Rehab test

Type A2 Repairs Removing the In-Place Joint Sealant

Using a ripper tooth to remove in-place joint sealant on longitudinal joint

Concrete Unit Recommendation
Contractor may use a ripper tooth or saws to remove the in-place joint sealant.

Return to A2 Sequence Slide 4 of 14

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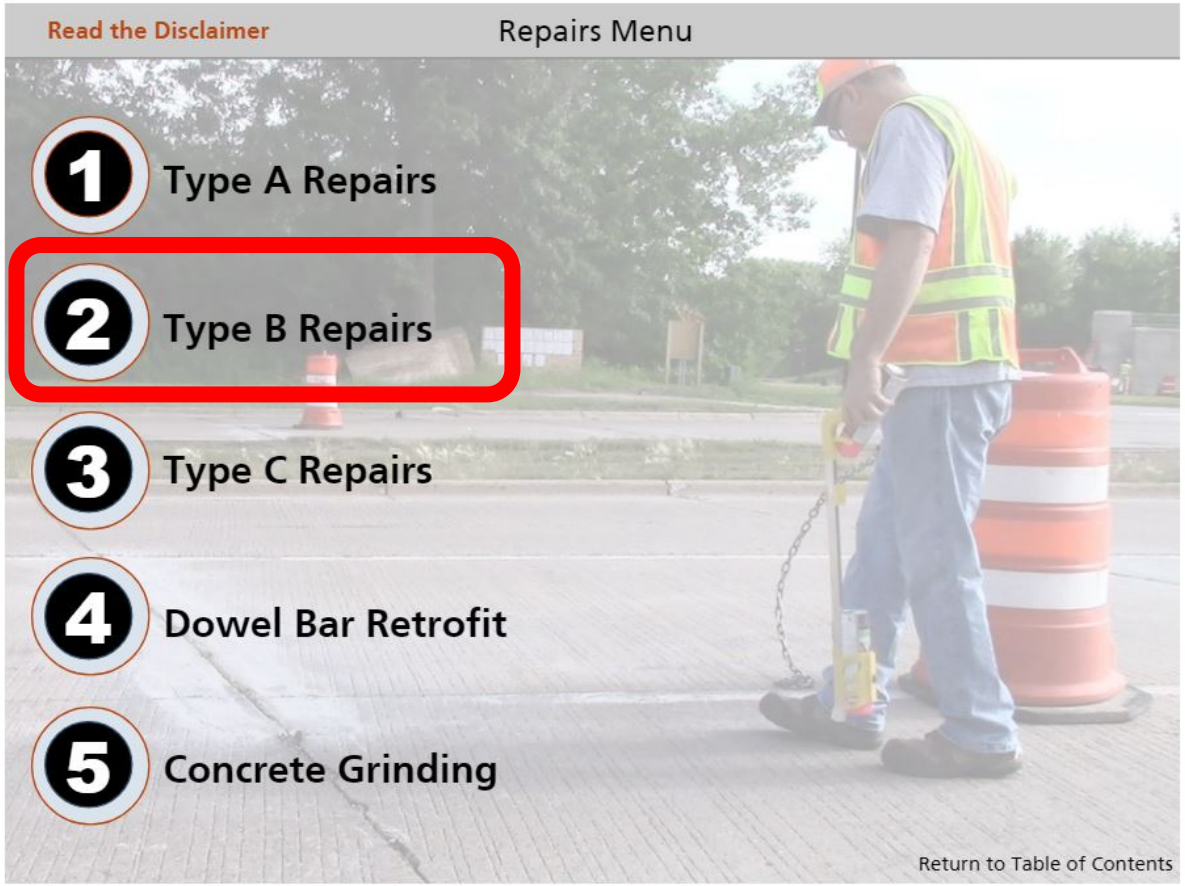
REVIEW FEEDBACK ••• Sign In

Concrete Pavement Rehab test



PREV

Type B Repairs

Boiler Plate

Click to return to recommendations X

Partial Depth Repair Type BA

- Spot repair of localized spalling
- Repair delaminated areas above reinforcing steel and dowel bars
- Measured by area

Type BA Repair

Joint and Crack Repair Type B3

- Repair of joint spalling and transverse contraction joint tunneling
- Measured linearly

Type B3 Repair

Partial Depth Repair Special Type BE

- Repair of localized bottom-up deteriorations
- Primarily found at intersecting longitudinal and transverse contraction joints and below longitudinal joints
- Always paid for in conjunction with a Type BA or B3 repair
- Measured by area

Type BE Repair

Return to Repairs Menu

Spot Surface Repair (Type BA)

Concrete Repair - All Sections
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Concrete Pavement Rehab test

Type BA Repairs How to Perform Partial Depth Type BA Repairs

Click on a button to view that step

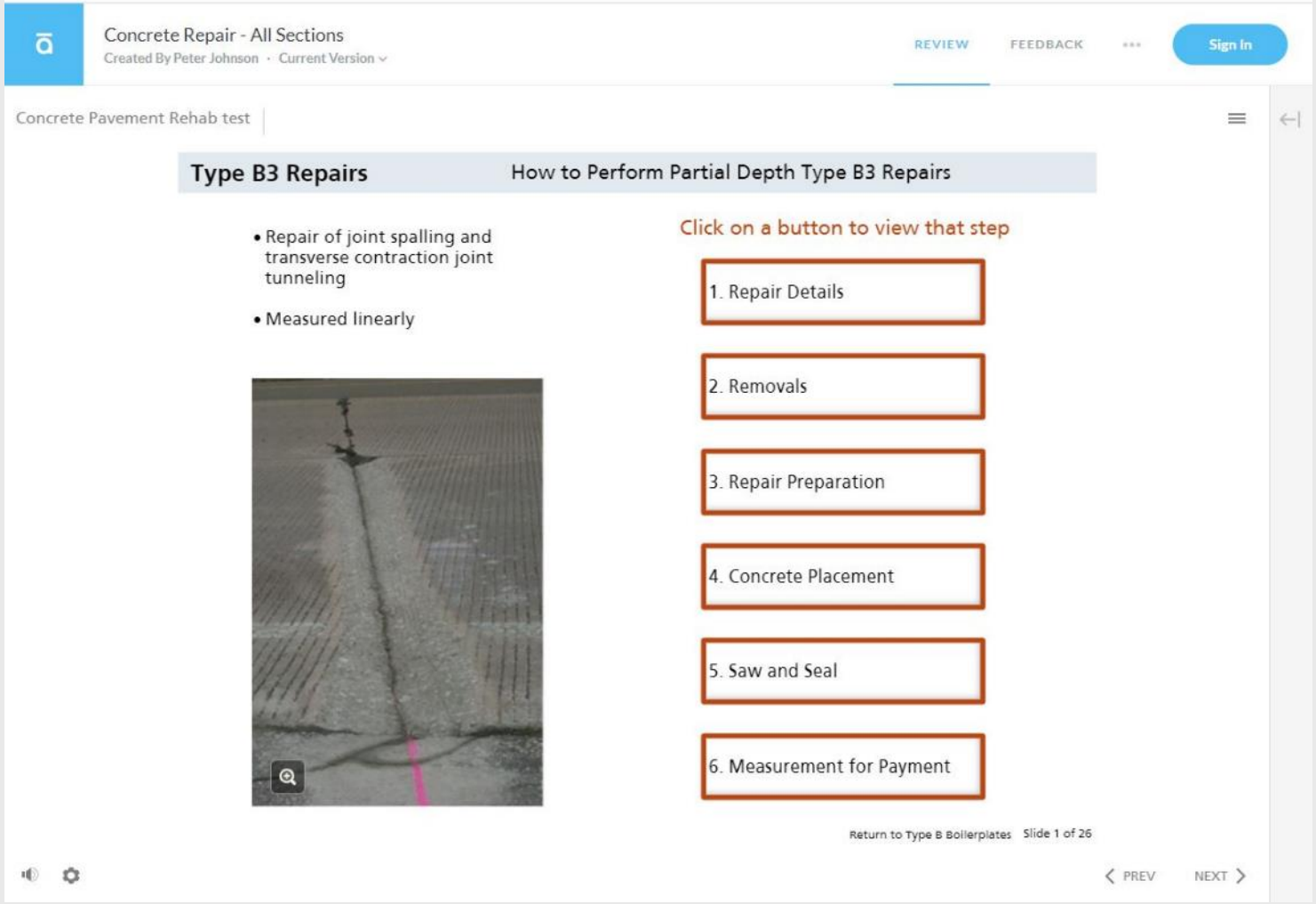
- Spot repair of localized spalling
- Repair delaminated areas above reinforcing steel and dowel bars
- Measured by area

1. Repair Details
2. Removals
3. Repair Preparation
4. Concrete Placement
5. Saw and Seal
6. Measurement for Payment

Return to Type B Repair Boilerplate Slide 1 of 26

PREV NEXT

Joint Repair (Type B3)



Use Type BE Repair when a PDR Goes Full Depth

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Concrete Pavement Rehab test

Type BE Repairs

How to Perform Partial Depth Type BE Repairs

- Repair of localized bottom-up deteriorations
- Primarily found at intersecting longitudinal and transverse contraction joints and below longitudinal Joints
- Measured by area
- Always paid for in conjunction with a Type BA or B3 repair

Click on a button to view that step

1. Repair Details
2. Removal
3. Repair Preparation
4. Concrete Placement
5. Saw and Seal
6. Measurement for Payment

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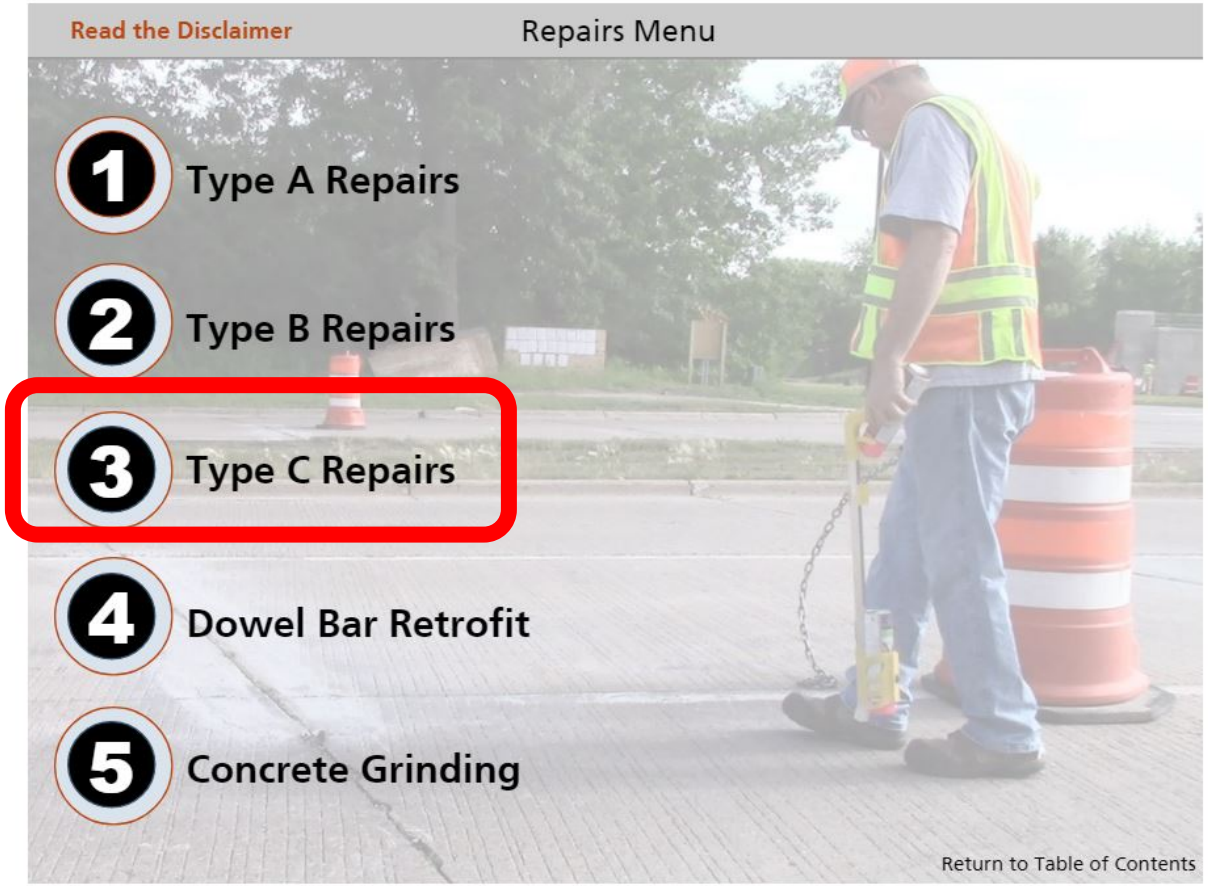
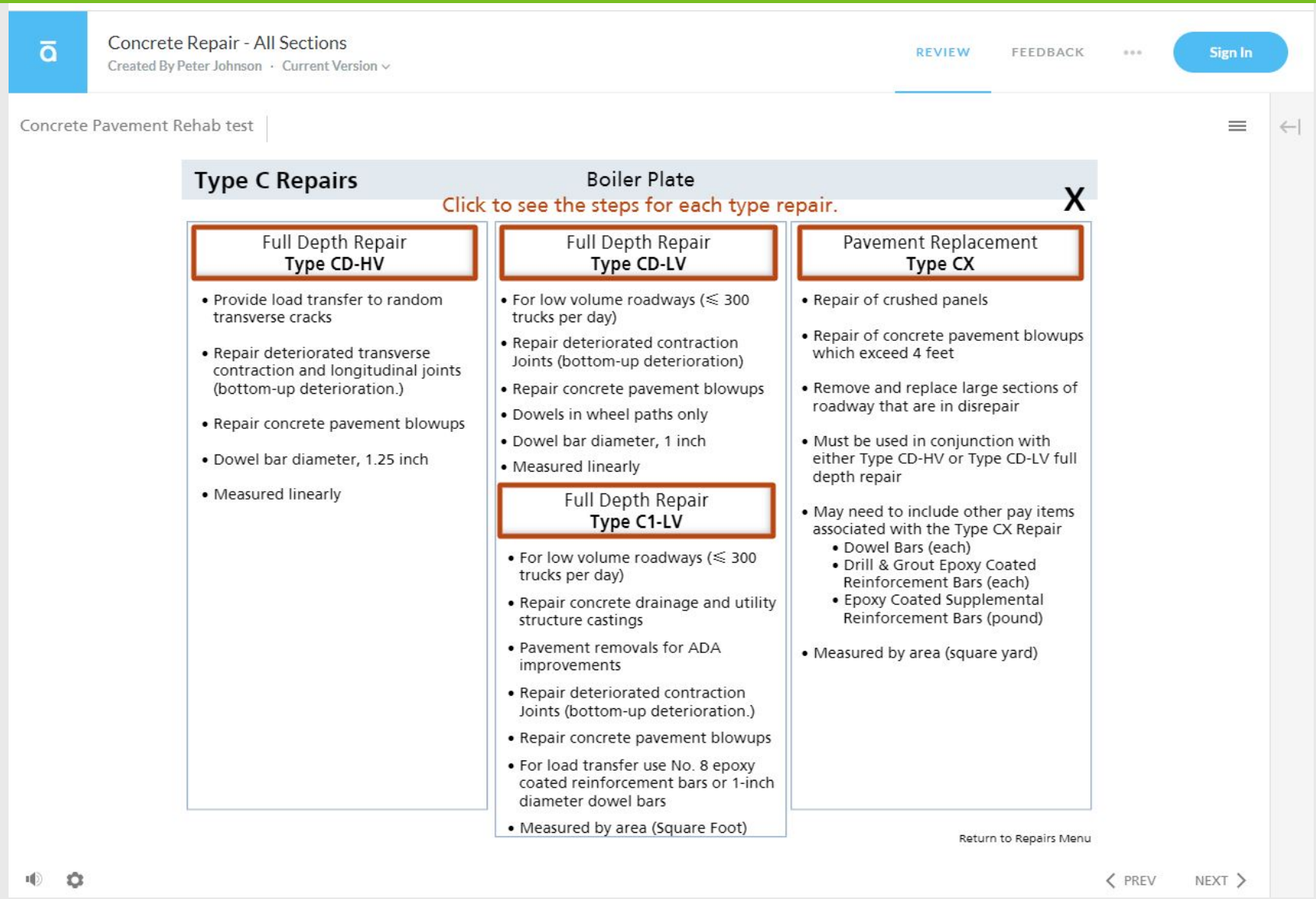
Concrete Pavement Rehab test



PREV


Concrete Repair - All Sections
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REVIEW
FEEDBACK
Sign In
Concrete Pavement Rehab test
Type C Repairs
Boiler Plate
Click to see the steps for each type repair.
X
Full Depth Repair
Type CD-HV
• Provide load transfer to random transverse cracks
• Repair deteriorated transverse contraction and longitudinal joints (bottom-up deterioration.)
• Repair concrete pavement blowups
• Dowel bar diameter, 1.25 inch
• Measured linearly
Full Depth Repair
Type CD-LV
• For low volume roadways (≤ 300 trucks per day)
• Repair deteriorated contraction Joints (bottom-up deterioration)
• Repair concrete pavement blowups
• Dowels in wheel paths only
• Dowel bar diameter, 1 inch
• Measured linearly
Full Depth Repair
Type C1-LV
• For low volume roadways (≤ 300 trucks per day)
• Repair concrete drainage and utility structure castings
• Pavement removals for ADA improvements
• Repair deteriorated contraction Joints (bottom-up deterioration.)
• Repair concrete pavement blowups
• For load transfer use No. 8 epoxy coated reinforcement bars or 1-inch diameter dowel bars
• Measured by area (Square Foot)
Pavement Replacement
Type CX
• Repair of crushed panels
• Repair of concrete pavement blowups which exceed 4 feet
• Remove and replace large sections of roadway that are in disrepair
• Must be used in conjunction with either Type CD-HV or Type CD-LV full depth repair
• May need to include other pay items associated with the Type CX Repair
• Dowel Bars (each)
• Drill & Grout Epoxy Coated Reinforcement Bars (each)
• Epoxy Coated Supplemental Reinforcement Bars (pound)
• Measured by area (square yard)
Return to Repairs Menu
PREV
NEXT

Full Depth Joint Replacement Type CD-HV & Type CD-LV

Concrete Repair - All Sections
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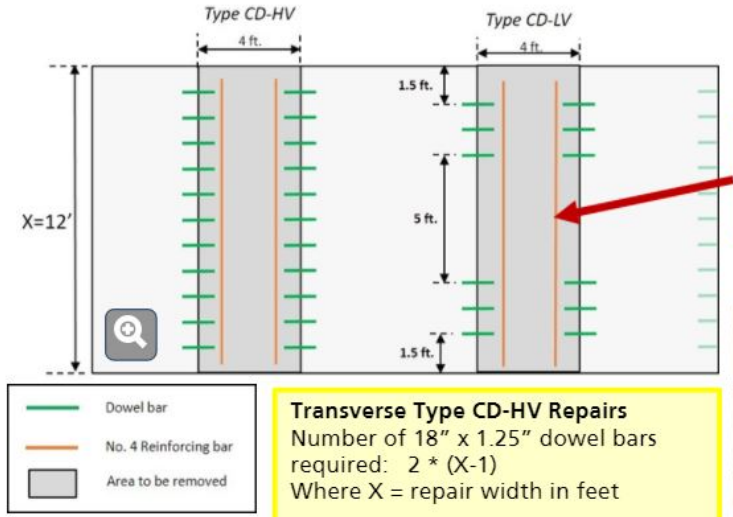
Concrete Pavement Rehab test

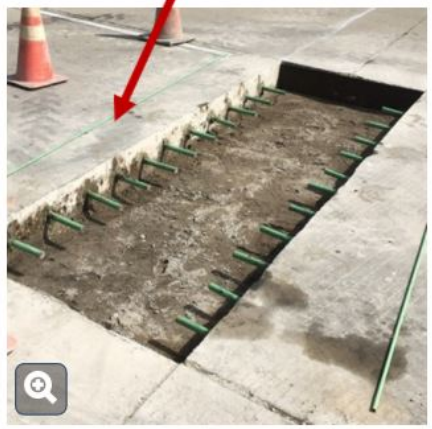
Type CD-HV Repairs

Repair Preparation
Transverse Type CD Repair Bar Installation Locations

Click on an image for a larger view.



Type CD-HV and Type CD-LV
Length of No. 4 Reinforcing Bar:
X – 2 ft
Where X = repair width in feet



Transverse Type CD-HV Repairs
Number of 18" x 1.25" dowel bars required: 2 * (X-1)
Where X = repair width in feet

Add an additional dowel bar per side for each 1 foot increase in lane width/ pay quantity

Transverse Type CD-LV Repairs
Number of 18" x 1" dowel bars required: 3 dowel bars per wheel path

Return to Type CD-HV Sequence Slide 20 of 40

PREV NEXT

Pavement Replacement Type CX Repair

Concrete Pavement Rehab test

Type CX Repairs

How to Perform Full Depth Type CX Repairs

Click on a button to view that step

- Repair of crushed panels
- Repair of concrete pavement blowups which exceed 4 feet
- Remove and replace large sections of roadway that are in disrepair
- Must be used in conjunction with either the FDR (Type CD-HV) or (Type CD-LV)
- May need to include other pay items associated with the Type CX Repair
  - Dowel Bars (each)
  - Drill & Grout Epoxy Coated Reinforcement Bars (each)
  - Epoxy Coated Supplemental Reinforcement Bars (pound)
- Measured by area (square yard)

1. Repair Details
2. Removals
3. Repair Preparation
4. Concrete Placement
5. Saw and Seal
6. Measurement for Payment

Concrete Unit Recommendations

All CPR projects should include either a Full Depth Repair Type CD-HV or Type CD-LV and Pavement Replacement Type CX.

Return to Type C Repair Boilerplates Slide 1 of 44

Type CX Repair

Concrete Repair - All Sections
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Concrete Pavement Rehab test

Type CX Repairs Repair Preparation – Install Dowel Bar Baskets – Square Joints

Type CD-HV +Type CX Repair Installation of Dowel Bar Baskets

Click on an image for a larger view.

Concrete Unit Recommendation
If lane removals are not equal, place dowel bar basket as shown.

Install dowel bars adjacent to existing transverse contraction joints and parallel to the roadway centerline.

Type CD-HV +Type CX Repair Installation of Dowel Bar Baskets

DEPARTMENT OF TRANSPORTATION

Thank you!

Gordon “Gordy” Bruhn

gordon.bruhn@state.mn.us

651-366-5523

DEPARTMENT OF TRANSPORTATION

Concrete Paving and Maturity - Rob Golish

2020 Paving Projects

- Fly ash shortage
- Few projects that were driven on early
- Rain damaged concrete
- Everything considering, paving went well in 2020

New Standard Plans

- 5-297.221 Construction Joints
  - Now includes – Construction and Terminal Headers
  - Joint depth for all concrete – T/3
  - Basket 12” from centerline

Dowel Bar Bond Breaker Material

- Require dowel bars and dowel baskets to be dipped in a waxy bond breaker material.

Thickness Verification by Scanning (MIT-SCAN T2)

- ✓**New Special Provision** used when constructing:
  - ✓A concrete overlay of existing asphalt (Whitetopping)
  - ✓Concrete placed directly on grade and the total cubic yard quantity for the project is >3,500 cubic yards
- ✓**Not to be use on unbonded overlays**
  - ✓Existing reinforcement and dowel baskets below the UBOL influenced the results

Benefits of Using Maturity

- Reduce field control cylinders/beams
- Real-time and Continuous
- Effectiveness of Cold Weather Protection Plan
- Monitoring Temperature of Concrete
- Form Removal
- Sawing
- Opening to Traffic

2020 Maturity Projects

Paving

- MnDOT's I-90 near Blue Earth (Croell)
- MnDOT's I-90 near Austin (Croell)
- Fillmore County's CSAH 1 (Croell)
- Goodhue County's CSAH 21 (Croell)
- MnDOT's I-35W MnPASS (Pci Roads)
- MnDOT's I-94 Albertville (Pci Roads)
- MnDOT's I-35W/Lake Street (Shafer Contracting)
- Rice County's CSAH 46 (Doyle Conner and Rochester Ready-Mix)
- Hennepin County's Minneapolis Reconstruction (Ti-Zack & Cemstone)
- City of Detroit Lake's South Washington (Strata Corporation)

Bridges

- MnDOT's Jordan bridge deck (Cemstone)
- MnDOT's 3rd Avenue bridge deck (Cemstone)

Maturity Method

Developing the maturity-strength relationship requires three steps:

Step 1 - Develop the maturity-strength curve

Step 2 - Estimating the in-place strength

Step 3 - Validating the strength-maturity relationship

Contractor/Producer responsible for all steps Maturity Process

Development of Maturity Curve
Cast Strength Specimens

Maturity Curve can be built in Field or Lab

Embed the sensors in the center of the 2 additional beams or cylinders specimens

Cure specimens in a moist condition at a temp of range 60° – 80° F

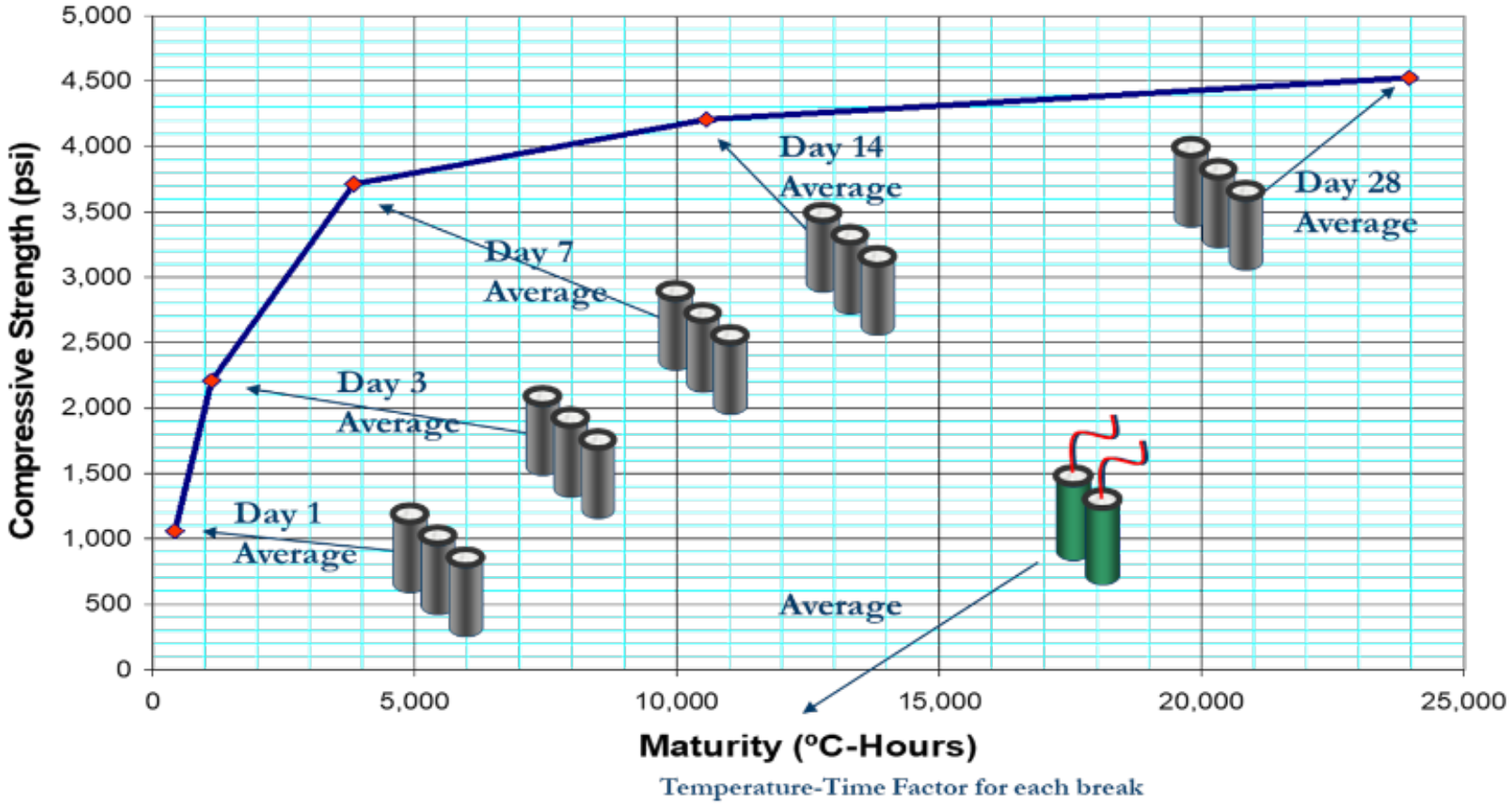
Maturity Equipment
Provided by Contractor/Producer

Maturity Readers

Data Loggers

Development of Maturity Curve

- Strength test specimens at time specified in 2461



Development of Maturity Curve

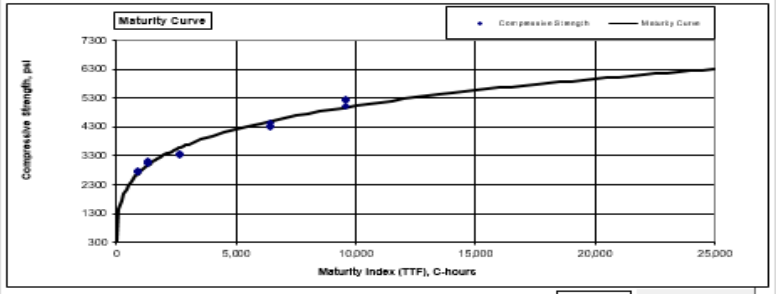
- Strength test specimens at time specified in 2461

Minnesota Department of Transportation 10/22/2019

Concrete Maturity - Compressive Strength Development

Project No.:	8901-23		Tester:	C.Calloway		Report Date:	11/27/19		
Location:	I-425		Contractor:	TUV		Curing Date:	11/20/19		
Curve #:	1		Engineer:	T.Sander		Curing Time:	7:45am		
						Opening Strength, psi	3000		

Beam No.	Age at Break (hours)	Ave. Diameter "D" (in)	Ave. Length "L" (in)	Total Test Load (lbs)	Failure Type	Compressive Strength (psi)	TTF Sensor 1 (C-Hours)	TTF Sensor 2 (C-Hours)	Ave. TTF (C-Hours)
1	16.5	6.01	12.02	79060	Cone	2785	881	887	885
2		6.00	12.00	77090	Cone/Split	2725			
3		5.96	11.99	76720	Cone	2750			
4	28.5	6.01	12.02	85625	Cone	3020	1235	1321	1280
5		6.00	12.01	87290	Cone	3085			
6		5.97	12.00	87830	Cone/Split	3140			
7	39.5	6.00	12.00	95400	Cone	3375	2547	2654	2600
8		6.02	12.00	95900	Cone	3370			
9		6.00	11.99	94230	Cone	3335			
10	53.5	6.00	11.99	121740	Cone/Split	4305	6521	6352	6435
11		5.98	12.00	124110	Cone	4420			
12		5.99	12.01	121800	Cone/Split	4320			
13	64.5	6.01	12.00	149940	Cone	5285	9542	9654	9600
14		6.00	12.00	147070	Cone/Split	5200			
15		6.01	12.01	142340	Cone/Split	5020			



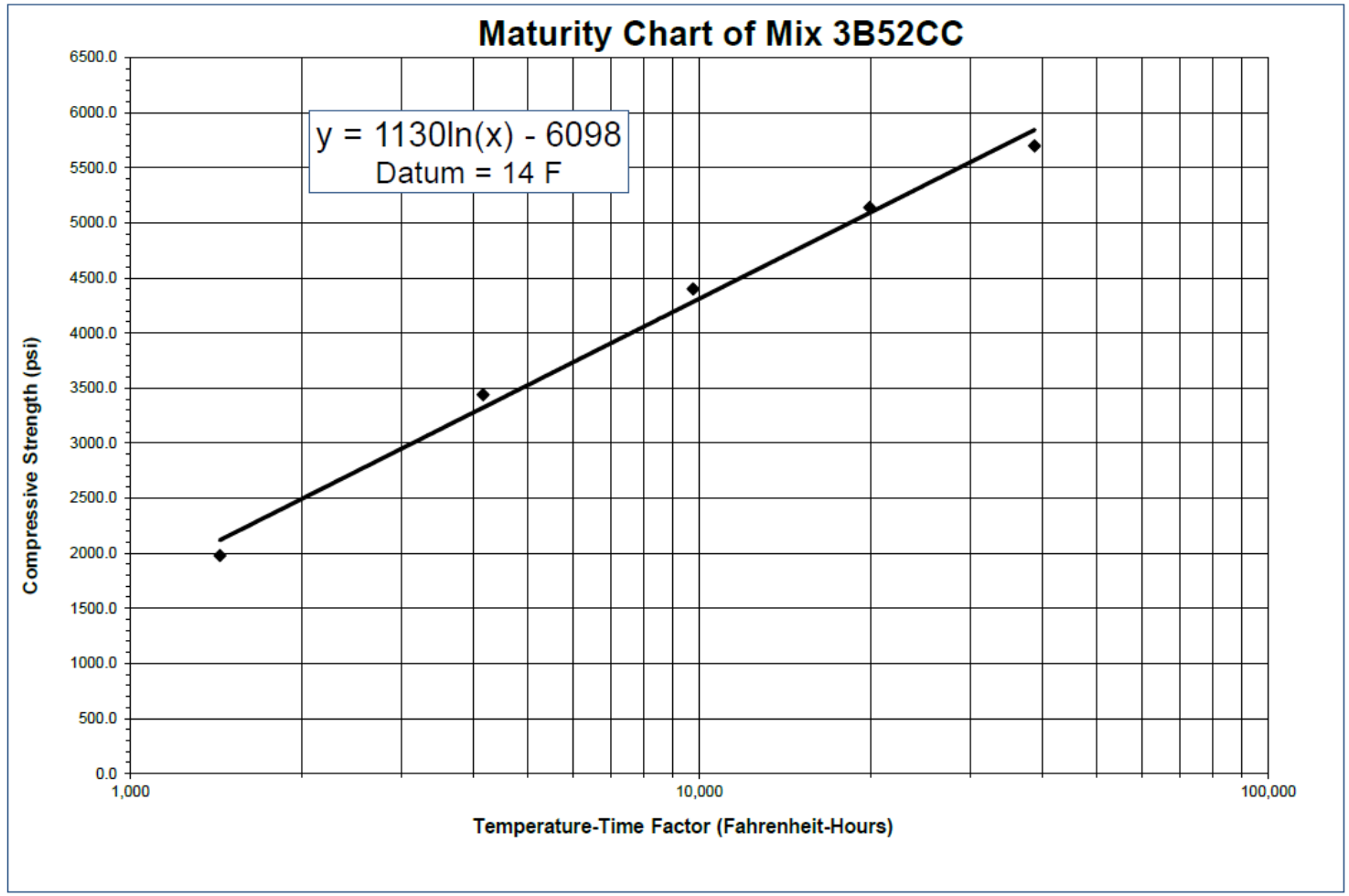
Required TTF for Opening: 1349 C-hours

Sa= 2638056.59
t= 1.1826E+24
a= 0.03968784

Solve Maturity Curve

Comments:

Mix Information			
Mix No.	3F52	Certified Contractor Rep:	
Truck No.	52654		
Air, %	6.8		
Temperature	67	Maturity Curve Reviewed by:	
W/C Ratio	0.45		



Maturity Method

Developing the maturity-strength relationship requires three steps:

Step 1 - Develop the maturity-strength curve

Step 2 - Estimating the in-place strength

Step 3 - Validating the strength-maturity relationship

Contractor/Producer reads data and provides Engineer with data to determine if pavement can be opened/forms can be removed

Maturity Method

Developing the maturity-strength relationship requires three steps:

Step 1 - Develop the maturity-strength curve

Step 2 - Estimating the in-place strength

Step 3 - Validate the maturity-curve

Contractor/Producer casts beams/cylinders to validate maturity cure

More info on Maturity Method

Concrete Maturity

Materials Home | Concrete Home | Contacts

Maturity

Introduction

- The maturity method is an non-destructive procedure used to estimate the strength of in-place concrete based on temperature history of the concrete.

Did you know

Maturity is an allowable method to determine development of concrete strength. See Standard Specifications for Construction 2018, Specification 2461.3.G.6, "Estimating Concrete Strength by the Maturity Method."

Uses

- Predicting opening times to traffic, striping forms, terminating cold weather protection are several uses for the maturity method.

Specification

- Specification 2461.3.G.6, "Development of Maturity-Strength Relationship"
- The updated special provisions will be posted in the near future

Procedures

- Maturity method procedures

Forms

Concrete maturity workbook - beams (revised 7/22/2019)

Concrete maturity workbook - cylinders (revised 9/2018)

Contact the Concrete Engineering Unit if a Contractor wants to use maturity on your project.

Thank you!

Rob Golish

Robert.golish@state.mn.us

651-366-5576

Concrete Ready-Mix – Brad Swenson and Matt Herbst

Brad Swenson

Greater Minnesota Plant Coordinator
Minnesota Department of Transportation
Materials and Road Research
1400 Gervais Avenue
Maplewood, MN 55109
218-232-1012 (cell)
bradley.s.swenson@state.mn.us

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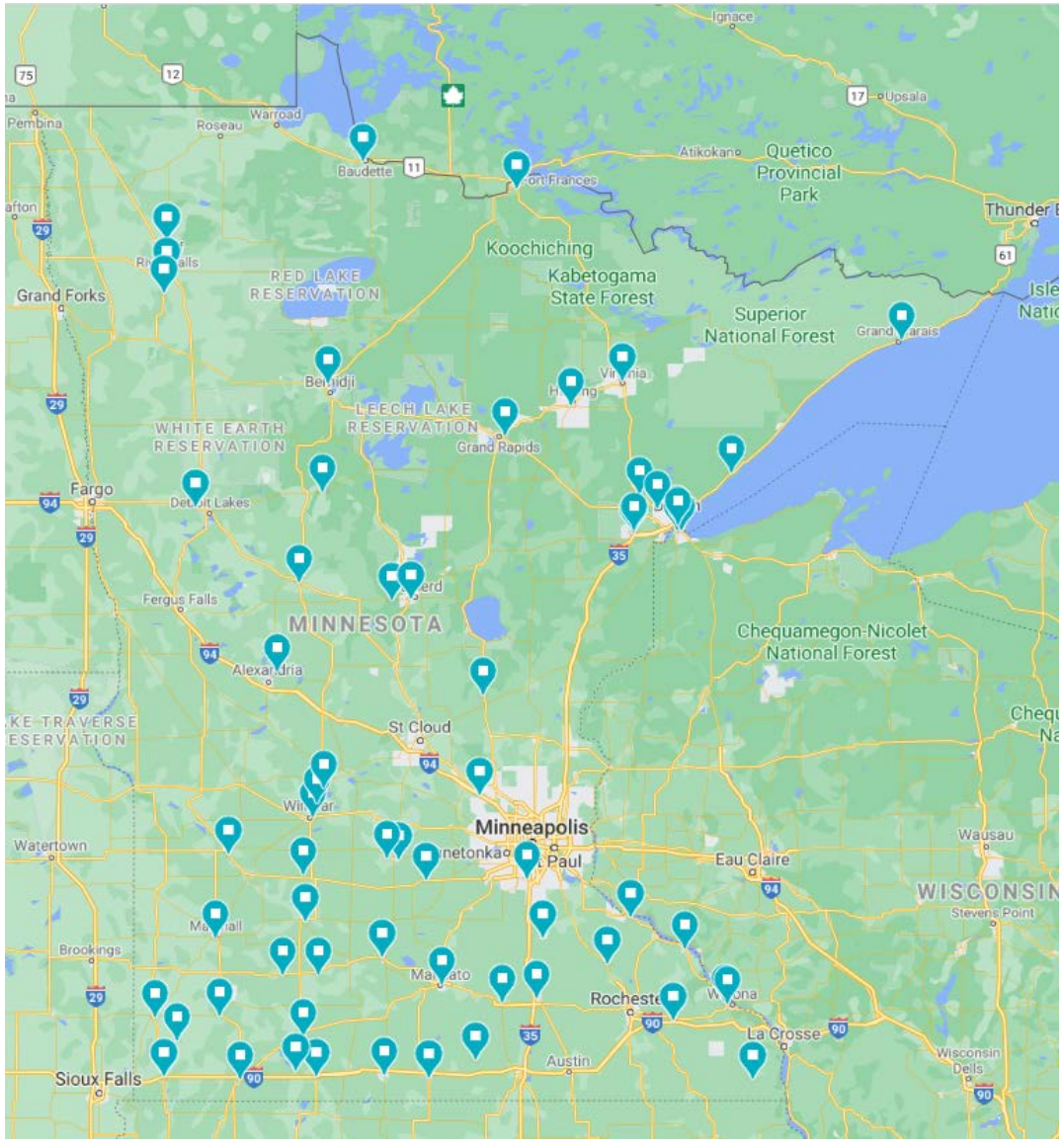
2020 Ready-Mix Plant Visits



Positives of 2020

- Brad and Matt are continuing to build positive relationships with Industry and Agency
- Learning from errors (limited times the same mistake made twice by same person)
- Improvements (not 100%)
  - Submitting QC/QA workbooks on time
  - Filling out diary in QC workbook
  - Producers are complying with minimum testing requirements

Lots of room for improvement yet!

Concrete Plant Refresher for Producers

- No Concrete plant monitor training this year.
- The aim of the training is to convey correct information and updates directly to people working at the concrete plants.
- Training currently proposed for spring of 2021
  - Options as an industry or by company (companies)
  - Virtual or in-person TBD

HPC Mix Designs

- JMF mix design for 3YHPC, Mass Concrete, SCC are project and plant specific
- This is not a new spec but one that has been missed many times
- Not approved for all projects after it is initially approved
    - Special Provisions could be different
- Passing gradation required before start of production for bridge decks

Certificate of Compliance Issues

- OD weights do not match weights on the mix design
- Not having approved mix designs
- Incorrect absorptions
- Over on water content
- Using materials not on approved project specific mix design
- Moistures on Certificate of Compliance not matching the moisture test results
- Tolerances on aggregates/cement/admixtures (Target vs Actual)
- Missing S.P. or Bridge numbers

"These issues were seen on signed certificates of compliance"

Certificate of Compliance Check

Concrete Plant:	ACME CONCRETE
S.P.	5555-1212
Date:	7/11/2021
Time:	6:30 AM
Ticket #:	619619
Mix Type:	3F52

DEPARTMENT OF TRANSPORTATION

Only enter data into shaded cells!

Load Size:	10.00			OD (lbs/CY) From Mix Design!	PER YD³				BATCH (lbs)		% Diff from Actual to Target	Allowable Tolerance
Ingredient	**Pit #**	**MCFac**	**Abs Fac**		**Abs**	**SSD**	**Free Moist**	**Target (CY)**	**Target Load**	**Actual**		
Sand	69004	0.046	0.011	1205	13.3	1218.3	42.2	1260.4	12604.3	12490	-0.91%	+/- 2%
CA 1	69004	0.038	0.012	1810	21.7	1831.7	47.1	1878.8	18787.8	18880	0.49%	+/- 2%
CA 2												+/- 2%
Cement				510					5100.0	5120	0.39%	+/- 1%
Fly Ash				90					900.0	910	1.11%	+/- 3%
Other CM												+/- 3%
Water				270.0						1645.0		+/- 1%

FM/YD³ (Total of all Aggregate Free Moistures)	89.2
FM Batch (Total FM/YD³ X Load Size)	892.4
Batch Water in lbs	1645.0
Total Water (Free + Batch)	2537.4

Batched Cement	5120
Batched Fly Ash	910
Other Batched CM	0
Total Cementitious	6030

Design Water Batch	2700.0
Total Water	2537.4
Water Available in lbs	162.7
***Computed Water Available (GAL)**	**19.5**
Water Available on Cert of Compliance (GAL)	**20**
Water added at Plant (GAL)	**0**
Water added on Jobsite (GAL)	**0**
Adjusted Water Available (GAL)	**19.5**
Final W/C Ratio	**0.421**

Common Water Conversions			
GAL	32.4	**LBS**	**270**
LBS	270	**GAL**	**32.4**

***Note:** Water Available is computed as taught in the MnDOT Concrete Plant Technical Certification course. Actual Batching systems may compute available water slightly different but should never compute more available water than what is shown on this worksheet.

Moistures

- ≥ 20 yards daily
- Every 4 hours
- Night before if no rain - starts at time of production even if it is private work
- Sample size weights should be more random

Moistures

TP 2152 (4/21/2020)

Minnesota Department of Transportation

Concrete Batching Report

Batch Plant: [redacted]

		Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse
Aggregate Size		sand		#67				sand		#67									
Pit #		[redacted]		[redacted]				[redacted]		[redacted]									
Date																			
Tester																			
A. Wt. Sample + Pan	Wet	591.6		2192				591		2192.3									
B. Wt. Sample + Pan	Dry	574.2		2155				573.8		2154.8									
C. Moisture Loss	A-B	17		37				17		38									
D. Tare Wt. Pan	-	0		0				0		0									
E. Dry Wt. Sample	B-D	574		2155				574		2155									
F. Total Moisture Factor	C/E	0.030		0.017				0.030		0.017									
G. Absorb. Factor	-	0.007		0.012				0.007		0.012									
H. Free Moisture Factor	F-G	0.023		0.005				0.023		0.005									
I. Time Scales Set		10:00						13:00											

Highlighted results on Line F "Total Moiture Factor" must match MCFac column on the Certificate of Compliance unless a moisture probe has been approved on the contact report by the Concrete Engineer.

Minimum Sample Sizes

- Insufficient Sample Sizes
- MnDOT Schedule of Materials Control
  - Random sample sizes (grab a sample – approximate size not always the same exact the number)

Minimum Sample Sizes:

Gradation:		**Moisture:**	
3/4" Plus, #4:	30 lb.	Fine Aggregate:	500 g
3/4" Minus, #67:	10 lb.	Intermediate Aggregate:	500 g
#7, CA-70:	6 lb.	Coarse Aggregate:	2000 g
CIA, FIA:	1000 g		
CS, FS:	500 g		
#89, CA-80:	500 g		
Fine Aggregate:	500 g		
Companion Required, Double Sample Sizes			

Minimum Sample Sizes

TP 2152 (5/20/2020)

Minnesota Department of Transportation

Concrete Batching Report

Batch Plant: [redacted]

		Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse
Aggregate Size			FA	#67				FA		#67									
Pit #			[redacted]	[redacted]				[redacted]		[redacted]									
Date		9/29/20																	
Tester		[redacted]																	
A. Wt. Sample + Pan	Wet	547.2		581.5				560.2		561.2									
B. Wt. Sample + Pan	Dry	522.6		574.2				541.1		556.1									
C. Moisture Loss	A-B	25		7				19		5									
D. Tare Wt. Pan	-	0		0				0		0									
E. Dry Wt. Sample	B-D	523		574				541		556									
F. Total Moisture Factor	C/E	0.047		0.013				0.035		0.009									
G. Absorb. Factor	-	0.003		0.005				0.003		0.005									
H. Free Moisture Factor	F-G	0.044		0.008				0.032		0.004									
I. Time Scales Set		7: 00						12:00											

Highlighted results on Line F "Total Moiture Factor" must match MCFac column on the Certificate of Compliance unless a moisture probe has been approved on the contact report by the Concrete Engineer.

Minimum Sample Sizes

Composite Gradation for: #67

Agg. Fractions	3/4-	5/8-		Composite	
Proportions	50 %	50 %	%	100%	Grad. Req.
1 1/4"	50	50		100	100
1"	50	50		100	100
3/4"	45	50		95	90-100
3/8"	23	17		40	20-55
#4	7	2		9	0-10

Washing Data for Sieve Analysis of Fine Aggregate

(A) Dry Sample and Record Weight	489.7
(B) Wash and Dry Sample, Record Weight	486.6
(C) Loss by Washing (A - B)	3.1

* #6 and #200 not included in Fineness Modulus ** Recommended filler sieve

Comments:	[redacted]

Sieve Analysis of Fine Aggregate

	Test No.:	QCF2	Sample Wt. (g):	489.7
Sieve Sizes	Weights (g)			
Pass – Ret.	Ind.	Cum.	% Pass	Req.
3/8" – #4		488.9	100	100
#4 – #6		488.9	100	95 -100
*#6 – #8	30.4	488.9	-	**
#8 – #16	144.8	458.5	94	80 -100
#16 – #30	83.2	313.7	64	55 -85
#30 – #50	147.4	230.5	47	30 -60
#50 – #100	74.1	83.1	17	5 -30
#100 - #200	5.8	9.0	2	0 -10
*#200 – Btm	0.1	3.2	0.7	0 -2.5
Loss by Washing	3.1			
Check Total	488.9	± 0.3 % of Sample Wt		488.2 -491.2
Fineness Modulus	Within ± 0.20		2.76	2.68

Overloaded Sieves

Minnesota Department of Transportation

Concrete Aggregate W

S.P.:	Plant: [redacted]
Engineer:	Tester: [redacted]

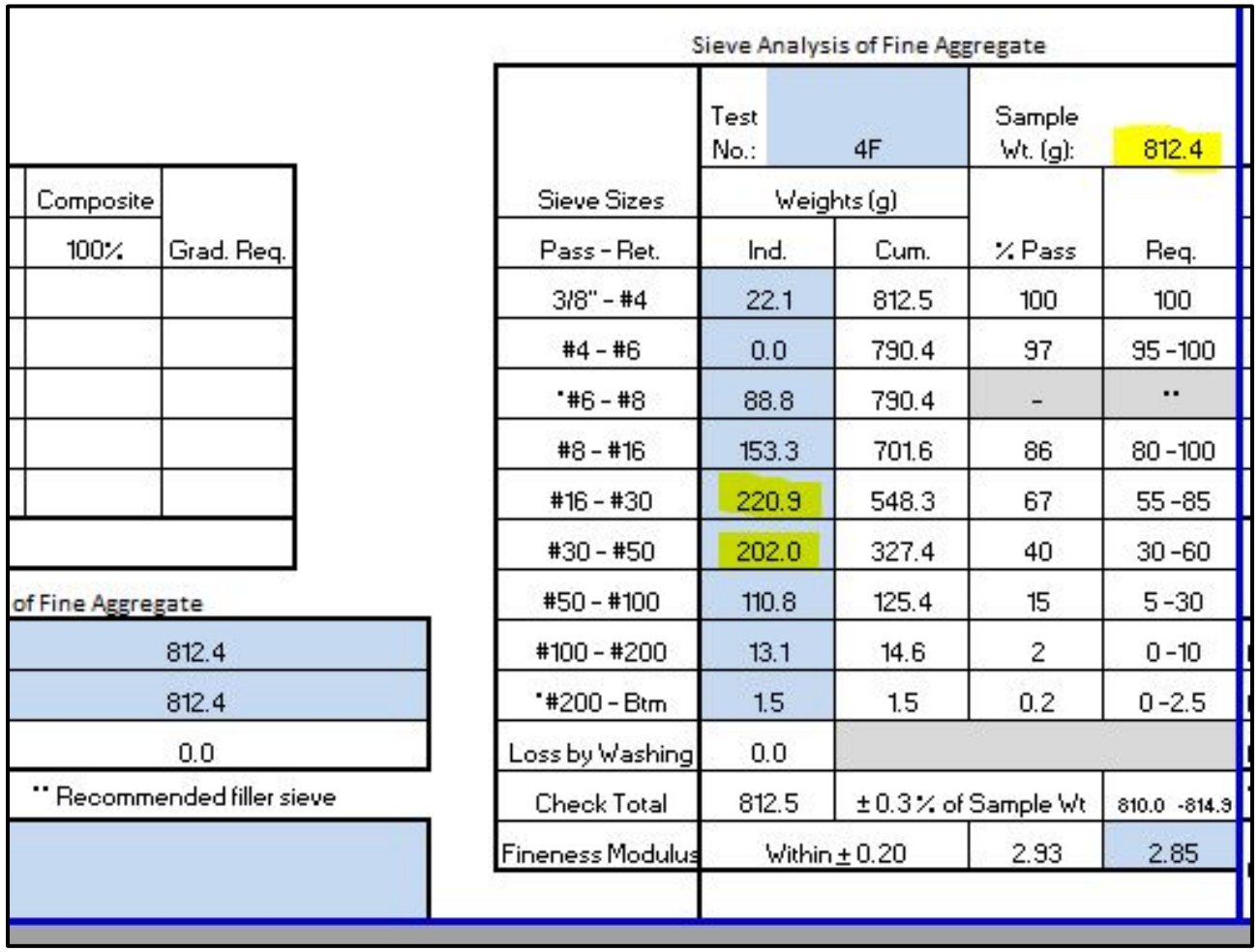
Agg. Fractions	CA: #67		Mix Prop.: 100	%
	Test No.:		Sample Wt. (lb):	40.4
Sieve Sizes	Weights (lb)			
Pass – Ret.	Ind.	Cum.	% Pass	Req.
1 1/4" – 1"		40.2	100	100
1" – 3/4"	2.5	40.2	100	100
3/4" – 5/8"	6.0	37.8	94	90-100
5/8" – 1/2"	8.6	31.8	-	-
1/2" – 3/8"	9.4	23.3	58	-
3/8" - 1/4"	10.1	13.9	34	20-55
1/4" - #4	2.4	3.8	-	**
#4 – Btm	1.4	1.4	3	0-10
Check Total	40.2	± 0.2 lb of Sample Wt		40.2 -40.6

MAXIMUM ALLOWABLE QUANTITY OF MATERIAL RETAINED ON A SIEVE
References from ASSHTO T 27 - 97[1] and/or Mn/DOT Standards
{+ #4 Sieve Quantities interpolated by this formula = {(2.5) x (Sieve opening, mm) x (Sieving Area, M2)} }

Nominal Dimensions of Sieve			203mm	8"	305mm	12"	305mm x 305mm	12"x12"	360mm x 360mm	14"x14"	400mm x 400mm	16"x16"	368mm x 572mm	14.5 x 22.5
		Sieving Area m^2	* .02850		* .06701		.09290		.12645		.16516		.21048	
			kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
In.	Mm													
4	100		-	-	-	-	23.23	-	-	-	-	-	-	-
3 ½	88		-	-	15.08	33.2	20.90	-	-	-	-	-	-	-
3	75		-	-	12.56	27.7	17.42	-	-	-	-	-	39.47	87.0
2 ½	63		-	-	10.55	23.3	14.63	-	-	-	-	-	31.15	69.4
2	50		1.56	7.8	8.38	18.5	11.61	25.5	15.79	34.8	20.59	45.4	26.31	58.0
1 ½	37.5		2.67	5.9	6.28	13.8	8.71	19.2	11.84	26.1	15.47	34.1	19.73	43.5
1 ¼	31.5		2.24	5.6	5.28	12.6	7.32	16.1	9.96	21.9	13.01	28.6	16.58	36.5
1	25		1.78	3.9	4.19	9.2	5.81	12.8	7.89	17.4	10.30	22.7	13.15	29.0
¾	19		1.35	3.0	3.18	7.0	4.41	9.7	5.99	13.2	7.85	17.3	10.00	22.0
5/8	16		1.14	2.5	2.68	5.9	3.72	8.2	5.06	11.2	6.61	14.6	8.42	18.6
½	12.5		0.89	2.0	2.09	4.6	2.90	6.4	3.95	8.7	5.17	11.4	6.57	14.5
3/8	9.5		0.67	1.5	1.59	3.5	2.21	4.9	2.99	6.6	3.90	8.6	5.00	11.0
1/4	6.35		0.45	1.0	1.06	2.3	1.47	3.3	2.01	4.4	2.6	5.8	3.34	7.4
4	4.75		0.33	0.7	0.80	1.8	1.10	2.4	1.50	3.3	1.95	4.3	2.50	5.5

Screen Sizes

Overloaded Sieves



Composite	
100%	Grad. Req.

of Fine Aggregate

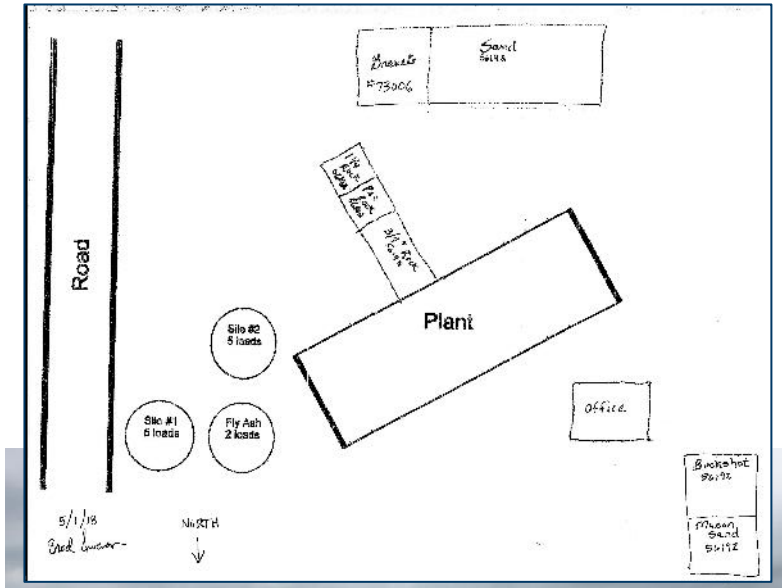
812.4
812.4
0.0

** Recommended filler sieve

Sieve Analysis of Fine Aggregate

	Test No.:	4F	Sample Wt. (g):	812.4
Sieve Sizes	Weights (g)			
Pass - Ret.	Ind.	Cum.	% Pass	Req.
3/8" - #4	22.1	812.5	100	100
#4 - #6	0.0	790.4	97	95 -100
*#6 - #8	88.8	790.4	-	**
#8 - #16	153.3	701.6	86	80 -100
#16 - #30	220.9	548.3	67	55 -85
#30 - #50	202.0	327.4	40	30 -60
#50 - #100	110.8	125.4	15	5 -30
#100 - #200	13.1	14.6	2	0 -10
*#200 - Btm	1.5	1.5	0.2	0 -2.5
Loss by Washing	0.0			
Check Total	812.5	± 0.3 % of Sample Wt		810.0 -814.9
Fineness Modulus	Within ± 0.20		2.93	2.85

Stockpile Issues



Contact Report

TP-2163 (revised 12/11/20)

Minnesota Department of Transportation

Contact Report - Ready Mix 2021

Plant Name: M #:
Address: Date:
Phone:
Batch Person: Plant Email:
Test results Email: Has the Test Results email address changed?

Prior to the production of Department concrete **each construction season**, a Department Representative shall perform a thorough on-site inspection of the concrete plant with a MnDOT Certified Plant Technician, Quality Control Supervisor or Quality Control Manager representing the Producer. Display the Contact Report and site map in plain site at all times.

MnDOT Certified Plant Technician: Cert#: Phone#:
MnDOT Certified Plant Technician: Cert#: Phone#:
MnDOT Certified Plant Technician: Cert#: Phone#:
MnDOT Certified Plant Technician: Cert#: Phone#:
MnDOT Certified Plant Quality Control Supervisor: Cert#: Phone#:
MnDOT Certified Plant Quality Control Manager: Cert#: Phone#:

Agency verifies the cementitious and admixture samples are documented in the current year electronic Sample Log.

Agency Representative: Agency:
Cell #:
Cert #:

Agency Inspection

Approved Date:

Not approved for the following reason(s):

Final Certification of the plant will be posted on the Concrete Unit website.

Re-inspected and approved on by

A MnDOT Certified Plant Technician, Quality Control Supervisor or Quality Control Manager, representing the Producer, signs the report certifying compliance with the Certified Ready Mix requirements and continual maintenance of the plant to assure that the plant can

Page 1

Contact Report - Ready Mix | Addendum Ready-Mix Paving

- Updated the Water Section to include Clarified Water
- Listed filler sieves to prevent overloading
- Added the Paving Addendum

MnDOT Audit Investigations

- Biggest concern identified by Audit is lack of communication from Plant Monitors
  - Not relaying non-compliance issues to the Engineer
- Inexperience (both Agency and Consultants)
- Increasing compliance but room for improvement

MnDOT Audit Investigations

- Focused on ready-mix plant operations and QC personnel along with Agency Plant Monitoring
  - Falsification of Test Results – repeated starting weights
  - Knowingly using non-compliant material
  - Unqualified Personnel (does not mean non-certified)
  - Repeated Incomplete Documentation
  - Moistures in QC workbook not matching Certificate of Compliance.

MnDOT Audit Investigations

2461.3.F.5 Agency Quality Assurance (QA)

(10) *If any equipment malfunctions, testing procedures or test results are questionable, or unusual activity is occurring during the plant visit perform the following:*

(a) Continue monitoring at the plant and document observations in the diary.

(b) Investigate to determine the origin of the concern and document the resolution.

(c) Contact Independent Assurance Inspector, Project Engineer or Concrete Engineering Unit when necessary.

Non-compliance with Certified Ready-Mix Plant Program

If the Engineer observes the Producer not complying with the requirements of the Certified Ready-Mix Plant Program, the Engineer will perform the following:

(1) Verbally notify and promptly email the Producer and the Concrete Engineer the list of observed deficiencies and provide a deadline to correct the non-compliance.

Non-compliance with Certified Ready-Mix Plant Program (cont.)

(2) If non-compliance is not corrected by the deadline, notify the Contractor and Producer that concrete production is unauthorized in accordance with 1512, "Unacceptable and Unauthorized Work."

The Concrete Engineer will determine if the severity of the non-compliance results in decertification of the plant in accordance with 2461.3.F.1.c, "Certified Ready-Mix Plant Decertification."

Non-compliance with Certified Ready-Mix Plant Program

- MnDOT Concrete Unit is requesting Producer to explain in writing why it happened and what action will be taken to prevent reoccurrence
- Ask IA for assistance if procedural issue
- Call Matt or Brad at the Concrete Office if issues persist

Consequences of Non-Compliance

- Additional MnDOT Audit
- Removal of Federal Funds from a Project
- Decertification of Ready-Mix Plant
- Suspension or Revocation of Tech Certification
- Prosecution for fraud

Certified Ready-Mix Decertification

The Concrete Engineer, with coordination from the Engineer, may decertify the plant and halt production of concrete under any of the following conditions:

1) Unauthorized procedural, material, or equipment changes made after the completion of the Concrete Plant Contact Report,
2) Failure to meet the required testing rates,
3) Failure to complete required documents,

Certified Ready-Mix Decertification (cont.)

The Concrete Engineer, with coordination from the Engineer, may decertify the plant and halt production of concrete under any of the following conditions:

4) Failure to provide competent MnDOT Certified Plant Technicians,
5) Disregard of any of the requirements of 2461.3.F, Certified Ready-Mix Concrete, or
6) Falsification of test records or certificates of compliance.

DEPARTMENT OF TRANSPORTATION

2020 Special Provision Changes to 2018 Schedule of Materials Control

Incorporated Into 2019 & 2020 & 2021 Projects

Schedule of Materials Control Changes

- Revised Plant Testing Rates
  - Effective in Contracts let March 22, 2019 and later
  - Gradation rates based on daily CY for JMF & Bridge
  - Gradation rates based on weekly CY for all other concrete
  - Eliminated 1 per 2 days, 2 per 3 or more days
  - Typically QA will test 1 QA (QC Split) and 1 Agency Verification each week

3131 - Intermediate Aggregate Requirements

- Quality
  - Provide CIA in accordance with 3137.
  - Provide FIA, CS and FS in accordance with 3126.
- Gradation
  - Intermediate aggregates do not have individual sieve gradation requirements, they will be combined with another aggregate.
- Intermediate Aggregate Test Methods
  - When proportioning CIA with a coarse aggregate to meet the specified limits of ASTM #67 gradation, sample and test CIA in accordance with Table 3137-6 using a minimum sample size equivalent to CA-70 per the Schedule of Materials Control. Sample and test all other CIA intermediate aggregates in accordance with Table 3126-5.
  - Sample and test FIA, CS and FS in accordance with Table 3126-5.

Quality Control Personnel

The Producer will provide the following personnel:

- *QC Plant Technician(s)* to perform all testing and quality control requirements of 2461.

Plant Certified

- *Quality Control Supervisor* responsible for oversight of all QC testing and is required to remain on-site during concrete production or have cellular phone availability.

Plant Certified

- *Quality Control Manager* responsible for oversight of the Quality Control Supervisor and the certified ready-mix plant program.

http://www.dot.state.mn.us/const/tcp/

Provisional Testers Using QC Workbook

- MnDOT will allow provisional testers to work in the Concrete Ready-Mix Plant QC Workbook
  - Provisional Testers can't sign Certificate of Compliance
- New 2461.3.F.4.e Language:
  - *The Producer's designated QC Supervisor will review and submit to the Engineer and the Concrete Engineering Unit by the Tuesday immediately following the previous week's production.*

Agency Aggregate Gradation Results

- Spec 2461.3.F.4.d Aggregate Gradation Control Charts and Sample Log
  - Removed requirement for Producer to record any Agency gradation results (Verification or QA Gradation) in QC Workbook or Chart

Concrete Ready-Mix Plant QA Workbook

The Engineer will complete the Concrete Ready-Mix Plant QA Workbook in real time which includes all of the following documents:

(1) Diary

(2) Weekly Certified Ready-Mix Plant Report

(3) Concrete Aggregate Worksheet if gradation testing performed in the field

(4) JMF Concrete Aggregate Worksheet if gradation testing performed in the field

Submit to the Engineer and the Concrete Engineering Unit by the Thursday immediately following the previous week's production.

Thank you!

Matt Herbst

matthew.herbst@state.mn.us

651-366-5423

Thanks!

Questions?